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Factors Affecting Food-Related Behaviors of Adolescents

Nancy N. Salvetti
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To the Graduate Council:

I am submitting herewith a thesis written by Nancy N. Salvetti entitled "Factors Affecting Food-Related Behaviors of Adolescents." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Food Science and Technology.

Jean D. Skinner, Major Professor

We have read this thesis and recommend its acceptance:

Majorie Penfield, Frances Andrews

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Accepted for the Council:

Vice Chancellor
Graduate Studies and Research

FACTORS AFFECTING FOOD-RELATED BEHAVIOR OF ADOLESCENTS

A Thesis

Presented for the

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Degree

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Nancy N. Salvetti

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ABSTRACT

Adolescents' evening meal patterns and the effects of the following factors on adolescents' eating behavior were investigated: gender, region (metropolitan or rural), mothers' employment, who prepared the evening meal, teens' employment, nutrition attitudes, and nutrition knowledge. A sample of 229 adolescents 16-18 years of age from four metropolitan and three rural high schools in East Tennessee completed 24-hour food records, written questionnaires, and nutrition attitude/knowledge tests in spring 1980. Additional data were collected from nine high schools in the Knoxville area in spring 1981. A paired sample of 74 adolescents working on the day of the survey and 74 nonworking adolescents was used to investigate the factor, teens' employment. Students were paired on the basis of gender, race, age, and school. Food records were evaluated for energy and nutrient content for the total day and the evening meal. Nutrient intakes per 1000 kcal and dietary scores based on the RDA and the RDA per 1000 kcal were computed as measures of quality.

Adolescents' diets for the total day in spring 1980 were frequently below 2/3 of the RDA for calcium, iron, vitamin A, and ascorbic acid. Males consumed greater amounts of all nutrients than did females. The quality of females' diets was lower than those of males for calcium, riboflavin, and protein. Region and mothers' employment did not affect the overall quality of diets for the day. However, adolescents with employed mothers tended to have higher ascorbic acid intakes and had lower iron intakes per 1000 kcal than did those whose mothers

were not employed. A positive relationship was found between nutrition attitude scores and the total dietary score per 1000 kcal on the survey day. Nutrition knowledge scores were not related to dietary scores.

Adolescents' evening meals on the survey day in spring 1980 included an animal protein food, such as meat or cheese, in 84% of meals, and a starchy food, such as potatoes or bread, was found in 91%. Only 30% included milk and 34% vegetables. Tea and soft drinks were found in 54% and desserts or snack foods in 16%. Evening meals were low in calcium, iron, vitamin A, and ascorbic acid when compared to the standard, 1/3 of the RDA. In addition, half did not meet 1/3 of the RDA for energy. Most (82%) ate the evening meal at home; 15% ate at a restaurant; 6% skipped. Although mothers prepared 53% of the meals, 23% of the adolescents prepared their own. Self-prepared evening meals were significantly lower in quality with less iron, thiamin, and niacin than meals prepared by mothers. Males consumed greater amounts of nutrients at the evening meal and ate more snacks during the late afternoon and evening than did females. Rural adolescents' evening meals were lower in quality for niacin than were meals of metropolitan adolescents. Metropolitan adolescents tended to omit vegetables and tended to eat the evening meal away from home more often than did rural adolescents. Adolescents with employed mothers had evening meals that tended to be higher in ascorbic acid than did those with nonemployed mothers. Evening meal patterns were not affected by mothers' work status.

In the paired sample, working adolescents' evening meals were lower in ascorbic acid than were the meals of the nonworking. Those

who worked ate more sandwiches, more frequently included an animal protein source, and tended to include vegetables, other than potatoes, less often at the evening meal than did those who did not work. Working adolescents ate the evening meal less often at home. Only 3% of the nonworking adolescents skipped the evening meal compared to 11% of the working adolescents.

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CHAPTER I

INTRODUCTION

According to recent task force recommendations by the National Conference on Nutrition Education 1979, nutrition education programs should be developed for different age groups in the population (Egan et al., 1980). To boost effectiveness and relevancy, curricula must be based upon the current environment and eating behaviors of the target group (Egan et al., 1980). Using the systems approach, the impact of various economic, ethnic, and social factors can be considered in planning programs to meet regional needs. More research is needed in this area particularly for nutritionally vulnerable groups such as adolescents, children, and pregnant women (Egan et al., 1980).

Some aspects of the adolescent's social environment in the United States have remained relatively constant in the past 35 years. Activities revolving around school and home still are major preoccupations for most teenagers. During this period, however, family life has been affected by many sociocultural and economic changes. With increasing numbers of women with children participating in the labor force, the role of the mother as the gatekeeper of food for the family may be declining. Teenagers over age 16 are more mobile today than in the past, and today's teenagers often have access to transportation that allows them to work and participate in after-school activities away from home.

Eating patterns during the evening hours may be affected particularly by employment and activity trends in our society because the family is mainly responsible for preparing or obtaining this meal for its members. Activities after school may cause teenagers to miss regular evening meals with the family. These teenagers may eat their meals at work or in restaurants, or they may postpone eating until they return home later in the evening. The quality of adolescents' diets may be affected when the evening meal is missed or eaten away from home. Families today must cope also with limited time available to prepare meals. Adjustments to compensate may involve greater participation of family members in meal preparation than was found in the past.

The purposes of this study were to describe the evening meal patterns of adolescents in East Tennessee and to investigate the relationship of selected factors to their eating behavior and nutrient intake during the evening hours. The factors chosen for investigation were gender, region (metropolitan or rural), mothers' employment, who prepared the evening meal, teens' employment, nutrition attitudes, and nutrition knowledge.

CHAPTER II

REVIEW OF LITERATURE

Adolescents' Food-related Behavior

Nutritionists give the highest priority to reaching groups that have the greatest need for intervention. Special attention is given to the critical periods of physical development because an improper diet at those times can cause irreversible damage to the body. Adolescence is an important developmental stage in the life span. Growth during adolescence is characterized by an acceleration phase, peak growth period, and a deceleration phase that continues until adult maturity (Johnston, 1961). The body's demand for nutrients to support growth in adolescence is greater than most other times in life (Heald, 1975). Nutritional needs are highest in the year of maximum growth, usually near puberty (Heald, 1975). Teenagers, as a group, display variations in body size, velocity of growth, and maturation (Barnes, 1975). Because the peak growth period may happen over a five-year range, age is not the most accurate predictor for nutrient needs for adolescents (Gaines and Daniel, 1974; Wait, 1973).

Much of the concern about teenagers' dietary habits has arisen from the results of the dietary surveys. Researchers have reported that a disturbing number of adolescents did not consume the recommended amounts of one or more nutrients during the period of observation.

Low-income teenagers were "the most poorly nourished age group" studied in the Ten State Nutrition Survey 1968-1970 (DHEW, 1972).

In the majority of surveys, teenage males consumed greater amounts of all nutrients, except vitamin C, than did teenage females (Wharton, 1963; Hodges and Krehl, 1965; Hampton et al., 1967; Schorr et al., 1972; Gaines and Daniel, 1974; Lee, 1978; Howe and Vaden, 1980; USDA, 1980). This discrepancy can be explained by the fact that males consume substantially more kilocalories (kcal) than do females. Hampton et al. (1967) found that adolescent boys' mean daily caloric intake from four-week food records ranged from 2732 to 2908 kcal while girls consumed 1876-2000 kcal. These figures are in relative agreement with other studies that have reported adolescent males consume an average of 300-1000 kcal more each day than do adolescent females. Pao and Mickle (1981) reported evidence that energy intake and nutrient adequacy are related. In the Nationwide Food Consumption Survey (NFCS) 1977-78 adolescent females with mean energy intake less than 70% of the Recommended Dietary Allowances (RDA) for three days had considerably lower nutrient intakes than those adolescents who averaged over 100% of the RDA for food energy (Pao and Mickle, 1981).

Investigators have found that calcium, iron, vitamin A, and ascorbic acid are the nutrients most likely to be insufficient in diets of adolescents (Wharton, 1963; Hodges and Krehl, 1965; Hampton et al., 1967; DHEW, 1972; Lee, 1978; Howe and Vaden, 1980). Other nutrients below recommended amounts for all age groups in the NFCS 1977-78 were vitamin B_6 and magnesium (Pao and Mickle, 1981). Riboflavin deficiency,

measured by blood erthrocyte glutathione reductase activity, was reported in a sample of adolescents from New York City (Lopez et al., 1980).

Several researchers have reported that calcium intake is related to the consumption of milk products. According to Hampton et al. (1967) adolescents who substituted soft drinks for milk at meals tended to have lower calcium intakes than those who drank milk. Teenagers aged 15-18 in the NFCS 1977-78 with calcium intakes above 70% of the RDA obtained a larger percentage of the nutrient from the milk group than those with calcium intakes below 70% of the RDA (Pao and Mickle, 1981). Mean calcium intakes for children and teenagers were lower in 1977 than in 1965 (USDA, 1980). Calcium supplied from milk and milk products was 10-15% lower in 1977 than in 1965 for most age groups (Pao, 1981). The decline in milk product usage among adolescents has been accompanied by an increase in soft drink consumption (Pao, 1981). Sixty percent of males and 56% of females aged 15-18 reported consuming soft drinks in 24-hour recalls in the NFCS 1977-78 (Pao, 1981). Males aged 15-18 had the largest consumption of all groups averaging 13 ounces daily for each individual (Pao, 1981).

Many adolescents, particularly females, do not consume the recommended amount of iron. Iron intakes for females aged 12-50 in 1977 had not changed from the 1965 national survey and in the latest survey averaged 60-65% of the 1980 RDA (Pao, 1981). Males aged 15-18 in the NFCS 1977-78 had a mean iron intake 92% of the RDA (Pao and Mickle, 1981). Other investigators also have reported mean iron intakes of adolescent females close to or below 2/3 of the

the National Gallup Youth Survey, 1977, Gallup (1980) reported spinach, broccoli, beans, squash, and liver were five of the least favorite foods of teenagers. The citrus/tomato group was the most important source of ascorbic acid for individuals with intakes over 70% of the RDA in the NFCS 1977-78 (Pao and Mickle, 1981). For those with ascorbic acid intakes less than 70% of the RDA in the NFCS 1977-78, vegetables, including potatoes, were the most important source.

Many teenagers skip meals and snack frequently (Anon., 1981). These irregular eating practices may contribute to the variability of nutrient intakes exhibited in adolescent records and recalls. Hampton et al. (1967) reported large daily and individual variations for calories and nutrients during four consecutive weeks. Lacy et al. (1978) reported significant day to day variation in energy intake in the eight-week food records of 24 adolescent girls in Great Britain.

Meal pattern evaluation enables nutritionists to suggest ways in which missing nutrients can be incorporated with minimal disruption of established dietary patterns. Leverton (1968) suggested adolescents often do not follow our culture's traditional pattern of three daily meals. Meal regularity and frequency have been shown to affect daily nutrient intake. Huenemann et al. (1968) classified regular and irregular adolescent eaters by the degree of variability in their four-week food records. They found that the less regular eaters had lower nutrient intakes than regular eaters. Guthrie (1981a) reported that individuals in the NFCS 1977-78 who reported eating three meals each day on three-day food records had diets that supplied a greater

proportion of the RDA than those who ate two meals for one or more days. The most common meal pattern for teenagers in the NFCS 1977-78 was three times per day followed by four, five, six, and two for males and four, five, two, and six for females. Only 1.3% of those studied reported eating only one meal during the day (USDA, 1980).

The amounts of nutrients consumed from foods obtained away from home have increased for all age groups between 1965 and 1977 (USDA, 1980). Oritz et al. (1981) found that as the age of the youngest child increased family meals were less likely to be eaten together at home. Foods obtained outside the home supplied almost 39% of the total day's calories for males aged 15-18 and 48% for females aged 15-18. Meals away from home provided 1/3-1/2 of all nutrients, except for vitamin A and ascorbic acid for males, as reported in 24-hour recalls in the NFCS 1977-78 (USDA, 1980).

Individuals less than 35 years of age eat more frequently at fast food restaurants than do older adults (Gallup, 1975). Adolescents and college students may eat fast food more often than the average family partially because some school food services have adopted this pattern (Shannon and Parks, 1980). Many of the fast food meals studied by Shannon and Parks were classified as nutritious by nutrient density criteria. Fast foods can be chosen that contribute substantial amounts of protein, thiamin, riboflavin, ascorbic acid, iron, and calcium (Shannon and Parks, 1980). Vitamin A, folacin, iron, and copper may be low in some fast foods, while calories, sodium, and fat tend to be high (Anon., 1975; Shannon and Parks, 1980). Although several food sources of calcium were available in fast food menus, they were

selected infrequently by consumers in a study by Greecher and Shannon (1977).

Few researchers have examined the meal patterns of adolescents during the evening hours and very few data are available on the nutritional value of adolescents' evening meals. Several studies have reported that the evening meal is well liked by adolescents (Hinton et al., 1963; Huenemann et al., 1968). According to Huenemann et al. (1968) dinner was eaten more often than either lunch or breakfast and was the most preferred meal of adolescents in California. Ethnic background had a significant influence on the regularity of meals and dinner preference. Hertzler et al. (1976) reported adults were present with adolescent girls more often at the evening meal than at breakfast. This finding was reported also by Hodges and Krehl (1964) in Iowa.

The types of foods served at dinner were mentioned most often as the reason California teens liked this meal (Huenemann et al., 1968). The foods eaten most commonly at the evening meal by Iowa teenagers were meat, potatoes, and a dessert (Hodges and Krehl, 1964). Using the individual's designation for meals, the investigators in the NFCS 1977-78 reported 90% of females aged 15-18 and 91% of males aged 15-18 ate dinner or supper as reported in one day recalls (dinner may have referred to the noon meal in some cases) (USDA, 1980).

Varying percentages of daily intake for males aged 15-18 were provided by dinner: energy, 42%; protein, 49%; fat, 46%; carbohydrate, 35%; vitamins and minerals, 35-48%. Supper for males aged 15-18 provided 40% of the day's food energy and the following nutrients:

protein, 45%; fat, 42%; carbohydrate, 35%; vitamins and minerals, 32-44%. For females aged 15-18, dinner was the source of 46% of the day's food energy and the following nutrients: protein, 54%; fat, 50%; carbohydrate, 39%; vitamins and minerals, 37-53%. Supper for females aged 15-18 supplied 44% of the day's food energy and the following nutrients: protein, 51%; fat, 47%; carbohydrate, 39%, vitamins and minerals, 37-49% (USDA, 1980). Therefore, adolescents' evening meals made an important contribution to the day's intake of nutrients and energy. Females obtained a greater proportion of the day's energy intake and nutrients from dinner and supper than did males.

Huenemann et al. (1968) observed that teenagers snack frequently and tend to eat more often than three times per day. Thomas and Call (1973) reported snacks were found in 78% of adolescents' 24-hour recalls in the Ten State Survey. In recalls in the NFCS 1977-78, 64% of males aged 15-18 and 60% of females aged 15-18 reported one or more snacks (USDA, 1980).

Snacking is no longer regarded as a harmful eating pattern for adolescents. Contrary to previous assumptions, snacks often make positive contributions of nutrients and calories during the day (Wharton, 1963; Huenemann et al., 1968; Thomas and Call, 1973; USDA, 1980). Guthrie (1981b) stated that the value of snacks in the diet should be examined in the context of the total daily diet.

Snacks were reported most commonly in the time periods 10:00-11:00 a.m., 3:00-4:00 p.m., and 8:00-10:00 p.m. in the NFCS 1977-78.

Nearly 1/2 of the snacks were eaten during the evening hours from 5:00 p.m. until midnight.

Factors that Influence Adolescents' Food-related Behavior

The food-related behavior of human beings is affected by a complex combination of physiological, psychological, and sociocultural factors (DeGarine, 1972). Previous research with adolescents has shown that many social factors associated with the family, peer group, and community environment are likely to affect their eating behavior.

The family unit traditionally has been responsible for the socialization of young children and adolescents. Food patterns are learned early in life through interaction with family members and other individuals in their environment. In this way, cultural foodways are transmitted from one generation to the next. In our society, the mother has been regarded as the gatekeeper of foods for the family (Lewin, 1943) and as a consequence, much nutrition research has emphasized her importance in this role. Today an ecological approach is needed because all family members, including the children, influence decisions and events that may affect nutritional well-being (Caliendo et al., 1977; Hertzler and Vaughan, 1979).

Socioeconomic Status

The socioeconomic status of the family is a factor that has been found to affect the food intake and meal patterns of adolescents. Parental educational levels, occupations, and income are used frequently as indicators of social status. Adolescent girls from Illinois were

classified into three social status groups based upon the father's occupation and parents' education by Hinton et al. (1962). They found that the higher social status group had diets that were nutritionally superior to the diets of girls in the lowest classification. Nutritional status of children and teenagers was related to the educational level of the mother in the Ten State Survey 1968-1970 (DHEW, 1972). Teens in the high socioeconomic group in California tended to have more regular eating patterns and skipped fewer meals than did those in the low socioeconomic group (Huenemann et al., 1968). In a Nova Scotia study, AuCoin et al. (1972) found that better diet scores of adolescents were associated with higher educational levels of the parents. The mother's educational level and the occupation of the household head also were positively related to teenagers' dietary complexity scores in a New York study (Schorr et al., 1972). Differences in mean nutrient intakes were observed for middle- and low-income preadolescents in Tennessee (Wakefield et al., 1980).

Regional and Ethnic Background

The location and cultural surroundings in which the family lives influence meal patterns and the availability of food. The eating behavior of urban, suburban, and rural adolescents may not be the same because they have access to different sources of foods. The availability of restaurants, supermarkets, home gardens, and other influencing factors, including transportation, are not the same in various locations. Geographic sections of the United States have characteristic regional foodways due to their climatic, geographic, ethnic, cultural, and socioeconomic differences.

The influence of location and ethnic background have been studied by comparing the diets of adolescents living in different regions and belonging to different racial groups. Brown (1967) reported college students in Illinois from farm families mentioned large family meals, food variety, and seasonal variation more often than did students from urban families in their description of food habits during childhood and adolescence. Preadolescents living in rural areas of Tennessee had higher mean intakes of calories, vegetable protein, iron, and vegetable fat and lower intakes of animal protein, ascorbic acid, riboflavin, thiamin, vitamin B_6, vitamin B_{12}, calcium, phosphorus, and animal fat than did urban subjects (Wakefield et al., 1980).

Wharton (1963) reported black teenagers in Illinois had higher mean intakes of several nutrients and lower intakes of fat than did white teenagers. Black teenagers in California had less regular eating habits and lower nutrient intakes than did white or Oriental teenagers (Huenemann et al., 1968). Wakefield et al. (1980) found black preadolescents in Tennessee had higher mean intakes of vitamin A and lower intakes of calcium, phosphorus, and magnesium than did white preadolescents. Favorite foods reported by teens in the National Gallup Youth Survey differed between whites and nonwhites and among those from various regions of the country (Gallup, 1980).

Family Interaction

The influence of family relationships on adolescents' food-related behavior has been investigated in several studies. In an Iowa study with adolescent girls Hinton et al. (1963) found that higher scores

on the personal adjustment and family relationship section of the Minnesota Counseling Inventory were related to better quality diets and greater meal regularity. Allen et al. (1970) defined family commensality related to food behavior as the number of meals eaten together, appetite, perceptions about food quality and quantity, and who prepared meals. Among four nutritional factors, family commensality was found to be the factor most closely related to academic performance of high school students. The relationship of family structure to the iron status of adolescent girls in a low income area of Missouri was studied by Hertzler et al. (1976). Significant correlations were found among three measures of family structure including the number of adults in the household, shared family food activities, and shared feelings with adults. The results suggest that feelings shared with adults in the family are related to the number of food-related activities in which the adolescent participates with the family.

Mothers' Employment

During the past three decades women have joined the labor market in steadily increasing numbers. Since 1978 the number of families with both husband and wife working has been greater (42% in 1980) than those with husbands only working (36% in 1980) in households with both spouses present (Westcott and Bednarzik, 1981). This profound sociocultural change has affected families and our society in many ways. For this reason, it is a contemporary topic of interest to researchers in many fields. Nutritionists are concerned with the

influence of mothers' employment on children's food-related behavior and on family eating practices.

Because adolescents are more independent than younger children, it is expected that many mothers of this group will be employed outside the home. In a sample of 210 families in Wisconsin Oritz et al. (1981) found that homemakers with the youngest child in the teen age group were more likely to be employed than those with younger children. Women 34-44 years of age have shown the largest increases in participation in the labor market during the past six years, and this group has a higher employment population ratio (percentage of female population employed) than younger or older females (Leon and Rones, 1980). The figures indicate that at the present time the majority of women in the United States in the age group likely to have teenage children are employed. In the southeast during the 1970's females' participation in the labor force has shown increases similar to the national trend. During 1979, 48.7% of the female population in Tennessee were employed or looking for work (Bureau of Labor Statistics, 1980).

This factor in the adolescent's environment has received only limited investigation in nutrition research studies. Hinton et al. (1962) reported no relationship between mothers' employment and the nutritional quality of the diets of female adolescents in Iowa. Similar results were reported by AuCoin et al. (1972) with adolescents in Nova Scotia. Findings by Oritz et al. (1981) in Wisconsin suggested that family meal patterns were affected by homemakers' employment status. They found that homemakers employed fulltime spent less time

preparing food at home than did parttime or nonemployed homemakers. Families with fulltime employed homemakers also ate a greater percentage of meals away from home. The authors noted that these results showed that families with employed homemakers may have eaten more foods in a convenience form.

Several researchers have investigated the extent to which teenagers help their families with household chores and food-related activities. Douvan and Adelson (1966) reported that girls with employed mothers were more likely to help with household chores than boys, and girls in general had more household responsibilities than did boys. More household chores were assigned to boys with employed mothers than boys with mothers who were not employed, according to Propper (1972). In Missouri, teenage girls participated more often in meal preparation and cleanup than food shopping or menu planning (Hertzler et al., 1976). In the Seventeen's Food Survey (1979) with a national sample, over 60% of the mothers of teenage girls were employed and 93% of the teenage respondents prepared or helped prepare meals for themselves or their families. Girls prepared breakfast and lunches for themselves more often than they prepared dinner. Over half of the girls shopped for food during the week of the survey, spending an average of $27.00 or approximately 1/3 of the family food expenditures.

Peer Group

Learning to relate to others outside the family sphere is an important developmental task during adolescence (Kaluger and Kaluger, 1974; Young and Ferguson, 1979). The peer group often satisfies dependency needs for adolescents while they are developing their

own identity (Kaluger and Kaluger, 1974). The need to conform to the group standards of peers can affect the behaviors, attitudes, and values of adolescents (Kaluger and Kaluger, 1974). Children approximately 10 years of age begin to focus increasing attention toward their peers. Maximal peer conformation, according to several investigators, occurs during early adolescence (Young and Ferguson, 1979). Young and Ferguson found that children between the fifth and eighth grades chose adults outside the family as a reference group for informational items most frequently while parents were the most frequent choice for moral judgements. With increasing age, peers were chosen most often as a reference for social items. High school students in Toronto indicated they shared twice as many activities with friends compared with the number shared with parents (Propper, 1972).

Because adolescents spend more time in activities away from home than do younger children, parents typically have less direct influence over their food intake (Brown, 1967). Food-related behavior can be affected by the adolescents' interactions with others in their age group (Anon., 1981). Popular foods, restaurants, and eating patterns such as fad dieting or vegetarianism are likely to be influenced by group acceptance. An understanding of group food patterns may help nutritionists suggest ways to make good nutrition popular among teenagers (Schorr et al., 1972).

Concerns about Physical Appearance

The individuals' rapidly changing physical appearance is a major concern of male and female teenagers. Deviations from the norm of

their age group and the culturally determined ideal body size can be a source of psychological and emotional stress (Balsley et al., 1968; Kaluger and Kaluger, 1974). Overweight females at this age often are subjected to considerable social pressure from family and peers to lose weight (Steele, 1980). Changing body proportions to meet these expectations often is pursued through dieting. Teenage girls try to become thin and boys may attempt to gain weight and develop a muscular build (Bowden, 1973). Conscious dieting was reported by 37% of adolescent girls in a suburban high school at the time of an interview by Dwyer et al. (1967). The fact that many of the dieters were not clinically obese suggested that some girls were trying to change body build rather than the amount of adipose tissue (Dwyer et al., 1967). Obesity is a problem among adolescents that is likely to continue into adulthood (Balsley et al., 1968). Dwyer et al. (1967) found that 15.2% of female students from one middle class high school were obese based on triceps measurements. In the Ten State Nutrition Survey 1968-1970 (DHEW, 1972) 5-39% of adolescents were obese. The incidence of overweight for teenagers in Kentucky was 8-28% and was two times more frequent among females than among males (Lee, 1978).

Teens' Activities

Teenagers are involved in a variety of activities during the hours they are not attending school. Popular activities of teens listed by Kaluger and Kaluger (1974) included sports, hobbies, shopping, listening to music, watching television, social activities with clubs or friends, and talking. Many high school students are employed

in jobs after school and on weekends. During 1978 and 1979 approximately 50% of males and 45% of females aged 16-19 were employed, a 5% increase for both groups since 1975 (Leon and Rones, 1980). Teenagers in the 16-17 year age groups nationally have increased labor force participation at a faster rate than that of southern teenagers 16-17 years between 1974 and 1978 (Bureau of Labor Statistics, 1980). Labor force participation in the southeast during 1978 was 49.5% for males and 37.7% for females 16-17 years of age (Bureau of Labor Statistics, 1980). Older adolescents, 18-19 years old, increase their labor force participation appreciably. During 1978, 72.4% of males and 57.7% of females 18-19 years old were employed or looking for jobs in the southeast (Bureau of Labor Statistics, 1980). The unemployment rates for black teenagers in 1978 and 1979 were more than twice as high as that of white teenagers (Leon and Rones, 1980). Over half of black teenagers live in central city areas where teenage unemployment is most prevalent (Westcott, 1976). Only 1/3 of black female teenagers in 1975 were employed compared to 1/2 of white females in this age group.

The types of jobs available to teenagers less than 18 years of age are limited by child labor laws, lack of experience, and school attendance, which limits working hours. Teenagers 16 and 17 years old are excluded from employment in hazardous occupations and 14 and 15 year olds also are restricted to less than 18 hours weekly and are prohibited from night work during the school year (Westcott, 1976, 1981). Jobs available for 14 and 15 year olds are almost exclusively sales or unskilled labor (Westcott, 1981).

Westcott (1976) compared the employment patterns of youth living in central city, suburban, and nonmetropolitan areas. In 1975 more teenagers lived in the suburbs (6.5 million) than in the central city (4.5 million) or in nonmetropolitan areas (5.2 million). During that period, suburban teenage labor force participation was the highest. Males living in the central city and females in nonmetropolitan areas had the lowest participation rates (54% and 45%, respectively) in 1975.

The service and trade industries provide 70% of the jobs for youth in metropolitan areas and 60% in nonmetropolitan areas, with most of the remaining youth employed in manufacturing or for the government (Westcott, 1976). Westcott (1976) reported that area of residence and gender have greater influences on the types of jobs held by teenagers than does race. Teens living in metropolitan areas hold more white collar jobs, such as sales and clerical work, than do nonmetropolitan teens who are more likely to be employed in blue collar jobs. Service occupations account for 1/4 of the occupations of teenagers in all demographic areas. Three-fifths of the employed teenage girls living in the city and 2/5 living in nonmetropolitan areas held white collar jobs; 30-40% in all areas worked in service-related occupations. In contrast, over 1/2 of males in all areas held blue collar jobs with 18% in nonmetropolitan areas doing farm work. In the central city 1/2 of the jobs for males were service work compared with 1/4 in nonmetropolitan areas (Westcott, 1976).

Students with busy schedules may not have time to eat regular meals with the family (Leverton, 1968). Eating meals at work, at

fast food restaurants, or snacking may be a necessity (Anon., 1981). Making nutritious food available when and where it is needed will improve the diets of those who do not have time for regular meals (Leverton, 1968).

Physically active individuals require more calories to meet their energy requirements than those who are less active. Teenagers as a group, however, are not necessarily more active than adults (Huenemann et al., 1967). Males in California were slightly more physically active than were females according to Huenemann et al. (1967).

The assumption that employment and activities are likely to be detrimental to good daily eating practices was disputed in one study. Schorr et al. (1972) found that dietary complexity, a measure of dietary quality, was higher for employed students and for those participating in extracurricular activities than for those who were not. Several investigators have reported that activities may interfere with regular meals. The reason most often given by high school students in California for skipping lunch during the school year was the interference of other activities (Huenemann et al., 1968). Brown (1967) indicated that work schedules may affect the eating patterns of college students. The effect of teenagers' employment on family, peer, and coworker relationships was studied by Greenberger et al. (1980) in California with a sample of 531 working and nonworking adolescents in the tenth and eleventh grades. The employed adolescents in that study worked an average of 20-24 hours per week. Workers spent less time than nonworkers with the family and ate dinner less frequently at home. An increased number of hours spent working was associated with

less time and fewer dinners eaten with the family. The investigators found no significant difference for the amount of time workers spent with peers or the quality of family or peer social relationships compared with nonworking teenagers (Greenberger et al., 1980).

Nutrition Education

Secondary nutrition and health education programs provide individuals with information that can be applied in daily life to benefit physical well-being. The major objective, unlike purely academic subjects, is to produce desirable behavioral changes. Nutrition educators sometimes have assumed that knowledge alone will provide an incentive for improving dietary practices (Hochbaum, 1981). Hochbaum stated that although factual knowledge is a useful device for justifying decisions, it is not a strong motivator of change. Other factors such as taste, convenience, price, peer pressure, cultural, and social norms may be more influential than health considerations on food-related behavior (Hochbaum, 1981).

Relatively few investigators have studied the relationship between exposure to nutrition education and the food practices of adolescents. In Missouri, Whitehead (1960) reported students who received one or two years of nutrition education had higher dietary scores based on the intake of 10 food groups than did a control group with no instruction. Hinton et al. (1963) found adolescent girls in Iowa with higher dietary food group scores also tended to perform better on a nutrition application test. In a study by Skinner (1978), a nutrition knowledge test was administered and 24-hour food records collected from adolescents before and after units on nutrition

were taught in Oregon schools. A relationship was found between the change in nutrition knowledge scores from the first to the second test and the change in dietary scores per 1000 kcal as reported in 24-hour food records before and after the nutrition units. In a British Columbia study of eighth grade students, Thompson and Schwartz (1977) found that dietary scores calculated from intake of the four food groups were positively correlated with nutrition attitude scores. Dietary scores in that study were not correlated with nutrition knowledge. However, an association was found between adolescents' nutrition knowledge and their nutrition attitudes.

There is little information in the literature about adolescents' meal patterns in the late afternoon and evening. The available data suggest that the evening meal is well-accepted and provides substantial amounts of energy and nutrients for adolescents. Although several investigators have studied the influence of socioeconomic status and ethnic background on the nutritional quality of adolescents' diets, few have researched other factors in the adolescents' environment. No other dietary studies in Tennessee with 16-18 year-old adolescents have been reported.

CHAPTER III

METHODOLOGY

Sample Selection

High school students, 16-18 years old, living in East Tennessee were the target population of this study. At this age teenagers can have a driver's license and, by law, can be employed in a variety of occupations. With access to transportation and opportunities for employment, adolescents may spend more time away from home. Consequently, during these hours they often may be responsible for selecting their own food.

Senior high schools in East Tennessee were identified from a list of all Tennessee public schools (Tennessee Department of Education, 1979). With a map of standard metropolitan areas in Tennessee, schools were classified into two categories, rural and metropolitan (Center for Business and Economic Research, 1975). Using this method, small towns on the fringe of urban areas were included in the metropolitan group. Four metropolitan and three rural schools were selected randomly from the list. Seven schools were selected as alternates. Two sections of a required junior or senior class in each school were invited to participate in the survey.

A standard procedure was followed for obtaining the voluntary consent of the school principal, teachers, parents, and students. Principals of the selected high schools were sent an invitation letter that explained the objectives of the study and procedures for

administering the survey (Appendix A). The principals were contacted by phone to obtain permission to visit the school and to identify a teacher who might be willing to donate one class period of each of two required junior or senior classes. A letter that explained the project was sent to the identified teachers with a packet of parental/student consent forms (Appendix B; Appendix C). In a phone call, the time and day of data collection were arranged at the teacher's convenience. They were asked to distribute consent forms one week before the researcher's visit. Parents were informed of the purpose of the survey and asked to sign a consent form if their child was less than 18 years old. Students over 18 signed their own consent forms. In addition, participation in the survey was voluntary for students.

Additional high schools in the Knoxville area were sampled in 1981 to increase the number of employed teenagers in the study. Metropolitan schools were selected because travel funds for research were limited, and greater numbers of working students were found in the metropolitan area than in the rural area in the 1980 sample. Schools were chosen on the basis of consent from the school district and principal. Schools located in low-, middle-, and high-socioeconomic areas were represented.

To analyze the factor, teens' employment, a sample was selected from the surveys collected during spring 1980 and spring 1981. Seventy-four students who worked on the survey day were paired with randomly selected nonworking students from the same school and of the same gender and race. Those students involved in extracurricular

activities were not included as possible sample members because that factor also may affect adolescent evening meals.

Development of Instruments

Adolescents' food patterns during the evening hours were investigated in this study. The relationships of several factors to food-related behavior were studied also. The factors considered were population regions classified as metropolitan or rural areas, mothers' employment, who prepared the evening meal, teens' employment, nutrition attitudes, and nutrition knowledge.

The sample survey was an appropriate method of data collection for this study because it was possible to select subjects randomly, the information needed was quantitative, and it could be supplied easily by the target group (Warwick and Lininger, 1975). A 24-hour food record was chosen for collecting food consumption data. With limited time and available personnel for field work, this method allows a larger number of subjects to be included in the sample than does the personal interview. Because adolescents eat frequently during the day, a food record may provide more complete data than a recall. With the record, subjects are informed in advance to observe and record the types and amounts of foods eaten. The influence of prior knowledge of the survey on food intake was speculated to be minimal with teenagers.

Instruments used for collecting data in the study were a 24-hour food record, an activity summary, a sociodemographic questionnaire, and a nutrition attitude/knowledge test. A quantitative estimate of food

intake and descriptive information about meals and snacks were obtained from the food record (Appendix D). The two-page form was designed with enough space for recording specific foods and estimates of amounts of food for each eating occasion throughout the 24-hour period. The time and place the meal or snack was eaten and the person who prepared it were recorded with the eating occasions. Meals were not classified as breakfast, lunch, supper, or snacks on the form.

Students who were working on the day of the food record were identified by a 24-hour activity summary (Appendix D). The one-page form was divided into five time period blocks. Students were instructed by verbal and written directions to indicate whether they were at school, at home, working at a paying job, or involved in an extra-curricular or community activity during the 24 hours that the food record was kept. Activities from 2:00 p.m. to 5:00 p.m. and 5:00 p.m. to 8:00 p.m. were used in data analysis in this study.

Sociocultural, demographic, and employment data were obtained from the sociodemographic questionnaire (Appendix D). This portion of the survey consisted of 69 closed response questions. The questions were divided into the following sections: information about you, student employment, extracurricular activities, community activities, evening meal patterns, family characteristics, parents' working schedules, and spouse's working schedule.

A nutrition attitude test was compiled for this study consisting of items developed and validated by Carruth and Anderson (1977), Sims (1978a, 1978b), and Grotkowski and Sims (1978) and two additional

new items. A nutrition knowledge test for teenagers developed by Skinner (1978) was used also in this study.

A preliminary draft of the dietary and sociodemographic section of the survey was pilot tested on four teenagers during April, 1980. Pilot testing was used to determine the clarity of instructions and questions and to estimate the time needed for completion. The researcher was present to give instructions. Subjects were asked verbally if any aspect of the survey was unclear.

Pilot test results indicated that questions and instructions were comprehended by the audience. The four teenagers correctly completed the activity summaries. The ability of subjects to record food intake in household measures varied. To improve the quality of food records found in the pilot test, the verbal instructions for filling out the record were expanded. A presentation was planned to teach students to keep an accurate food record.

The survey questionnaire was revised to improve organization and appearance. In the final version, the food record and activity forms were placed at the front with cover instructions, the sequence of several questions was changed, and surveys were printed on colored paper. Better response rates have been reported with pastel colored questionnaires than with white. Also, colored forms are easier to file and code (Warwick and Lininger, 1975).

Data Collection

The researcher administered surveys in schools on a weekday, Monday through Thursday, during one class period in May 1980 and

May 1981. Fieldwork was conducted by the same researcher in all schools. To assure food records would be kept on a schoolday, data were not collected on Fridays.

The purposes and procedures for the survey were explained to students in a short presentation at the beginning of the class period. They were told that the survey was being conducted in several other high schools in the state and that the purpose of the study was to find out what teenagers eat and what factors affect their eating habits. The confidentiality of their answers and the voluntary nature of their participation were explained. Each group of subjects was given verbal directions for filling out the food record form, activity summary, sociodemographic questionnaire, and nutrition attitude/ knowledge test (Appendix D).

The teenagers were given instructions for recording food intake. They were asked to record all food and beverages, except water, for the 24 hours immediately following the classroom visit. They were instructed to record the time, place, and person who prepared the food in the spaces provided. An example of a completed food record form was shown to the class on a transparency with an overhead projector. The amounts of foods in the example were illustrated with household measures and package weights. Students were shown how to break down combination foods such as sandwiches or casseroles into component parts and were instructed to record each food separately; to include beverages; to estimate amounts in cups, tablespoons, teaspoons, slices, or ounces; to use brand names whenever possible; to write neatly and to use the back of the form if there was not enough room in the spaces.

The activity summary also was explained with an example on a transparency. Students were told to mark an arrow at the proper position on the time blocks to start recording activities for the next 24 hours.

The types of questions included in the sociodemographic questionnaire were explained to the students. They were told to start at the beginning with question one and follow carefully the directions in large type. Time was allowed in the presentation for questions about the survey.

The nutrition attitude/knowledge test was administered and collected during the next 15-20 minutes of the class period. In the remaining time the students began the sociodemographic questionnaire. The food records, activity summaries, and sociodemographic questionnaires were returned by the students in class the next day and mailed by the teachers in supplied stamped envelopes to the researcher at The University of Tennessee, Knoxville.

Coding and Nutrient Analysis

The time period defined for the evening meal was 3:30 to 10:00 p.m. Eating occasions during that time period were subjectively assigned the designation of snack or evening meal based on the types of foods eaten. The evening meal was defined as an eating occasion that included foods from the Four Food Groups and had a greater variety of foods than snacks. If no such meal was eaten during this time, a snack was selected as the evening meal if it included more than one food or a protein food (including dairy products). If two meals were

eaten during the evening meal time period, the first usually was chosen as the evening meal. In several cases, the person who prepared the meal or the number of persons at the meal influenced the decision. The evening meal was coded separately from the rest of the day for nutrient analysis.

The 24-hour food records were coded for computer nutrient analysis using The Nutritive Value of Foods, Home and Garden Bulletin Number 72 (USDA, 1978). When foods were not in the handbook, consistent substitutions were made with items of similar nutrient content. Unclear or missing quantities were standardized consistently to usual portion sizes. To assure that substitutions were used consistently, they were recorded in a notebook for reference during coding. The coded food records were checked for accuracy by another researcher.

A computer program was written using the Home and Garden Bulletin Number 72 (USDA, 1978) as a data base for calculating individual nutrient intakes of kilocalories, protein, fat, carbohydrate, calcium, iron, vitamin A, thiamin, riboflavin, niacin, and ascorbic acid for the total day and the evening meal. Nutrient intakes for each subject were expressed also per 1000 kcal and as a percentage of the RDA and RDA per 1000 kcal (Appendix E). The RDA per 1000 kcal is calculated by dividing the recommended allowance for each nutrient by the recommended allowance for energy and multiplying the quotient by 1000.

The criteria used to evaluate the adequacy of diets for the total day were 2/3 of the RDA and 2/3 of the RDA per 1000 kcal. Evening meal nutrient intakes were compared with 1/3 of the RDA and

2/3 of the RDA per 1000 kcal. Nutritionists traditionally have used 2/3 of the RDA as a standard of dietary adequacy. In the United States the evening meal is often the heaviest meal of the day; therefore, 1/3 of the RDA was chosen as a reasonable standard of adequacy for this meal. Nutrient intakes per 1000 kcal were used in this study as a measure of the nutrient density of adolescents' diets.

Two scoring systems used by Skinner (1978) were additional measures of overall diet quality. A dietary score based on the RDA was calculated for kilocalories and eight nutrients. An RDA per 1000 kcal dietary score was calculated for the same eight nutrients. A score of zero was assigned to nutrient intakes which fulfilled less than 1/3 of the RDA or RDA per 1000 kcal, a score of one for 1/3-2/3 RDA or RDA per 1000 kcal, and a two for intakes over 2/3 of the RDA or RDA per 1000 kcal. A maximum of 18 points was possible for the RDA total dietary score. Sixteen points was the maximum RDA per 1000 kcal dietary score.

A classification system was devised to show the types of foods eaten at the evening meal. The following categories of foods were included: animal source protein (cheese, eggs, meat); nonanimal source protein (legumes); starchy foods (potatoes, pasta, bread); vegetable source of vitamin A, other vegetables (including tomatoes, excluding potatoes); salad (lettuce or coleslaw); milk; other beverages; fruit; dessert; ice cream or milkshake; snack foods (chips, crackers). Evening meals were coded to indicate whether individuals ate at least one serving of the foods in the above categories. Foods were not classified into a category when less

than one serving was eaten. Serving sizes for each category are shown in Appendix F.

Individual sociodemographic questionnaires and nutrition attitude/knowledge tests were coded for computer scoring. A total attitude score was calculated for each subject by summing the responses on 26 scaled attitude statements. A knowledge score was computed by summing the number of multiple choice questions answered correctly on the 28-item test.

Statistical Analysis

The effects of selected factors on nutrient intakes for the total day and the evening meal were tested by least squares analysis of variance. This procedure was appropriate because there were disproportional subclasses in the sample. In uncontrolled field studies unequal numbers of individuals with subclass characteristics usually are found. The analysis was conducted via PROC GLM in SAS 79.5 (SAS Institute, 1979).

The factors tested in the first analysis with the spring 1980 random sample were gender, region (metropolitan vs. rural), school (seven from East Tennessee), and mothers' employment status (unemployed vs. employed). Because gender significantly affected several nutrients for the total day and the evening meal in the first analysis, gender was included as a factor in all subsequent models. Another factor, who prepared the evening meal (mother vs. self), was tested in a separate analysis with the spring 1980 sample. The effects of teens' employment on nutrients consumed in the total day and at the evening

meal were tested with the paired spring 1980-81 sample of working and nonworking teenagers on the day of the 24-hour food record.

The FUNCAT procedure, based on minimum chi square estimates, was used to test the effects of selected factors on the following categorical dependent variables from the information reported in 24-hour food records and questions from the sociodemographic questionnaire: the proportion of evening meals which included foods in each category, whether the evening meal was eaten at home or away from home, perceived choice in meal selection, and whether or not the respondents usually have a regularly scheduled evening meal at home. The factors gender, region, and mothers' employment were tested with the spring 1980 sample. Gender and teens' employment were tested with the paired spring 1980-81 sample.

Means and standard deviations were computed for group scores on the nutrition attitude and knowledge sections of the survey. Correlations were computed between knowledge scores and attitude scores and the dietary scores for the total day and the evening meal.

CHAPTER IV

RESULTS AND DISCUSSION

Characteristics of Samples

Two hundred and twenty-nine dietary/sociodemographic questionnaires accompanied by parental permission forms were returned from the random sample of adolescents surveyed in spring 1980. The return rate for this portion of the survey was 68.4%. The sample had 116 males and 113 females. Almost all were between the ages of 16 and 18 years. Fifty-eight percent of the students were from schools classified as metropolitan and 42% were from rural schools. Approximately 93% of the adolescents were white and 7% were black (Table 1).

The paired sample, assembled from surveys collected during spring 1980 and 1981, had 148 working and nonworking adolescents. Fifty-four percent were male. Most of them were between 16 and 18 years old and the majority (93%) attended metropolitan schools. Fourteen percent were black and 86% white. This sample had higher percentages of males, 18 year-olds, metropolitan students, and blacks than did the random sample from spring 1980 (Table 1).

Description of Mothers' Employment Patterns

A mother, stepmother, or female guardian was present in 96% of the adolescents' households in the random survey (Table 2). Of those present, 59% were employed outside the home. Most of the employed mothers worked over 20 hours per week, worked 4-7 days per week,

Table 1--Demographic characteristics of selected 16-18 year-old adolescents in East Tennessee during spring 1980 and 1981

	Random Sample[a,b] 1980 % Respondents	Paired Sample[c,d,e] 1980 and 1981 % Respondents
Gender		
Male	50.7	54.1
Female	49.3	45.9
Age		
15	1.3	0
16	36.3	12.8
17	50.7	54.1
18	11.8	32.4
19	0	0.7
Region		
Rural	42.4	6.8
Metropolitan	57.6	93.2
Race		
White	93.0	85.8
Black	6.6	13.5
Other	0.4	0.7

[a]Seven high schools in East Tennessee (three rural; four metropolitan).

[b]n = 229.

[c]Each teenager working on the day of the survey was paired randomly with a nonworking teenager of the same gender and race, who attended the same high school.

[d]Sixteen high schools in East Tennessee (seven from spring 1980, nine from spring 1981).

[e]1980 n = 50; 1981 n = 98.

Table 2--Employment characteristics of mothers living in adolescents'[a] households in East Tennessee during spring 1980[b]

	% Mothers
Mothers of adolescents	
Present in household[c]	96.0
Not present in household	4.0
Work status[d]	
Employed	59.2
Not employed	40.8
Hours per week[e]	
Less than 10 hours	6.4
10-19 hours	7.9
20-29 hours	7.1
30-39 hours	20.6
40 hours or more	57.9
Time of day hours scheduled[e,f]	
Morning only	8.9
Morning and afternoon	79.7
Afternoon and evening	11.4
Evening	10.6
Night (11:00 p.m.-7:00 a.m.)	4.9

[a]16-18 years old.

[b]Random sample of seven high schools (three rural; four metropolitan).

[c]n = 226.

[d]n = 213.

[e]n = 126.

[f]Percentages total over 100 because subjects could check more than one response.

and their work schedules usually included either afternoon or evening hours. A work schedule that included these hours several days per week was expected to have an effect on the evening meals of their adolescent children. The percentage of mothers employed in this sample was higher than the 1979 employment participation rate for the female population in Tennessee, 48.7% (Bureau of Labor Statistics, 1980). This finding was expected, because women in the age group with teenage children are more likely to be employed than women with younger children (Leon and Rones, 1980; Oritz et al., 1981).

Description of Teens' Employment Patterns

Thirty-three percent of adolescents 16-18 years of age were working at the time the random survey was administered during spring 1980. Forty-four percent reported working at some time during the school year. Food service jobs were held by 52%, sales or clerical by 23%, industrial or maintenance by 17%, and the remainder were self-employed (Table 3). Of those employed in food service jobs, 59% worked in fast-food restaurants and 33% in full-service restaurants. The majority of students had been employed at their present job over five months (Table 4). Approximately 2/3 usually worked from 4-7 days per week and 45% reported they had worked over 20 hours the previous week.

In the paired 1980-81 sample of working adolescents 38% were employed in food service, 34% in sales or clerical, 16% in industrial or maintenance, and 12% in other types of jobs (Table 3). Over half of the students working in food service had jobs in fast-food

Table 3--Types of jobs held by 16-18 year-old adolescents in East Tennessee during spring 1980 and 1981

Employed Students	Random Sample[a,b,c] 1980 % Respondents		Paired Sample[d,e,f,g] 1980 and 1981 % Respondents	
Food service	52.0		37.8	
Cafeteria		5.1		17.9
Fast-food restaurant		59.0		67.9
Full-service restaurant		33.3		14.3
Institutional kitchen		2.5		0
Industrial or maintenance	17.3		16.2	
Sales or clerical	22.7		33.8	
Self employed or other	8.0		12.2	

[a]Seven high schools in East Tennessee (three rural; four metropolitan).

[b]Random sample of employed teenagers n = 75.

[c]Random sample of teenagers employed in food service n = 39.

[d]Each teenager working on the day of the survey was paired randomly with a nonworking teenager of the same gender and race, who attended the same high school.

[e]Sixteen high schools in East Tennessee (seven from spring 1980; nine from spring 1981).

[f]Paired sample of employed teenagers n = 74.

[g]Paired sample of teenagers employed in food service n = 28.

Table 4--Employment characteristics of selected 16-18 year-old adolescents in East Tennessee

Employment Characteristics	Random Sample[a] 1980	Paired Sample[b,c] 1980 and 1981
	------% of employed adolescents------	
Length of employment[d]		
Less than 1 month	8.0	10.9
1-4 months	18.7	21.9
5-8 months	22.7	19.2
9-12 months	18.7	23.3
Over 1 year	32.0	24.7
Days per week[d]		
1 day or less	4.0	2.7
2-3 days	32.0	15.1
4-5 days	45.3	61.6
6-7 days	18.7	20.5
Hours previous week[d]		
Less than 5 hours	4.0	8.2
5-10 hours	10.7	11.0
11-20 hours	40.0	17.8
21-30 hours	25.3	39.7
31 or more hours	20.0	23.3
Work on school days[d]		
Yes	74.7	95.9
No	25.3	4.1
Work hours on school days[e]		
1-2 hours	10.6	12.5
3-4 hours	33.3	34.7
5-6 hours	50.0	45.8
7-8 hours	6.1	6.9

[a]Random sample of seven high schools (three rural; four metropolitan).

[b]Each teenager working on the day of the survey was paired randomly with a nonworking teenager of the same gender and race, who attended the same school.

[c]Sixteen high schools in East Tennessee (seven from spring 1980; nine from spring 1981).

[d]Random sample n = 75; paired sample n = 73 (one missing answer).

[e]Random sample n = 75; paired sample n = 72 (two missing answers).

restaurants (68%). The paired sample had fewer adolescents with jobs in food service and more with sales and clerical of other jobs than the random sample. As was found in the random sample, more than half (67%) were employed in their present jobs over 5 months (Table 4). Eighty-three percent worked from 4-7 days per week, 63% had worked over 20 hours during the previous week, and 53% usually worked more than 5 hours on a schoolday. Adolescents in the paired sample worked more days, longer hours, and were more likely to work on schooldays than those in the random sample.

Food usually was eaten during work hours by 89% of the employed teenagers in the random sample. Employed teenagers obtained foods prepared where they worked, as snacks from vending machines, and from nearby restaurants and stores. Very few brought food from home or ate meals from vending machines that provided milk and sandwiches.

Eighty-six percent of the working adolescents in the paired sample usually ate food during their work hours. Of those who ate at work, 53% ate food prepared where they worked, 42% ate snacks from vending machines, 24% ate at nearby restaurants, 19% ate at nearby stores, and 13% brought food from home. Only one person ate sandwiches or milk purchased from a vending machine.

The number of employed teenagers in the random sample was within the range reported by the Bureau of Labor Statistics (1980) for males and females aged 16-17 in the southeast during 1978. This investigator hypothesized that working teenagers may have different meal patterns than nonworking teenagers and, therefore, also may have dietary patterns that differ in nutritional value. The teenagers

in both samples ate food at work, and many had work schedules which could affect eating patterns during the evening hours.

Nutrient Analyses of 24-Hour Food Records

Nutrient analyses of adolescents' 24-hour food records from spring 1980 are shown in Table 5. Mean nutrient intakes of males met 100% of the RDA for all nutrients except iron, with a mean intake of 15.9 mg iron at 88% of the RDA (Table 5; Figure 1). Mean nutrient intakes of females were nearly 100% of the RDA or higher for kilocalories, protein, thiamin, riboflavin, niacin, and ascorbic acid (Figure 1). Nutrients consumed by females in the lowest average amounts compared to the RDA were calcium, iron, and vitamin A, with mean values 62, 61, and 68% of the RDA, respectively. Large standard deviations from the means indicate there was a wide range of nutrient intakes on the day of the survey.

The effects of gender on adolescents' nutrient intakes on the 24-hour food records in spring 1980 are shown in Table 6. Least square means were significantly higher ($p \leq .01$) for the males for energy and all nutrients in the total day. Males also had a significantly higher ($p \leq .01$) least square mean total dietary score and dietary score per 1000 kcal than did females.

The mean percentage of calories derived from protein, fat, and carbohydrate for the total day were approximately the same for adolescent males and females. Both genders averaged 39% of their energy intake from fat, 13-14% from protein, and 47-48% from carbohydrate.

Table 5--Nutrient analysis of 24-hour food records of 16-18 year-old adolescents in East Tennessee during spring 1980[a,b]

Nutrients	Mean ± SD	% Respondents[c] ≤ 2/3 RDA	% Respondents[c] ≤ 1/3 RDA	Mean/1000 kcal ± SD	% Respondents ≤ 2/3 RDA/1000 kcal[d]
Calories (kcal)					
Male	3071 ± 1248	17	2	----------	--
Female	2063 ± 905	20	2	----------	--
Protein (g)					
Male	104 ± 42	3	1	35 ± 9	1
Female	65 ± 33	9	3	32 ± 9	3
Fat (g)					
Male	133 ± 61	--	--	----------	--
Female	92 ± 47	--	--	----------	--
Carbohydrate (g)					
Male	365 ± 165	--	--	----------	--
Female	250 ± 118	--	--	----------	--
Calcium (mg)					
Male	1364 ± 849	28	12	435 ± 200	25
Female	746 ± 520	60	27	353 ± 184	61
Iron (mg)					
Male	15.9 ± 6.1	28	4	5.4 ± 1.8	26
Female	11.0 ± 5.8	63	14	5.3 ± 1.5	68
Vitamin A (IU)					
Male	5199 ± 4611	42	18	1708 ± 1427	29
Female	2731 ± 2955	69	32	1363 ± 1557	41
Thiamin (mg)					
Male	1.83 ± 0.83	10	4	0.60 ± .20	2
Female	1.20 ± 0.81	22	5	0.57 ± .22	4
Riboflavin (mg)					
Male	2.77 ± 1.40	12	2	0.90 ± .32	3
Female	1.52 ± 0.87	21	6	0.73 ± .28	9
Niacin (mg)					
Male	23.3 ± 9.9	11	1	8.0 ± 2.8	3
Female	15.3 ± 7.6	22	3	7.5 ± 2.5	9
Ascorbic acid (mg)					
Male	110 ± 143	42	15	37 ± 57	37
Female	62 ± 83	55	22	30 ± 40	51

[a]Random sample of seven high schools (three rural; four metropolitan).

[b]n = 225; 114 males, 111 females.

[c]1980 Recommended Dietary Allowances (RDA) (Appendix E).

[d]Nutrient allowances per 1000 kcal derived from the 1980 RDA shown in Appendix E.

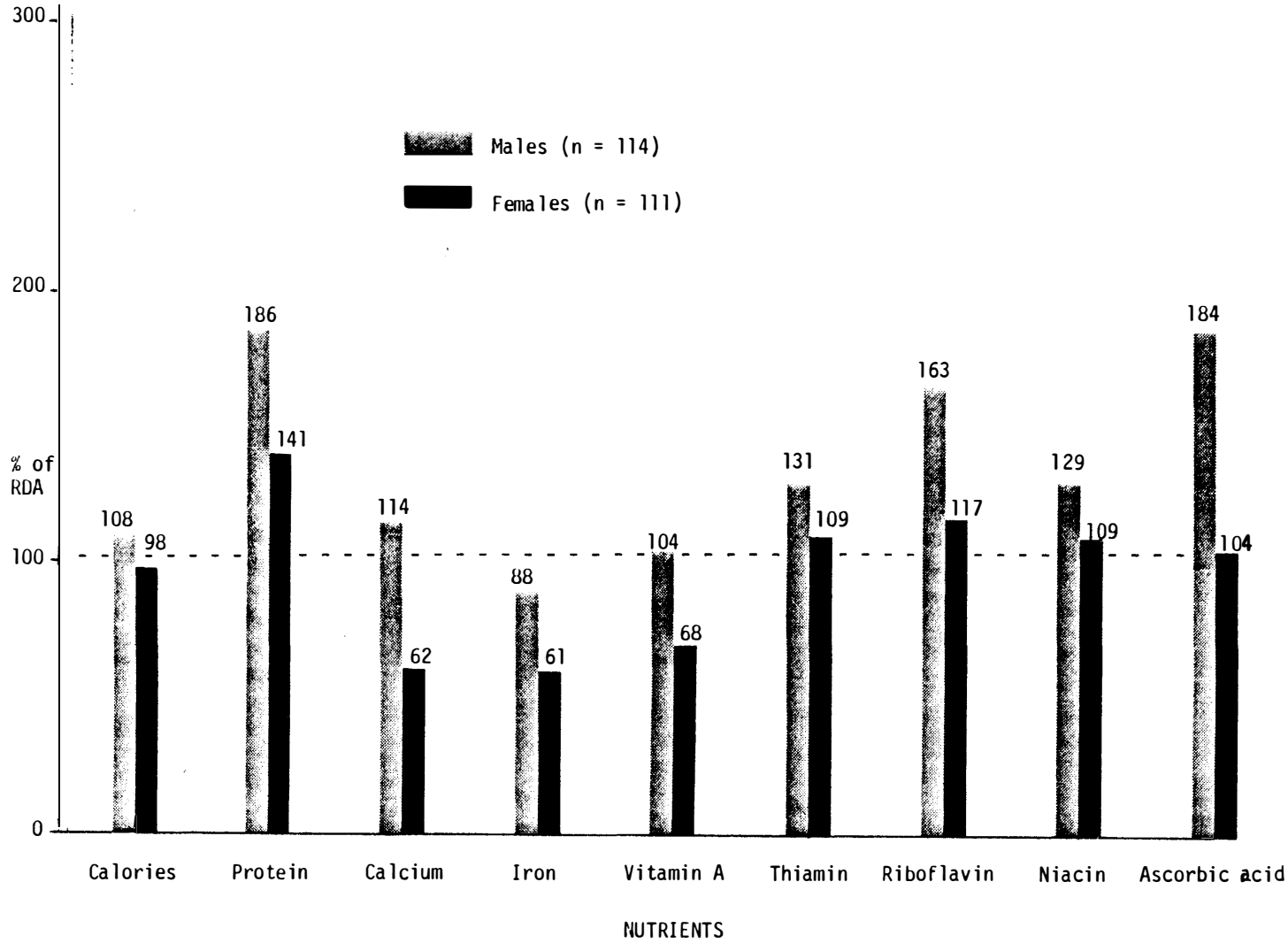

Fig. 1--Nutrient intakes of 16-18 year-old adolescents for total day: % of RDA.

Table 6--Effects[a] of gender on total day nutrient intakes reported in 24-hour food records of 16-18 year-old adolescents in East Tennessee during spring 1980[b,c]

Nutrients	Estimated Differences Between Males and Females			
	Least Square Means		Least Square Means/1000 kcal	
	$\bar{d}$	Ho:$\bar{d}$ = 0	$\bar{d}$	Ho:$\bar{d}$ = 0
Calories (kcal)	+1080	***	-----	---
Protein (g)	+39	***	+3	**
Fat (g)	+42	***	---	---
Carbohydrate (g)	+133	***	---	---
Calcium (mg)	+646	***	+79	***
Iron (mg)	+5.1	***	+0.2	ns
Vitamin A (IU)	+2440	***	+253	ns
Thiamin (mg)	+0.61	***	+0.01	ns
Riboflavin (mg)	+1.29	***	+0.16	***
Niacin (mg)	+8.0	***	+0.4	ns
Ascorbic acid (mg)	+50	***	+5	ns
Total score	+2.1	***	+1.4	***

[a]Tested by least square analysis of variance with the following variables: gender, region, school, and mother's employment.

[b]Random sample of seven high schools (three rural; four metropolitan).

[c]n = 208.

*Significantly different $p \leq 0.10$.

**Significantly different $p \leq 0.05$.

***Significantly different $p \leq 0.01$

[ns]Not significantly different.

The nutrients most frequently consumed by adolescents in amounts below 2/3 of the RDA were calcium, iron, vitamin A, and ascorbic acid (Table 5). Greater numbers of females did not meet 2/3 of the RDA for these nutrients than did males. Twenty-eight percent of males were below 2/3 of the RDA for calcium and iron and 42% for vitamin A and ascorbic acid. The proportion of females with intakes below 2/3 of the RDA for calcium, iron, vitamin A, and ascorbic acid were 60, 63, 69, and 55%, respectively.

With the exception of ascorbic acid, several other investigators also have found that males consumed greater amounts of food energy and nutrients than did adolescent females (Wharton, 1963; Hodges and Krehl, 1965; Hampton et al., 1967; Lee, 1978; Howe and Vaden, 1980). Unlike those studies, males in this sample also had significantly higher ascorbic acid intakes than did females. Female adolescents in the NFCS 1977-78 and the females in this study had similar mean intakes of calcium and iron; however, average vitamin A intake was substantially lower for females in this study than in the NFCS 1977-78 (USDA, 1980). Adolescents in other surveys also frequently consumed vitamin A, ascorbic acid, calcium, and iron in amounts below the recommended levels (Wharton, 1963; Hodges and Krehl, 1965; Hampton et al., 1967; Lee, 1978; Howe and Vaden, 1980).

Another way to express nutrient intake is in relationship to calories. A measure of nutrient density is the ratio of nutrients per 1000 kcal. Females generally consume less food energy than males; therefore, their diets must contain greater amounts of most nutrients

per 1000 kcal to meet the Recommended Dietary Allowances. The mean energy intake for adolescent males in this sample was about 1000 kcal higher than that of adolescent females. By examining the nutrient intakes per 1000 kcal, the quality of the diets of male and female adolescents can be compared on a more equal basis. When the intakes per 1000 kcal of the genders were compared in Table 6, males consumed significantly greater amounts of protein ($p \leq 0.05$), calcium ($p \leq 0.01$), and riboflavin ($p \leq 0.01$) than did females. Males also had a higher ($p \leq 0.01$) dietary score per 1000 kcal than did females.

Mean iron intakes per 1000 kcal of females, although nearly the same as males, met a lower proportion of the RDA per 1000 kcal because the allowance is higher for females (Figure 2). Mean vitamin A intake per 1000 kcal of females was above 100% of the RDA per 1000 kcal. This finding indicates that the quality of females' diets for vitamin A was adequate, but calorie consumption was insufficient to fulfill the RDA, as noted earlier.

Females in this study had mean nutrient intakes per 1000 kcal lower than those reported for their age group in the NFCS 1977-78 (USDA, 1980). Intakes per 1000 kcal of males were similar for calcium, riboflavin, and ascorbic acid in the two studies but were slightly below the NFCS 1977-78 for protein, iron, vitamin A, thiamin, and niacin. Although significant differences were found in our study, in the NFCS 1977-78 males and females aged 15-18 consumed nearly the same amounts of protein, calcium, and riboflavin per 1000 kcal.

Least square means computed for males and females in the paired spring 1980-81 sample are shown in Appendix G. Males consumed

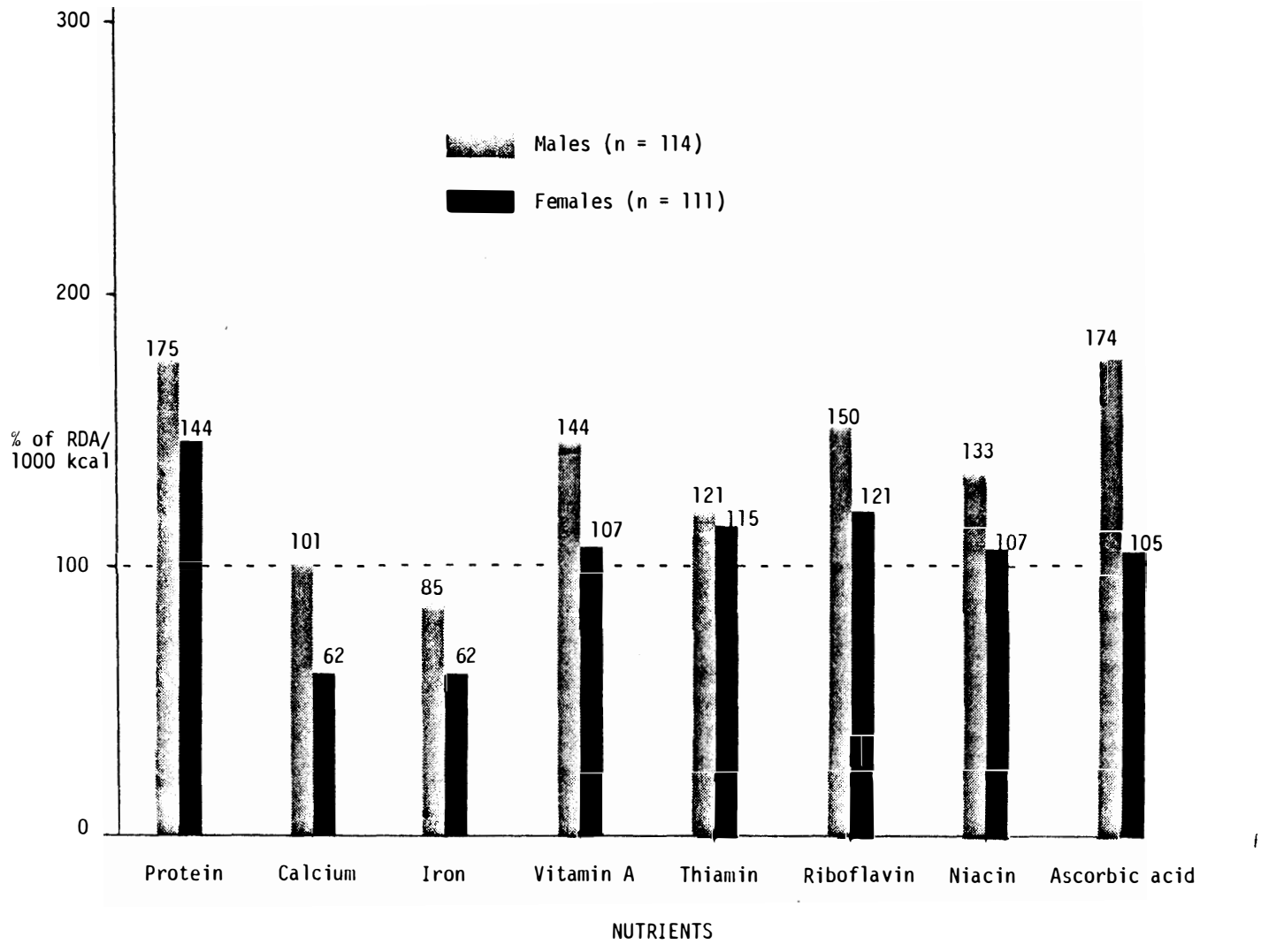

Fig. 2--Nutrient intakes of 16-18 year-old adolescents for total day; % of RDA per 1000 kcal.

significantly greater ($p \leq 0.01$) amounts of all nutrients, except vitamin A and ascorbic acid, than did females. Males in the paired sample had least square mean nutrient intakes similar to the means computed for males in the random sample shown in Table 5. Females in the paired sample had higher average intakes of vitamin A and ascorbic acid than did females in the random sample. Other nutrients, however, were consumed in similar amounts by the females in the paired sample and the random sample. In the paired sample males had higher riboflavin intakes per 1000 kcal ($p \leq 0.05$) and protein intakes per 1000 kcal ($p \leq 0.10$) than did females. Ascorbic acid intakes per 1000 kcal tended to be higher ($p \leq 0.10$) for females than for males in the paired sample. Vitamin A intakes per 1000 kcal were substantially higher for females in the paired sample than for those in the random sample.

Description of Adolescents' Evening Meals

As shown in Table 7, the majority of evening meals consumed by the random sample of adolescents were eaten at home (82%) or at another person's home (3%). The remainder of the sample ate the evening meal at fast-food restaurants (10%), at other restaurants (2%), or at work (3%). Approximately 6% of the group skipped the evening meal the day of the survey. Thirty percent of evening meals were eaten from 3:30 to 5:00 p.m., 48% from 5:00 to 7:00 p.m., and 22% from 7:00 to 10:00 p.m.

Mothers prepared 53% of the evening meals reported in 24-hour food records, 23% of the teenagers prepared their own, and 8% were

Table 7--Description of evening meals reported in 24-hour food records of 16-18 year-old adolescents in East Tennessee during spring 1980 and 1981

	Random Sample[a] 1980 Total Group	Paired Sample[b,c] 1980 and 1981 Working	Paired Sample[b,c] 1980 and 1981 Nonworking
	% Respondents		
Time of evening meal[d]			
3:30-5:00	29.9	22.7	27.8
5:01-6:00	23.2	25.8	16.7
6:01-7:00	24.6	13.6	33.3
7:01-8:00	13.7	16.7	13.8
8:01-9:00	3.8	12.1	6.9
9:01-10:00	4.7	9.1	1.4
Place[e]			
Home	81.5	61.5	82.9
Friend or relative	3.3	3.1	5.7
Fast food restaurant	10.0	10.8	10.0
Cafeteria/full service restaurant	2.4	7.7	1.4
Work	2.8	16.9	0.0
Who prepared[f]			
Mother	53.2	38.5	52.7
Father	1.0	0.0	1.4
Sibling	3.4	3.1	1.4
Other relative, maid	2.4	0.0	2.8
Self	23.0	23.1	23.6
Self and family member	0.5	0.0	1.4
Self and friend	1.0	0.0	0.0
Friend	0.5	1.5	2.8
Restaurant	15.2	33.8	13.9
Skipped evening meal[g]	6.2	10.8	2.7

[a]Seven high schools in East Tennessee (three rural; four metropolitan).

[b]Each teenager working on the day of the survey was paired randomly with a nonworking teenager of the same gender and race, who attended the same school.

[c]Sixteen high schools in East Tennessee (seven from spring 1980; nine from spring 1981).

[d]Random sample n = 211; paired sample working n = 66, nonworking n = 72.

[e]Random sample n = 211; paired sample working n = 65, nonworking n = 70.

[f]Random sample n = 205; paired sample working n = 65, nonworking n = 72.

[g]Random sample n = 225; paired sample working n = 74, nonworking n = 74.

prepared by other family members and friends. When asked which person prepares most of the evening meals at home, 85% responded mother and 12% responded self. Only one person said the father most often was responsible for this meal. Approximately 40% of the adolescents prepared their own meal or ate in restaurants on the day of the survey, showing that many of them were responsible for their own food choices at the evening meal. Thirty-six percent reported they usually did not have a regularly scheduled meal at home in the evening. These findings tend to support a statement by Huenemann et al. (1967) that "many adolescents are fending for themselves." Almost 1/2 of these teens said they had helped prepare at least one evening meal during the previous week. One-fifth of the "helping group" assisted with 5-7 meals in that time period. Male adolescents helped prepare an average of .75 evening meals and female adolescents assisted with 2.33 evening meals during the previous week.

Howe and Vaden (1980) also found that most adolescents in a midwestern high school ate dinner at home as reported in 24-hour recalls. The number of evening meals eaten away from home in the present study is in the same range as reported in the NFCS 1977-78 with approximately 9% of suppers for males aged 15-18 and 16% of suppers for females aged 15-18 obtained away from home on the day of the recall. Howe and Vaden (1980) reported the same proportion of evening meals were skipped (6.7%) by adolescents in their study as was found with this sample.

As was found with the random sample, most of the nonworking adolescents in the paired 1980-81 sample ate their evening meals at

home (83%) or at another person's home (6%) on the survey day (Table 7). Fast-food restaurant meals were eaten by 10%, and 1% ate in other restaurants. Mothers prepared 53% of nonworking adolescents' evening meals, 24% were self-prepared, and 10% were prepared by other family members and friends. Approximately 3% of the nonworking adolescents skipped the evening meal. Twenty-eight percent of their evening meals were eaten from 3:30 to 5:00 p.m., 50% from 5:00 to 7:00 p.m., and 22% from 7:00 to 10:00 p.m.

Nearly 2/3 of the working adolescents ate the evening meal at home (62%) or at another person's home (3%) (Table 7). Over 1/3 ate away from home at fast-food restaurants (11%), other restaurants (8%), or at work (17%). Mothers prepared 39% of working adolescents' evening meals, 23% were self-prepared, and 5% were prepared by other family members and friends. Almost 11% of the working adolescents skipped the evening meal. Twenty-three percent of working adolescents' evening meals were eaten from 3:30 to 5:00 p.m., 39% from 5:00 to 7:00 p.m., and 38% from 7:00 to 10:00 p.m.

Working adolescents ate fewer evening meals at home than did nonworking adolescents. Thirty-five percent of working adolescents' evening meals were eaten away from home compared to 11% of nonworking adolescents. Working adolescents skipped the evening meal more frequently than did the nonworking adolescents (11% compared to 3%, respectively). More working adolescents (38%) ate the evening meal after 7:00 p.m. than did the nonworking adolescents (22%).

Types of Foods at the Evening Meal

A starchy food such as potatoes, bread, or pasta and a protein food of animal origin were reported most frequently in the evening meals of these adolescents, with 91 and 84% of the meals containing these foods (Table 8). A vegetable source of protein, such as peanut butter or dried beans, was eaten by 20% of the sample. This finding may differ from other regions in the U.S. because dried legumes, such as pinto beans and blackeye peas, are traditional foods in southern Appalachia (Tennessee Home Economics Association, 1959).

Approximately 1/3 of the sample reported a vegetable (excluding potatoes) or salad at the evening meal. Less than 10% of the sample included a vegetable rich in vitamin A, and 24% had other types of vegetables in the meal. Lettuce and coleslaw salads, tabulated separately from vegetables, were found in 11% of meals. A vegetable source of vitamin A or other vegetables may or may not have been ingredients in their salads.

Thirty percent of the adolescents drank milk at the evening meal. Other beverages such as tea or soft drinks were included more often than milk and were found in 54% of the evening meals. Desserts or snack foods were eaten by 16% of the adolescents. Sandwiches, a category that included hamburgers and hotdogs, were the main entree in 36% of the evening meals.

In 1965 Hodges and Krehl observed evening meals of Iowa teenagers frequently included meat, potatoes, and desserts. Many teenagers in this sample also had meat or other animal protein foods and starchy

Table 8--Types of foods eaten by adolescents[a] at the evening meal reported in 24-hour food records in spring 1980[b,c]

Types of Foods	% of Evening Meals Which Included Food Categories[d]
Protein (animal source)[e]	84.4
Protein (nonanimal source)[f]	19.9
Starchy food[g]	91.0
Vitamin A vegetable	7.6
Other vegetable	23.7
Salad	10.9
Vegetable or salad[h]	34.1
Milk	30.3
Other beverage	53.6
Fruit	5.2
Dessert	7.6
Ice cream or milkshake	3.8
Snack food	5.2
Dessert, ice cream or snack food[i]	15.6
Sandwich	36.0

[a]16-18 years old.

[b]Random sample of seven high schools in East Tennessee (three rural; four metropolitan).

[c]n = 211.

[d]At least one serving (serving sizes shown in Appendix F).

[e]Meat, cheese, eggs.

[f]Dried beans, peanuts.

[g]Potato, bread, noodles.

[h]Meals which included any type of vegetable (excluding potatoes) or salad.

[i]Meals which included any type of dessert, ice cream, or snack food.

foods such as potatoes and bread at the evening meal. Unlike the Iowa study, desserts were not reported more frequently than milk, other beverages, or vegetables by teenagers in the present study. Edwards et al. (1964) reported that adolescents consumed less than optimal amounts of vegetables, particularly the dark green and yellow types. Other investigators have reported that vegetables, especially the vitamin A varieties, are among the most frequently reported disliked foods by adolescents (Schorr et al., 1976; Gallup, 1980). Vegetables, other than potatoes, were missing from 2/3 of the adolescents' evening meals in this study.

Less than 1/3 of the adolescents in this sample had milk at the evening meal, suggesting that many may not be in the habit of drinking milk at mealtime. According to the NFCS 1977-78, the trend among teenagers since 1965 has been toward increased soft drink consumption and less frequent usage of milk and milk products (Pao, 1981).

Nutrient Analyses of Evening Meals

Nutrient analyses of adolescents' evening meals from 24-hour food records collected during spring 1980 are shown in Table 9. Females averaged over 1/3 of the RDA for energy, protein, thiamin, riboflavin, niacin, and ascorbic acid (Figure 3). Evening meal mean intakes of calcium, iron, and vitamin A values were below 1/3 of the RDA for females. Males consumed at least 1/3 of the RDA for all nutrients (Figure 3).

Effects of gender on evening meal nutrient intakes are shown in Table 10. Least square means for females were significantly lower

Table 9--Nutrient analysis of evening meals[a] of 16-18 year-old adolescents in East Tennessee during spring 1980[b,c]

Nutrients	Mean ± SD	% Respondents[d] ≤ 1/3 RDA	Mean/1000 kcal ± SD	% Respondents[e] ≤ 2/3 RDA/1000 kcal
Calories (kcal)				
Male	1032 ± 441	50	----------	
Female	763 ± 376	54	----------	
Protein (g)				
Male	44 ± 20	7	43 ± 14	0
Female	31 ± 20	22	41 ± 14	2
Fat (g)				
Male	50 ± 27	--	----------	--
Female	38 ± 26	--	----------	--
Carbohydrate (g)				
Male	104 ± 53	--	----------	--
Female	76 ± 39	--	----------	--
Calcium (mg)				
Male	425 ± 402	59	403 ± 310	46
Female	278 ± 292	75	380 ± 355	62
Iron (mg)				
Male	6.7 ± 3.5	53	6.6 ± 2.3	12
Female	4.8 ± 2.9	73	6.5 ± 2.4	43
Vitamin A (IU)				
Male	2116 ± 3395	72	2214 ± 4246	44
Female	1246 ± 2284	77	1621 ± 2766	42
Thiamin (mg)				
Male	0.65 ± 0.44	41	0.63 ± 0.30	9
Female	0.45 ± 0.25	40	0.62 ± 0.24	4
Riboflavin				
Male	0.86 ± 0.61	35	0.82 ± 0.38	5
Female	0.59 ± 0.45	45	0.79 ± 0.43	4
Niacin				
Male	9.4 ± 5.3	27	9.5 ± 5.2	9
Female	6.9 ± 5.4	39	9.2 ± 5.6	17
Ascorbic acid (mg)				
Male	39 ± 91	59	37 ± 80	44
Female	22 ± 28	65	30 ± 39	49

[a]From food records for one day.

[b]Random sample of seven high schools (three rural; four metropolitan).

[c]n = 211; 106 male, 105 female.

[d]1980 Recommended Dietary Allowances (RDA) (Appendix E).

[e]Nutrient allowances per 1000 kcal derived from the 1980 RDA are shown in Appendix E.

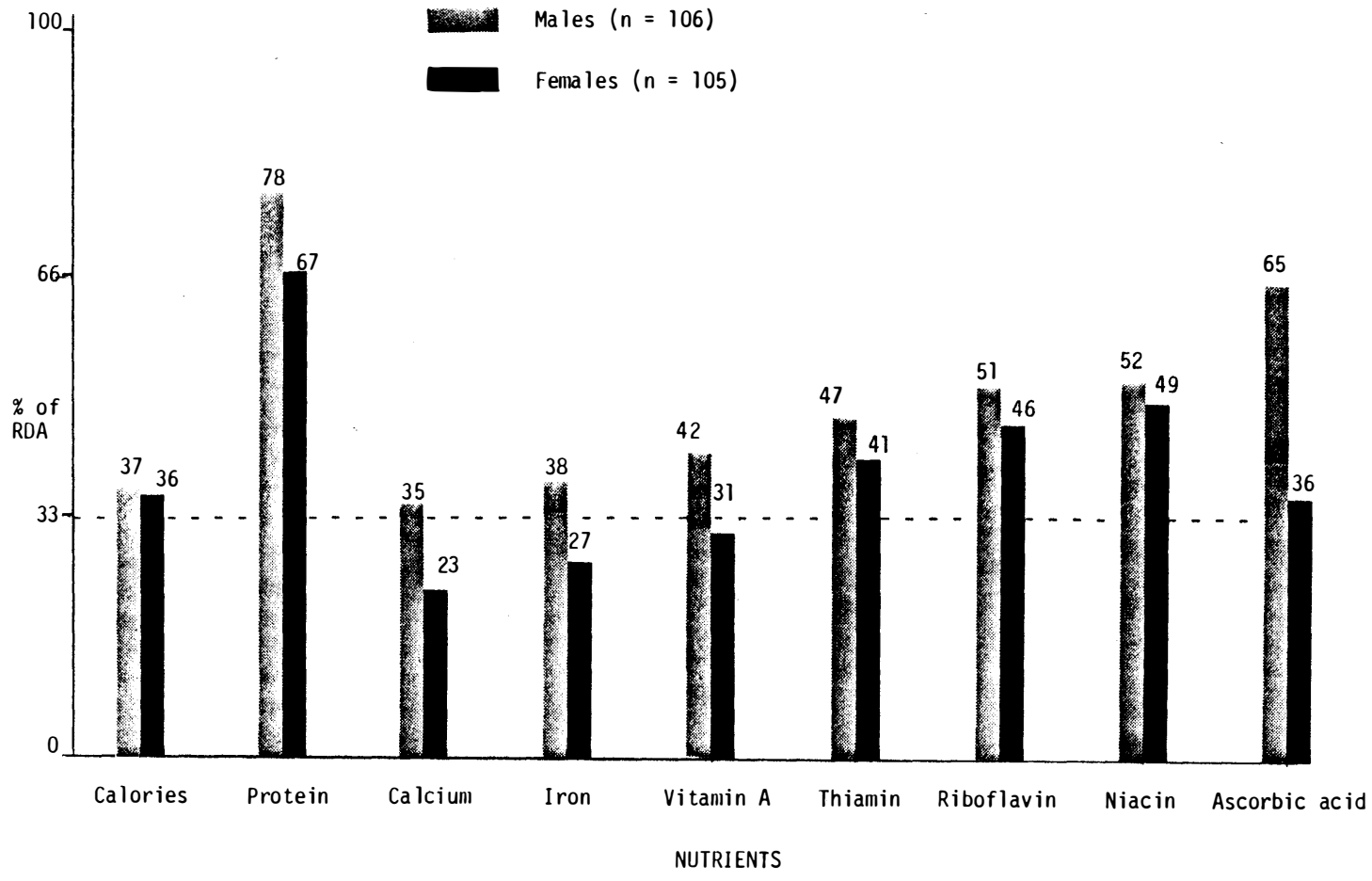

Fig. 3--Nutrient intakes of 16-18 year-old adolescents at the evening meal: % of RDA.

Table 10--Effects[a] of gender on evening meal nutrient intakes[b] of 16-18 year-old adolescents in East Tennessee during spring 1980[c,d]

Nutrients	Estimated Differences Between Males and Females			
	Least Square Means		Least Square Means/1000 kcal	
	$\bar{d}$	Ho:$\bar{d}$ = 0	$\bar{d}$	Ho:$\bar{d}$ = 0
Calories (kcal)	+311	***	-----	--
Protein (g)	+14	***	+3	ns
Fat (g)	+14	***	-----	--
Carbohydrate (g)	+33	***	-----	--
Calcium (mg)	+155	***	+28	ns
Iron (mg)	+2.3	***	+0.2	ns
Vitamin A (IU)	+747	*	+124	ns
Thiamin (mg)	+0.22	***	+0.01	ns
Riboflavin (mg)	+0.28	***	+0.03	ns
Niacin (mg)	+2.6	**	-0.3	ns
Ascorbic acid (mg)	+20	*	+7	ns
Total score	-----	---	+0.8	***

[a]Tested by least square analysis of variance with the following variables: gender, region, school, and mother's employment.

[b]From 24-hour food record.

[c]Random sample of seven high schools (three rural; four metropolitan).

[d]n = 198.

*Significantly different $p \leq 0.10$.

**Significantly different $p \leq 0.05$.

***Significantly different $p \leq 0.01$.

[ns]Not significantly different.

than males for energy, protein, fat, carbohydrate, calcium, iron, thiamin, riboflavin ($p \leq 0.01$), and niacin ($p \leq 0.05$). Vitamin A and ascorbic acid also tended to be higher for males ($p \leq 0.10$). Forty-three percent of calories at the evening meal came from fat and 16-17% were from protein for males and females. Calories from protein and fat for males and females were higher for the evening meal than for the total day.

At the evening meal adolescents had intakes of calcium, iron, vitamin A, and ascorbic acid more frequently below 1/3 of the RDA than other nutrients (Table 9). The proportion of respondents below 1/3 of the RDA for these nutrients ranged from 65 to 77% for females and from 53 to 72% for males. Adolescents in this sample also frequently consumed less than 2/3 of the RDA for these nutrients in the total day. Calcium, iron, vitamin A, and ascorbic acid are generally regarded as problem nutrients with this age group. Fifty percent of males and 54% of females consumed less than 1/3 of the RDA for calories at the evening meal. Thiamin, riboflavin, and niacin intakes were below 1/3 of the RDA for 39-45% of females and 27-41% of males.

Mean nutrient intakes per 1000 kcal for adolescent males and females at the evening meal compared to the RDA per 1000 kcal are shown in Figure 4. As shown in Table 10, least square means of evening meal nutrient intakes per 1000 kcal did not differ by gender; however, the dietary score per 1000 kcal was significantly lower ($p \leq 0.01$) for females, indicating their meals must be more nutrient dense than males to meet the RDA per 1000 kcal.

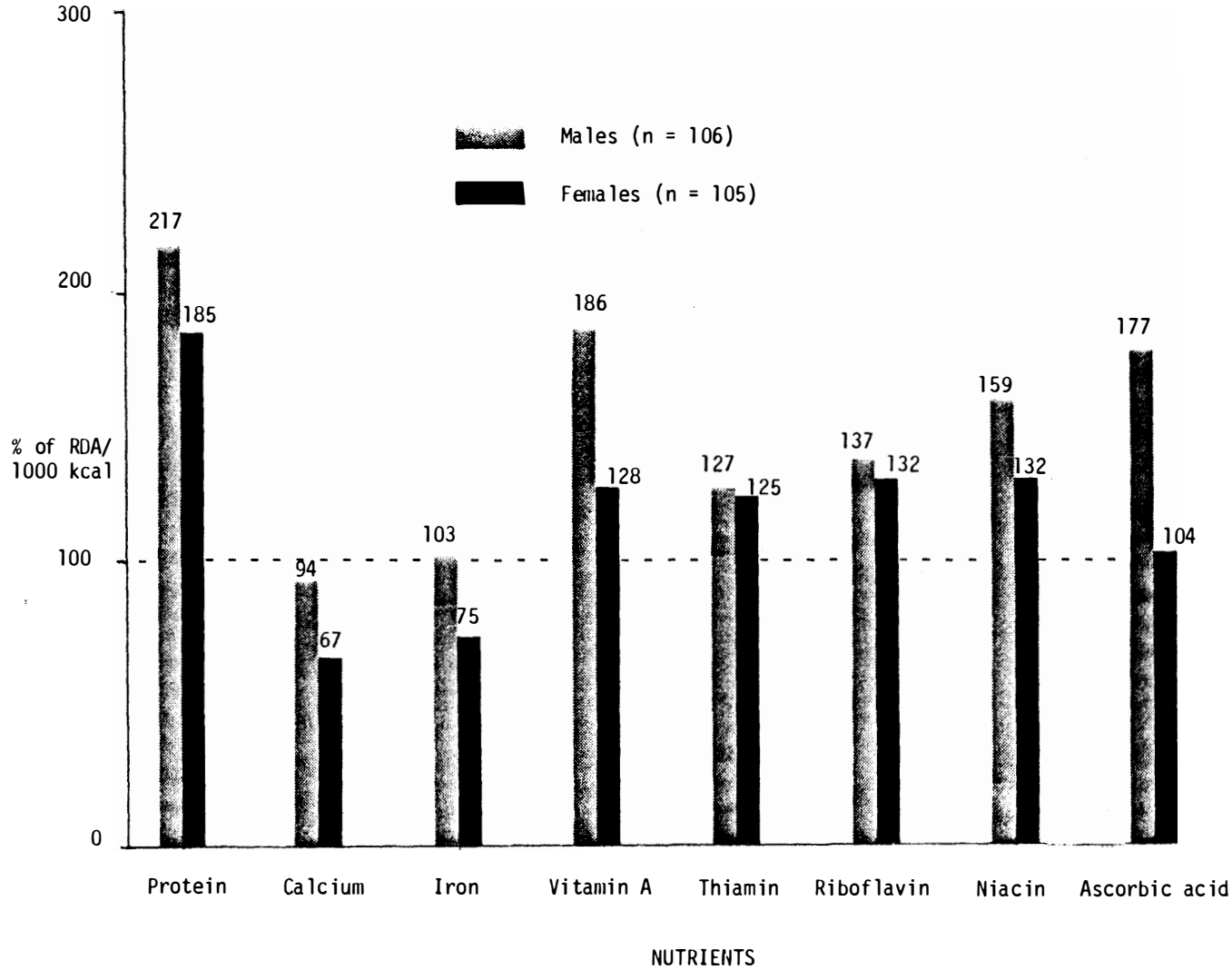

Fig. 4--Nutrient intakes of 16-18 year-old adolescents at the evening meal: % of RDA per 1000 kcal.

Nutrition Attitudes

The 26-item nutrition attitude questionnaire administered to adolescents in spring 1980 is in Appendix D. The mean score on the nutrition attitude section of the survey was 85.1 ± 10.0 points out of a possible 130. Scores ranged from 36 to 106.

Most of the teenagers (95%) in this sample had a positive attitude about the importance of nutrition and many (81%) agreed or strongly agreed that present food habits would affect their future health (Table 20, Appendix H). Their answers, however, were less consistent when these principles were applied to daily life. Over 1/3 (38%) thought they did not have time to think about nutrition and the same number (37%) responded that eating nutritious food throughout the day did not concern them. Thirty-eight percent said their eating habits probably would not change if they learned the basics of nutrition.

Almost half (53%) of the teenagers thought that organically grown products had better flavor and health-giving properties than commercial products, 43% believed that health foods contained more nutrients than regular foods, and 14% indicated that synthetic vitamins were not as good as naturally occurring vitamins in foods. Many of the adolescents were uncertain whether to agree or disagree with these statements. Thirty-two percent were uncertain about the first statement above, 39% about the second, and 51% about the third. Thirty percent thought that bread and potatoes were fattening foods and 27% did not know whether to agree or disagree. Few adolescents (15%) thought meat and

fish contained practically no calories; however, 28% were uncertain. Their responses to these statements revealed that many teenagers had misconceptions regarding nutrition. This finding has been reported also by other researchers who studied adolescents (Dwyer et al., 1970; Wang, 1971; Tift and Stanton, 1972). Because teenagers will soon be adult consumers, it is important that food and nutrition education programs provide them with the information that they need to make informed decisions in the marketplace.

Nutrition Knowledge

The 28-item nutrition knowledge test administered to adolescents in spring 1980 is shown in Appendix D. The adolescents who completed 24-hour food records in spring 1980 averaged 10.4 ± 3.1 correct answers on the 28-item nutrition knowledge test. Scores ranged from 3 to 19 correct. An item analysis of the nutrition knowledge questions is shown in Table 22, Appendix H. Most (90%) of these teenagers could identify a missing food group from the four food groups (question 2), 87% knew why adults gain weight (question 3), and 84% were able to choose an appropriate low-calorie snack (question 27). The group most frequently missed questions about the functions and food sources of nutrients. Only 10% could identify the best food source of iron (question 10), 15% the best source of vitamin A (question 16), and 21% a good source of ascorbic acid (question 17). Sixty percent, however, knew that fortified milk is a major source of vitamin D in the American diet (question 20). Twenty-seven percent answered correctly that liver and fortified cereals would need to be included

in a varied diet of 2000 kcal to meet the iron needs of a 16-year-old girl (question 22). Thompson and Schwartz (1977) also found adolescents frequently did not know the food sources of nutrients.

Over 2/3 also missed questions 4, 12, and 21 about the relative caloric content of foods, the difference between vegetable and animal protein, and how often a dark green or yellow vegetable should be eaten. Thirty-three percent answered correctly that calcium and iron are nutrients that are often low in U.S. diets (question 8). The most frequent nutritional misconceptions were about vitamin C (question 26) and the need for extra protein in athletes' diets (question 11).

Effects of Factors on Food-related Behavior of Adolescents

Gender

As shown in Table 11, no differences were found between males and females in the types of foods eaten at the evening meal. Males, however, ate significantly more ($p \leq 0.05$) snacks than females during the late afternoon and evening hours. The least square mean for the number of snacks from 3:00 p.m. to 3:00 a.m. was 1.8 for males and 1.3 for females. Males reported more often ($p \leq 0.01$) that they had no choice or a limited choice of foods during the day while females more frequently indicated they had a complete choice in selecting foods for meals and snacks (Table 12).

Table 11--Effects of categorical variables on frequency of foods eaten by 16-18 year-old adolescents at the evening meal reported in 24-hour food records

	Gender[a,b,c]		Region[a,b,c]		Mothers' Work[a,b,c]		Teens' Employment[d,e,f]	
	Male	Female	Metropolitan	Rural	Employed	Not Employed	Working	Nonworking
	% Respondents		% Respondents		% Respondents		% Respondents	
Protein (animal)	89	81	88	81	86	83	96	82**
Protein (nonanimal)	20	18	17	23	18	21	12	18
Milk	34	25	28	32	25	35	17	25
Other beverage	56	54	59	49	57	52	61	58
Vegetable	33	34	29	41*	30	38	32	47*
Dessert or snack food	17	14	18	13	15	17	23	13
Sandwich	37	36	40	30	37	35	48	22***

[a]Tested by FUNCAT procedure with the following variables: gender, region, and mothers' employment.

[b]Random sample (seven high schools in East Tennessee during spring 1980).

[c]$n = 198$.

[d]Tested by FUNCAT procedure for variables gender and teens' employment (gender not reported).

[e]Paired sample (each teenager working on the day of the 24-hour food record was paired randomly with a nonworking teenager of the same gender and race, who attended the same school--16 high schools in East Tennessee during spring 1980 and 1981).

[f]$n = 138$.

*Significantly different $p \leq 0.10$.

**Significantly different $p \leq 0.05$.

***Significantly different $p \leq 0.01$.

Table 12--Effects of selected categorical variables on meal patterns of 16-18 year-old adolescents

	Gender[a,b]		Region[a,b]		Mothers' Work[a,b]		Teens' Employment[c,d]	
	Male	Female	Metropolitan	Rural	Employed	Not Employed	Working	Nonworking
	% Respondents		% Respondents		% Respondents		% Respondents	
Evening meal eaten away from home[e,f]	17	13	21	6*	18	13	38	13***
Complete choice in meal selection[g,h]	53	77***	38	32	68	55	70	66
Regularly scheduled evening meal at home[i,j]	67	64	60	75**	62	71	47	65**

[a]Tested by the FUNCAT procedure with the following variables: gender, region, and mothers' employment.

[b]Random sample (seven high schools in East Tennessee during spring 1980).

[c]Tested by the FUNCAT procedure for variables gender and teens' employment (gender not reported).

[d]Paired sample (teenagers working on the day of the 24-hour food record were paired randomly with a nonworking teenager of the same gender and race, who attended the same school--16 high schools in East Tennessee during spring 1980 and 1981).

[e]For variables gender, region, and mothers' work n = 198.

[f]For variable teens' employment n = 137.

[g]For variables gender, region, and mothers' work n = 201.

[h]For variable teens' employment n = 147.

[i]For variables gender, region, and mothers' work n = 201.

[j]For variable teens' employment n = 143.

*Significantly different $p \leq 0.10$.

**Significantly different $p \leq 0.05$.

***Significantly different $p \leq 0.01$.

Region and School

No significant differences in nutrient intakes for the total day were observed between metropolitan and rural adolescents. There was a trend toward lower ($p \leq 0.10$) protein per 1000 kcal and niacin per 1000 kcal among rural adolescents. Shown earlier in Table 5 and Figure 1 (pages 43 and 44), adolescents' protein and niacin intakes were adequate. Males and females had mean protein and niacin intakes per 1000 kcal above the RDA per 1000 kcal (Figure 2, page 48). Few adolescents in the group had protein and niacin intakes below 2/3 of the RDA (Table 5, page 43).

Least square means of 24-hour nutrient intakes for adolescents from the seven schools varied significantly for iron per 1000 kcal ($p \leq 0.01$) and for calcium per 1000 kcal, vitamin A, and vitamin A per 1000 kcal ($p \leq 0.05$). There also was a trend ($p \leq 0.10$) for intakes of thiamin per 1000 kcal and riboflavin per 1000 kcal to differ among schools. The total dietary score and dietary scores per 1000 kcal for the total day did not differ between regions or among schools.

Wakefield et al. (1980) found rural preadolescent girls in Tennessee consumed significantly higher average amounts of energy and iron and significantly lower amounts of ascorbic acid, riboflavin, thiamin, vitamin B_6, vitamin B_{12}, calcium, and phosphorus than did urban preadolescent girls. Nutrients per 1000 kcal and niacin were not reported in that study. Their sample was entirely female with 50% blacks and 50% from low-income families. In the present study, the teenagers were older, 50% were male, only 7% were black, and reported family incomes were distributed normally.

The USDA (1980) reported only small differences among the nutrients consumed by individuals living in urban, suburban, and rural areas in the NFCS 1977-78. Individuals living in nonmetropolitan areas had lower mean vitamin A and ascorbic acid intakes than those in the central city or suburban areas. Mean calcium intake in the central city was lower than in nonmetropolitan and suburban areas.

Evening meal niacin per 1000 kcal was significantly lower ($p \leq 0.01$) for rural adolescents than for metropolitan adolescents. Least square mean niacin and vitamin A also tended to be slightly lower ($p \leq 0.10$) for rural adolescents at the evening meal. The total dietary score per 1000 kcal and other nutrients at the evening meal were unaffected by region. Nutrient intakes at the evening meal did not differ among schools.

Table 11 shows metropolitan adolescents tended to omit vegetables (other than potatoes) at the evening meal more often ($p \leq 0.10$) than rural adolescents. According to Wakefield et al. (1980) rural pre-adolescent girls in Tennessee consumed more vegetable protein and less animal protein in two 24-hour recalls than did urban girls. The present study, however, did not find that region affected the inclusion of animal or nonanimal protein sources at the evening meal.

Metropolitan adolescents tended to eat their evening meal away from home more frequently ($p \leq 0.10$) than did rural adolescents (Table 12). They also reported less frequently ($p \leq 0.05$) that they usually had a regularly scheduled meal at home in the evening.

Mothers' Employment

Adolescents with employed mothers tended to have higher ($p \leq 0.10$) ascorbic acid intakes than adolescents whose mothers were not employed. Iron intakes per 1000 kcal for the total day were higher ($p \leq 0.05$) for adolescents whose mothers were not employed. The consumption of other nutrients in the total day was not affected by mothers' work status. The dietary score and dietary score per 1000 kcal for the total day also were not significantly different for adolescents with employed and nonemployed mothers. Hinton et al. (1962) and AuCoin et al. (1972) also did not find a relationship between mothers' employment and the overall nutritional quality of adolescents' diets.

The ascorbic acid content of evening meals followed the same patterns as the total day; with least square means for ascorbic acid tending to be higher ($p \leq 0.10$) for adolescents with employed mothers. All other nutrients and the dietary score per 1000 kcal at the evening meal were not significantly different between the two groups of adolescents.

No differences were found in the types of foods consumed at the evening meal, perceived choice in food selection, evening meal regularity, or the number of snacks eaten in the afternoon and evening between adolescents with employed and nonemployed mothers (Table 11 and Table 12). Mothers' employment status did not affect where adolescents ate their evening meal. Oritz et al. (1981) found families with fulltime employed homemakers ate a greater proportion of meals away from home. In the present study, other factors including region and teens' employment status had more influence

on where the evening meals were eaten than did mothers' employment status.

Evening Meal Preparation

Twenty-four percent of evening meals on the survey day were prepared by the teenager and 53% were prepared by the mother (Table 7, page 50). More females prepared the evening meal themselves than did males. Sixty-four percent of these meals were prepared by female teenagers and 36% were prepared by male teenagers.

Self-prepared evening meals were significantly lower than evening meals prepared by mothers in iron and thiamin ($p \leq 0.05$) and iron per 1000 kcal and thiamin per 1000 kcal ($p \leq 0.01$) (Table 13). There was also a trend toward lower ($p \leq 0.10$) least square means for niacin and niacin per 1000 kcal in self-prepared meals. The dietary scores per 1000 kcal for evening meals prepared by mothers were significantly higher ($p \leq 0.01$) than evening meals prepared by the teenagers.

Teens' Employment

In the paired sample from spring 1980 and 1981, working adolescents had significantly lower intakes of riboflavin per 1000 kcal ($p \leq 0.01$) and calcium per 1000 kcal ($p \leq 0.05$) than nonworking adolescents for the total day (Table 14). Vitamin A per 1000 kcal and ascorbic acid per 1000 kcal and the dietary score per 1000 kcal also tended to be lower ($p \leq 0.10$) for the working adolescents on the day of the 24-hour food record than for nonworking adolescents.

Table 13--Effects[a] of meal preparation on evening meal nutrient intakes[b] of 16-18 year-old adolescents in East Tennessee during spring 1980[c,d]

Nutrients	Estimated Differences Between Meals Prepared by Mother and Self			
	Least Square Means		Least Square Means/1000 kcal	
	$\bar{d}$	Ho:$\bar{d}$ = 0	$\bar{d}$	Ho:$\bar{d}$ = 0
Calories (kcal)	+38	ns	-----	---
Protein (g)	+4	ns	+3	ns
Fat (g)	+5	ns	-----	---
Carbohydrate (g)	-4	ns	-----	---
Calcium (mg)	-40	ns	-82	ns
Iron (mg)	+1.0	**	+1.1	***
Vitamin A (IU)	+669	ns	+404	ns
Thiamin (mg)	+0.13	**	+0.13	***
Riboflavin (mg)	+0.02	ns	-0.05	ns
Niacin (mg)	+1.6	*	+1.7	*
Ascorbic acid (mg)	+19	ns	+17	ns
Total score	-----	--	+1.0	***

[a]Tested by least squares analysis of variance for variables gender and meal preparation.

[b]Reported in 24-hour food records.

[c]Random sample of seven high schools (three rural; four metropolitan).

[d]$n = 158$.

*Significantly different $p \leq 0.10$.

**Significantly different $p \leq 0.05$.

***Significantly different $p \leq 0.01$.

[ns]Not significantly different.

Table 14--Effects[a] of teens' employment on total day nutrient intakes reported in 24-hour food records of a paired sample[b] of 16-18 year-old adolescents in East Tennessee during spring 1980 and 1981[c]

	Estimated Differences Between Working and Nonworking Adolescents			
	Least Square Means		Least Square Means/1000 kcal	
Nutrients	$\bar{d}$	Ho:$\bar{d}$ = 0	$\bar{d}$	Ho:$\bar{d}$ = 0
Calories (kcal)	+17	ns	-----	---
Protein (g)	-6	ns	-2	ns
Fat (g)	-3	ns	-----	--
Carbohydrate (g)	+20	ns	-----	--
Calcium (mg)	-188	ns	-81	**
Iron (mg)	-0.4	ns	-0.1	ns
Vitamin A (IU)	-1256	ns	-687	*
Thiamin (mg)	-0.11	ns	-0.05	ns
Riboflavin (mg)	-0.31	ns	-0.16	***
Niacin (mg)	-1.0	ns	-0.2	ns
Ascorbic acid (mg)	-37	**	-13	*
Total score	-0.6	ns	-0.5	*

[a]Tested by least square analysis of variance with variables gender and teens' employment.

[b]Each teenager working on the day of the survey was paired randomly with a nonworking teenager of the same gender and race, who attended the same school.

[c]$n = 148$.

*Significantly different $p \leq 0.10$.

**Significantly different $p \leq 0.05$.

***Significantly different $p \leq 0.01$.

[ns]Not significantly different.

These findings do not agree with the results reported by Schorr et al. (1976) with adolescents in New York. In that study dietary complexity increased for employed teenagers. Higher levels of dietary complexity were significantly correlated with higher intakes of vitamin A, ascorbic acid, calcium, and iron. The methodology used in the study by Schorr et al. (1976) was not the same as this investigation. In this study actual nutrient intakes on the day that employed teenagers worked were compared with those of nonworking teenagers. Schorr et al. (1976) used a Guttman food scale to measure the dietary complexity of employed and nonemployed teenagers for three consecutive days.

At the evening meal working teenagers had significantly lower ($p \leq 0.01$) intakes of ascorbic acid and ascorbic acid per 1000 kcal than nonworking teenagers (Table 15). Evening meal vitamin A per 1000 kcal tended to be lower ($p \leq 0.10$) for teenagers who worked. Shown in Table 11 (page 64), the working adolescents ate sandwiches ($p \leq 0.01$) and included an animal protein source ($p \leq 0.05$) more often at the evening meal than the nonworking adolescents. A vegetable, other than potatoes, was more frequently ($p \leq 0.10$) included in the evening meals of the nonworking adolescents than of the working adolescents. No differences were found between working and nonworking adolescents in the inclusion of nonanimal protein foods, milk, other beverages, desserts, or snack foods at the evening meal.

Working teenagers were much more likely ($p \leq 0.01$) to eat their evening meal away from home than nonworking teenagers (Table 12, page 65).

Table 15--Effects[a] of teens' employment on evening meal nutrient intakes of a paired[b] sample of 16-18 year-old adolescents in East Tennessee during spring 1980 and 1981

Nutrients	Estimated Differences Between Working and Nonworking Adolescents			
	Least Square Means		Least Square Means/1000 kcal	
	$\bar{d}$	Ho:$\bar{d}$ = 0	$\bar{d}$	Ho:$\bar{d}$ = 0
Calories (kcal)	-35	ns	----	---
Protein (g)	-1	ns	+2	ns
Fat (g)	-1	ns	----	---
Carbohydrate (g)	-4	ns	----	---
Calcium (mg)	-44	ns	-37	ns
Iron (mg)	-0.7	ns	-0.2	ns
Vitamin A (IU)	-1185	ns	-2266	*
Thiamin (mg)	-0.08	ns	0.00	ns
Riboflavin (mg)	-0.15	ns	-0.15	ns
Niacin (mg)	-0.4	ns	+0.2	ns
Ascorbic acid (mg)	-18	**	-27	***
Total score	-----	---	-0.3	ns

[a]Tested by least square analysis of variance with variables gender and teens' employment.

[b]Each teenager working on the day of the survey was paired randomly with a nonworking teenager of the same gender and race, who attended the same school.

[c]$n = 137$.

*Significantly different $p \leq 0.10$.

**Significantly different $p \leq 0.05$.

***Significantly different $p \leq 0.01$.

[ns]Not significantly different.

More nonworking teenagers reported that they usually had a regularly scheduled evening meal at home ($p \leq 0.05$) than did working teenagers.

Greenberger et al. (1980) also found that working adolescents ate dinner at home less frequently than did nonworking adolescents. As reported earlier, the majority of employed teenagers in the random and paired samples usually ate during their work hours and obtained food either at work, where many were employed in food service, or from nearby food outlets. Shannon and Parks (1980) observed that fast-food services seldom offered fruits and vegetables, particularly the varieties rich in vitamin A on their menus. They also mentioned that some nutritionists were concerned that fast-food menus over represent foods of animal origin. Data of the present study showed that working teenagers ate more sandwiches and animal protein source foods and fewer vegetables than nonworking adolescents suggesting that working adolescents' food choices at the evening meal were perhaps limited to foods available in fast-food menus. In a study by Greecher and Shannon (1977) calcium food sources were infrequently selected by fast-food consumers. Teenagers who worked on the survey day had lower calcium, riboflavin, and ascorbic acid intakes per 1000 kcal than those who did not work. Although food sources of these nutrients may have been available to working teenagers, apparently they were selected less frequently by working teens than by nonworking teens.

Nutrition Attitudes and Knowledge

There were no significant correlations between the scores on the nutrition knowledge section of the survey and the dietary scores from 24-hour food records for the entire day or the evening meal (Table 16).

Table 16--Relationship between nutrition attitude scores[a,b] and knowledge scores[b,c] and dietary scores[d] from 24-hour food records of 16-18 year-old adolescents[e] during spring 1980

	Knowledge Scores		Attitude Scores	
	Correlation Coefficient	p	Correlation Coefficient	p
Total day				
Dietary score[f]	0.08	0.27	0.12	0.09
Dietary score per 1000 kcal[f]	0.09	0.19	0.15	0.03
Evening meal				
Dietary score per 1000 kcal[g]	0.02	0.84	----	----

[a]26-item nutrition attitude test.

[b]Sample includes adolescents who completed dietary-sociodemographic section of survey.

[c]28-item nutrition knowledge test.

[d]Scores based on fulfillment of the RDA and RDA/1000 kcal.

[e]Random sample of seven high schools in East Tennessee (three rural; four metropolitan).

[f]n = 216.

[g]n = 202.

A significant ($p \leq 0.05$) positive correlation was found between adolescent nutrition attitude scores and the dietary score per 1000 kcal for the total day from 24-hour food records. Thompson and Schwartz (1977) also found that adolescent dietary scores based on the four food groups reported in 24-hour recalls were related to scores on a nutrition attitude questionnaire. Nutrition knowledge scores also were not related to dietary scores in that study. A relationship was established between attitude scores and knowledge scores, however, in the study by Thompson and Schwartz (1977). Other investigators did find a relationship between the dietary practices of adolescents and their nutrition knowledge (Whitehead, 1960; Hinton et al., 1963; Skinner, 1978).

CHAPTER V

SUMMARY AND CONCLUSIONS

Adolescents' evening meal patterns and the effects of selected factors on adolescents' eating behavior were investigated. The factors considered were gender, region (metropolitan or rural), mothers' employment, who prepared the evening meal, teens' employment, nutrition attitudes, and knowledge about nutrition.

Twenty-four-hour food records, sociodemographic questionnaires, and nutrition attitude/knowledge tests were collected from 229 students in two junior or senior level classes from seven high schools (four metropolitan and three rural) in East Tennessee during spring 1980. The spring 1980 sample of adolescents who worked on the survey day was too small for analyzing the factor, teens' employment. Therefore, data were collected from a second sample in nine additional high schools in the Knoxville area during spring 1981, using the same instruments and methods. Adolescents who worked on the survey day in spring 1980 and 1981 were paired with randomly selected adolescents who were not working, were from the same school, and of the same gender, age, and race.

The evening meal was subjectively selected from eating occasions between 3:00 p.m. and 10:00 p.m. in the 24-hour food records. The consumption of energy and nine nutrients was calculated for the total day and for the evening meal. The quality of diets was assessed using nutrient intakes per 1000 kcal and dietary scores based on the

RDA and RDA per 1000 kcal. Adolescents' evening meal patterns were described by classifying the types of foods eaten and the time, place, and person who prepared the meal. Least squares analysis of variance was used to test the effects of factors on nutrient intakes for the total day and the evening meal. Selected categorical dependent variables were tested with chi square estimates.

For the total day in spring 1980, male adolescents consumed an average of 100% of the RDA for energy and all nutrients except iron. Mean nutrient intakes for females met 100% of the RDA for all nutrients except calcium, iron, and vitamin A. Nutrients most frequently consumed by males and females in amounts less than 2/3 of the RDA were calcium, iron, vitamin A, and ascorbic acid. The percentages of respondents below 2/3 of the RDA for those nutrients were 28, 28, 42, and 42% for males and 60, 63, 69, and 55% for females. Males had higher ($p \leq 0.01$) dietary scores and dietary scores per 1000 kcal than did females. When compared per 1000 kcal, the quality of female diets was lower than that of males for calcium and riboflavin ($p \leq 0.01$) and protein ($p \leq 0.05$). Overall quality of diets was not affected by region or by mothers' employment. Metropolitan adolescents tended to have higher ($p \leq 0.10$) protein and niacin intakes per 1000 kcal for the total day than did the rural adolescents. Adolescents with employed mothers had lower ($p \leq 0.05$) quality diets for iron. Ascorbic acid intakes per 1000 kcal for the total day tended to be higher ($p \leq 0.10$) for adolescents with employed mothers.

Most of the adolescents in the spring 1980 sample ate their evening meal at home. Fifteen percent ate in restaurants. Although

mothers prepared 53% of the meals, 23% were prepared by adolescents. Other family members and friends prepared 8%. Six percent of these adolescents did not eat an evening meal on the day of the survey. Protein foods of animal origin, such as meat or cheese, were found in 84% of evening meals and starchy foods, such as potatoes or bread, were found in 91%. Legumes, such as dried beans or peanuts, were found in 20% of the meals. Only 34% of the evening meals included vegetables other than potatoes. Milk was included in 30% of the meals; tea or soft drinks were found in 54%. Sixteen percent ate a dessert or snack food. Adolescent males consumed an average of 1/3 of the RDA for energy and all nutrients at the evening meal. Females' mean intakes met 1/3 of the RDA for energy, protein, thiamin, riboflavin, niacin, and ascorbic acid, but were below 1/3 of the RDA for calcium, iron, and vitamin A. The nutrients most frequently consumed at the evening meal in amounts below 1/3 of the RDA were calcium, iron, vitamin A, and ascorbic acid. The evening meals of 65 to 77% of females and 53 to 72% of males contained less than 1/3 of the RDA for those nutrients. Males consumed greater amounts of nutrients at the evening meal and had higher ($p \leq 0.01$) evening meal dietary scores per 1000 kcal than did females. Snacks were eaten in the late afternoon and evening more frequently by males than by females. Region and mothers' employment did not affect the overall quality of adolescents' evening meals. Metropolitan adolescents had higher ($p \leq 0.01$) intakes of niacin per 1000 kcal at the evening meal than did rural adolescents. Rural adolescents tended to eat vegetables more frequently than did metropolitan adolescents. Metropolitan adolescents also

tended to eat the evening meal away from home more often than rural adolescents. More rural adolescents reported that they usually had a regularly scheduled evening meal at home than was reported by metropolitan adolescents. Adolescents with employed mothers tended to have higher ($p \leq 0.10$) ascorbic acid intakes at the evening meal than those with nonemployed mothers. Evening meal patterns were not affected by mothers' work status. The types of foods eaten at the meal, where the meal was eaten, and the number of snacks in the evening did not differ between adolescents with employed mothers and those with mothers who were not employed. Evening meals prepared by adolescents were lower in thiamin and iron ($p \leq 0.05$) and niacin ($p \leq 0.10$) compared to meals prepared by mothers. The dietary score per 1000 kcal was lower ($p \leq 0.01$) for self-prepared meals than meals prepared by mothers; indicating they were poorer in overall quality. Female adolescents prepared 64% of the self-prepared meals.

In the paired 1980-81 sample, adolescents who worked had poorer quality diets for calcium ($p \leq 0.05$) and riboflavin ($p \leq 0.01$) on the day of the survey than nonworking adolescents. Vitamin A and ascorbic acid intakes also tended to be lower ($p \leq 0.10$) for working adolescents on the survey day. At the evening meal, working adolescents had lower ($p \leq 0.01$) intakes of ascorbic acid and tended to have lower ($p \leq 0.10$) intakes per 1000 kcal of vitamin A than did nonworking adolescents. Sandwiches and an animal protein food were included more often and vegetables, other than potatoes, tended to be included less often by those who worked. Working adolescents ate the evening meal away from home more often and reported less often that they

usually had a regularly scheduled evening meal at home than did the nonworking. Only 3% of the nonworking adolescents skipped the evening meal compared to 11% of the working.

Results of a nutrition attitude/knowledge test administered in spring 1980 revealed that adolescents need instruction in nutrition basics such as the functions and food sources of nutrients. An effort also is needed to correct frequent nutrition misconceptions. A relationship ($p \leq 0.05$) was found between nutrition attitudes of adolescents and the dietary scores per 1000 kcal for the total day. Nutrition knowledge scores were not related to dietary scores.

The ability of adolescents to make appropriate food choices must be questioned because their diets often were missing one or more food groups. Also, meals that they prepared were poorer in quality than those which mothers prepared, perhaps because they selected foods that required minimal preparation. As revealed by the nutrition test, many adolescents are lacking basic nutrition knowledge to apply to meal planning.

Adolescents should be encouraged to include food sources of calcium, iron, vitamin A, and ascorbic acid at meals or snacks to improve the quality of their diets. The evening meal is an appropriate time to recommend that adolescents eat raw or cooked vegetables and milk or milk products. Many adolescents prepared their own meals and ate in restaurants. Metropolitan and working adolescents, in particular, appeared to have irregular evening meal patterns. Working adolescents frequently ate meals away from home where sources of problem nutrients may be less readily available.

To address the needs of today's teenagers, programs should emphasize consumer skills, in addition to knowledge of nutrition. Regional programs could be designed to meet the needs of particular groups. Meal planning and preparation advice may be appreciated by teenagers who are responsible for their own meals. Selection of nutritious foods from restaurant menus should be emphasized. Desirable changes in food-related behavior may be achieved by correcting misconceptions and promoting positive attitudes toward the importance of nutrition.

Limitations of the Study

A multifactorial study such as this one requires a large number of respondents to compare subgroups within the sample. Only factors with sufficiently large subgroups were selected in this study. Race may be an important factor, but could not be studied because the sample had too few blacks. Socioeconomic groups could not be compared because less than half of the adolescents responded to a question about family income.

The 24-hour food record was used to gather food consumption data. Respondents estimated amounts of food in household measures. This method is inevitably less accurate than weighing. Some loss of accuracy occurs when respondents omit details and overestimate or underestimate amounts. Also, the foods listed in composition tables do not necessarily have the same nutrient values as foods actually eaten.

The nutritional adequacy of individual diets cannot be determined in a short period of observation because food intake varies from day to day. Certain nutrients such as vitamin A and ascorbic acid tend to be more variable if there are relatively few good food sources in the diet. Adolescents, in particular, often have irregular eating patterns which can increase daily variations in nutrient intake. This sample was large enough, however, to accurately estimate the mean intakes of the group from 24-hour food records.

Areas for Further Research

Several findings from this study could be investigated further in future studies of adolescents' food-related behavior. Many adolescents in this sample prepared their own meals. Additional information about self-prepared meals could be gathered, including the types of foods that adolescents prepare and which family members plans and shops for these meals. It also would be interesting to know how many adolescents prepare meals for siblings or other individuals in the household. An instrument could be developed to test adolescents' meal preparation knowledge.

Another area which could be investigated is the relationship between adolescents' nutrition attitudes and dietary practices. Specific attitudes related to behavior may be identified using modifications of the instruments used in this study.

Little information is available in the literature about adolescents' weekend meal patterns. Nutritionists working with this

age group need to know whether weekend patterns differ from those on weekdays.

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APPENDICES

APPENDIX A

THE UNIVERSITY OF TENNESSEE
KNOXVILLE 37916
COLLEGE OF HOME ECONOMICS

DEPARTMENT OF FOOD SCIENCE, NUTRITION
AND FOOD SYSTEMS ADMINISTRATION

FOOD SCIENCE (615) 974-5445
NUTRITION (615) 974-3491
FOOD SYSTEMS
ADMINISTRATION (615) 974-5445

Dear Principal:

As a research project of the Agricultural Experiment Station of the University of Tennessee, Knoxville, we are conducting a survey on factors affecting food habits of adolescents. The objectives of the project are as follows: 1) to identify the food habits of a representative sample of adolescents, 2) to identify and analyze economic, social, and demographic variables that influence the food habits of adolescents, 3) to investigate the relationship of food habits of adolescents to their nutrition knowledge and attitudes, 4) to determine the relationship between adolescent food habits and the nutrient adequacy of their diets, and 5) to compile and disseminate data in a format useful to nutrition educators. No similar study has been done previously in Tennessee. Results of this investigation will be useful to nutrition educators throughout the state.

Using random sampling techniques, High School was selected as one of the 21 schools to participate in the study. We would like to ask students in two sections of a required junior-level course in your school to participate. Students from those two classes would be asked to respond to a questionnaire covering nutritional practices, attitudes, and knowledge. The questionnaire would require a class period for students to complete plus a few minutes of their time outside class. The testing times can be flexible and planned to coordinate with each teacher's lesson pl ans as well as with the school schedule All questionnaires have been pilot tested and the project has been approved by the University Committee on Research Participation.

One week prior to data collections, teachers would be asked to distribute a parental permission form. Only students whose parents approve would be asked to participate.

Confidentiality of information and anonymity of participants in the survey are assured. Copies of the test instruments and approval forms are enclosed for your information.

A researcher from the University of Tennessee would administer the questionnaires in your school at a time scheduled with the individual teacher. We will call you

on to answer any questions you may have and if you agree to participate, to ask your help in identifying an appropriate teacher in your school. If you agree, a similar letter will be sent to the teacher to explain the survey and to request participation in the study. Your assistance in this project would be greatly appreciated.

Sincerely,

Jean Skinner, Ph.D.
Assistant Professor

Marjorie P. Penfield, Ph.D.
Associate Professor

Nancy Salvetti
Graduate Research Assistant

JS:MPP:NS:tm

Enclosures: copies of test instruments
approval forms

APPENDIX B

THE UNIVERSITY OF TENNESSEE
KNOXVILLE 37916
COLLEGE OF HOME ECONOMICS

DEPARTMENT OF FOOD SCIENCE, NUTRITION
AND FOOD SYSTEMS ADMINISTRATION

FOOD SCIENCE (615) 974-5445
NUTRITION (615) 974-3491
FOOD SYSTEMS
ADMINISTRATION (615) 974-5445

Dear Teacher:

As a research project of the Agricultural Experiment Station at the University of Tennessee, Knoxville, we are conducting a survey on factors affecting food habits of adolescents. The objectives of the project are as follows: 1) to identify the food habits of a representative sample of adolescents, 2) to identify and analyze economic, social, and demographic variables that influence the food habits of adolescents, 3) to investigate the relationship of food habits of adolescents to their nutrition knowledge and attitudes, 4) to determine the relationship between adolescent food habits and the nutrient adequacy of their diets, and 5) to compile and disseminate data in a format useful to nutrition educators. No similar study has been done previously in Tennessee. Results of this investigation will be useful to nutrition educators throughout the state.

Using random sampling techniques, has been selected for participation in the study. Your prinicpal has given us permission to contact you with regard to participation by students in two of your sections of a required junior-level or senior-level course. If you agree, students from your two classes will be asked to respond to a questionnaire covering nutritional practices, attitudes, and knowledge. The questionnaire will require a class period for students to complete plus a few minutes of their time outside class. The testing times will be flexible and planned to coordinate with your lesson plans as well as with the school schedule. All questionnaires have been pilot tested and the project has been approved by the University Committee on Research Participation.

One week prior to data collections, you will be asked to distribute a parental permission form. Only students whose parents approve will be asked to participate. Confidentiality of information and anonymity of participants in the survey are assured.

A researcher from the University of Tennessee will administer the questionnaires in your school at a time scheduled with you. We will call you on to answer any questions you may have and to set a time for data collection in your classes. Your assistance in this project would be greatly appreciated.

Sincerely,

Jean Skinner, Ph.D.
Assistant Professor

Nancy Salvetti
Graduate Research Assistant

Marjorie P. Penfield, Ph.D.
Associate Professor

JS/MPP/nmd

APPENDIX C

THE UNIVERSITY OF TENNESSEE
KNOXVILLE 37916
COLLEGE OF HOME ECONOMICS

DEPARTMENT OF FOOD SCIENCE, NUTRITION
AND FOOD SYSTEMS ADMINISTRATION

FOOD SCIENCE (615) 974-5445
NUTRITION (615) 974-3491
FOOD SYSTEMS
ADMINISTRATION (615) 974-5445

Dear Parent:

Your son or daughter has been selected to participate in a survey about teenage nutrition. The purpose of the survey is to find out what teenagers eat and what they know about nutrition. The results of the survey will be used to improve nutrition education programs for adolescents. Students from twenty-one high schools in Tennessee will be participating in the study. Because we want the survey to represent all teenagers, we hope you allow your son or daughter to participate, but the choice is yours. Most of the questionnaire will be completed in a class next week; the other part will take a few minutes after school. Of course, the information that your son or daughter gives will be confidential; his/her name and the name of his/her school will not be connected in any way with their responses. If you are willing to have your son or daughter participate in the survey, please complete the form below and return to school.

Thank you for your help,

Jean Skinner, Ph.D.
Assistant Professor

Nancy Salvetti
Graduate Research Assistant

Marjorie P. Penfield, Ph.D.
Associate Professor

JS/MPP/nmd

I, the undersigned agree to allow my son/daughter to participate in the project, "Factors Affecting the Food Habits of Adolescents," conducted by personnel of the Agricultural Experiment Station of the University of Tennessee, Knoxville.

I voluntarily give my permission for my son/daughter to participate and understand that I may withdraw that permission at any time.

I further understand that I may ask questions about the study and that my son/daughter may also ask questions prior to participation.

It also is understood that my son/daughter may decide not to participate if he/she so chooses.

Student's Name _____

Parent's Signature _____

Date _____

APPENDIX D

THE UNIVERSITY OF TENNESSEE
KNOXVILLE 37916
COLLEGE OF HOME ECONOMICS

DEPARTMENT OF FOOD SCIENCE, NUTRITION
AND FOOD SYSTEMS ADMINISTRATION

FOOD SCIENCE (615) 974-5445
NUTRITION (615) 974-3491
FOOD SYSTEMS
ADMINISTRATION (615) 974-5445

Hello!

You have been selected to participate in a survey about teenage nutrition. The purpose of the survey is to find out what you eat and what you know about nutrition. The results of the survey will be used to improve nutrition education programs for adolescents. Students from several high schools in East Tennessee will be participating in the study. Because we want the survey to represent all teenagers, we hope you will agree to participate, but the choice is yours. Some of the questionnaire will be completed in class today; the other part will take a few minutes of your time and you will bring it to class with you tomorrow. Of course, the information you give is confidential; your name and the name of your school will not be connected in any way with your responses. Because this is part of a research project, your teacher should not go over the questionnaire with you. If you agree to participate in the survey, begin answering the TEEN NUTRITION QUESTIONNAIRE now. Notice that there are two parts. You will complete Part I in class today; Part II you will fill out and return to class tomorrow.

Thank you for your help,

Jean Skinner, Ph.D.
Assistant Professor

Nancy Salvetti
Graduate Research Assistant

Marjorie P. Penfield, Ph.D.
Associate Professor

JS/NS/MPP/nmd

TEEN NUTRITION QUESTIONNAIRE

For the following statements, please indicate the extent of your agreement or disagreement by checking in the appropriate column.

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
1. Nutrition is important to me and one should not be careless about it.					
2. Everyone should take vitamin supplements just to be sure.					
3. When eaten at 8:00 a.m., cake and a soft drink would be considered a meal.					
4. Because they are such fattening foods, bread and potatoes must be avoided on weight reduction diets.					
5. Organically-grown products have better flavor and health-giving properties than commercial products.					
6. Knowing something is "good for me" has little or no influence on what I choose to eat.					
7. Synthetic vitamins are just as good as natural vitamins found in foods.					
8. I feel the foods I eat now will affect my future health.					
9. I feel that as long as I am maintaining my weight, I don't have to worry about nutrition.					
10. Health foods contain more nutrients than regular foods because they are less refined and processed.					
11. In my opinion, the best advice when eating away from home is to avoid the unknown.					
12. When eaten at 10:00 p.m., pizza and a beverage would be considered a meal.					
13. High protein foods such as meat and fish contain practically no calories.					
14. I feel that if I drink milk, I don't have to worry about nutrition.					

		Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
15.	I usually will not taste a food if its appearance is similar to something I dislike.					
16.	I think traditional ways of preparing food are the best ways.					
17.	I just don't have time to think much about nutrition.					
18.	A calorie is a fatty substance found in a food which causes weight gain.					
19.	Learning the basic ideas in nutrition will probably alter my personal eating habits very little.					
20.	Even if I take vitamins, I feel that I should be concerned about the foods I eat.					
21.	As long as the doctor doesn't say anything to me about nutrition, I don't think I need to worry about it.					
22.	My food has so many vitamins added that I don't have to bother about nutrition.					
23.	I am concerned about eating nutritious foods throughout the day.					
24.	Nutrition is not so important to me as long as I eat a lot of food.					
25.	Children should eat what is on their plate; mother knows best.					
26.	Restricting my meal patterns to familiar foods ensures that I enjoy what I eat.					

Select the one best response to each question. If you don't know, use your best guess. Circle your answer.

1. Which of the following terms is used as a measure of the amount of energy a food contains?

   a. Calories
   b. Carbohydrates
   c. Nutrients
   d. Vitamins

2. The "Basic 4" food groups include 1) milk and milk substitutes, 2) meats, 3) fruits and vegetables. What is the 4th category?

   a. Bread and butter
   b. Breads and cereals
   c. Legumes and poultry
   d. Fats (butter and margarine)

3. Why do adults gain weight?

   a. Overweight is hereditary.
   b. Overweight is unavoidable with age.
   c. They eat more than they use up.
   d. They like sweets.

4. Which of the following foods would contribute the most calories to the diet?

   a. 10 potato chips
   b. 1 baked potato
   c. 3 oz. steak
   d. 8 oz. whole milk

5. For most people in the world, the major source of energy comes from which of the following nutrients?

   a. Carbohydrates
   b. Fats
   c. Proteins
   d. Vitamins

6. Which of the following lunches would be most nutritious for the teenage girl who is trying to lose 5 lbs. before the gymnastic season begins?

   a. Skip lunch
   b. 1 cup skim milk, 1 cup yogurt, 1 apple
   c. 1 small bag of cheese crackers
   d. 1 cup vegetable soup, 1 cup skim milk, 1 slice bread

7. The Recommended Dietary Allowances (RDAs) for the pregnant teenager will be the same as which of the following?

   a. Any girl her age and size plus allowances for pregnancy
   b. Any boy of the same age
   c. Any pregnant woman of equal size
   d. Any teen girl minus 300 calories daily to decrease the risk of toxemia and excessive weight gain

8. Which of the following nutrients are often low in U.S. diets according to recent national surveys?

   a. Calcium and Iron
   b. Protein and iron
   c. Protein and vitamin C
   d. Vitamins D and E

9. One of the uses of fat in the diet is as a carrier for which of the following?

   a. Vitamin C
   b. Protein
   c. Vitamin D
   d. Niacin

10. Which of the following foods has the greatest amount of iron?

   a. 1 cup yogurt
   b. 1/2 fresh grapefruit
   c. 3 oz. fish
   d. 3 oz. hamburger

11. When is extra protein needed by athletes?

   a. As part of the daily intake at all times
   b. In the pre-game meal
   c. 3 days prior to a competitive event
   d. During the training period for a new sport

12. Why are vegetable proteins of a poorer quality than animal proteins?

   a. They contain less energy.
   b. They slow down digestion.
   c. They lack certain amino acids.
   d. They contain less fat.

13. What happens to protein that is consumed in excess of immediate body needs for protein and energy?

   a. Converted to body fat and urea.
   b. Converted to muscle.
   c. Excreted as protein--by way of the urine.
   d. Stored as protein in the liver.

14. What are amino acids?

   a. Toxic food additives
   b. Necessary food preservatives
   c. The fundamental unit of all proteins
   d. An acid found in many fruits

15. In completely vegetarian diets, which of the following will always be supplied in smaller amounts than a diet which contains animal foods?

   a. Carbohydrate
   b. Cholesterol
   c. Fiber
   d. Vitamin C

16. Which of the following is the best source of vitamin A?

a. Beets
b. Corn
c. Oranges
d. Sweet Potatoes

17. Which of the following is a good source of vitamin C?

a. Bananas
b. Onions
c. Peaches
d. Strawberries

18. Because of the high caloric intake during adolescence, the need for which nutrient is higher than at any other time during one's lifetime?

a. Niacin
b. Vitamin C
c. Vitamin E
d. Zinc

19. Under what conditions will a significant amount of riboflavin be destroyed?

a. By heat in cooking of vegetables
b. Milk in glass bottles left in sunlight
c. High temperatures as in processing (canning) vegetables
d. Pasteurization of milk

20. What is the major source of vitamin D in the American diet?

a. Eggs
b. Enriched cereals
c. Fortified milk
d. Unprocessed milk (raw milk)

21. It is recommended that leafy, dark green or orange-yellow vegetables be included in the diet <u>at least</u> how often?

a. Once a day
b. Every other day
c. Weekly
d. Every two weeks

22. How nearly will a balanced and varied American diet of 2000 calories daily likely to meet the iron needs of a 16 year old girl?

a. Almost always fulfill her needs.
b. Greatly exceed the Recommended Dietary Allowance (RDA) in most cases.
c. Will fulfill the Recommended Dietary Allowance (RDA) only if the diet follows the Basic 4.
d. Will not meet her needs unless liver and iron fortified cereals are often included.

23. Which of the following foods provides the calcium equivalent to that in 8 oz. milk?

    a. 1 cup strawberry yogurt
    b. 1/2 cup broccoli
    c. 1 pork chop
    d. 1/2 cup carrots

24. Which of the following statements is true about the "meat group" of the Basic 4?

    a. Is most likely to be present in insufficient amounts in the American diet.
    b. Would need the equivalent of 12 oz. cooked lean meat to provide recommended amounts.
    c. Dried peas, beans or nuts can substitute for meat.
    d. Is responsible for furnishing large amounts of vitamin C.

26. Which of the following statements is true about the idea that Vitamin C will prevent the common cold?

    a. Most nutrition authorities support this statement.
    b. Most nutrition authorities do not support this statement.
    c. There is little known on this subject.

27. What are the U.S. Recommended Daily Allowances (U.S. RDA)?

    a. Higher than the Recommended Dietary Allowances (RDAs) for most Americans
    b. Identical to the Recommended Dietary Allowances (RDAs)
    c. Lower than the Recommended Dietary Allowances for most Americans
    d. Minimum amounts necessary to prevent deficiency diseases--the same as the MDR

28. Which of the following would be the most appropriate after-school snack for a 17-year old girl who does not want to gain weight?

    a. 1 "Big Mac" (hamburger) and chocolate shake
    b. French fries and pop
    c. 2 apples, glass of milk
    d. one chocolate bar and a low-calorie Coke

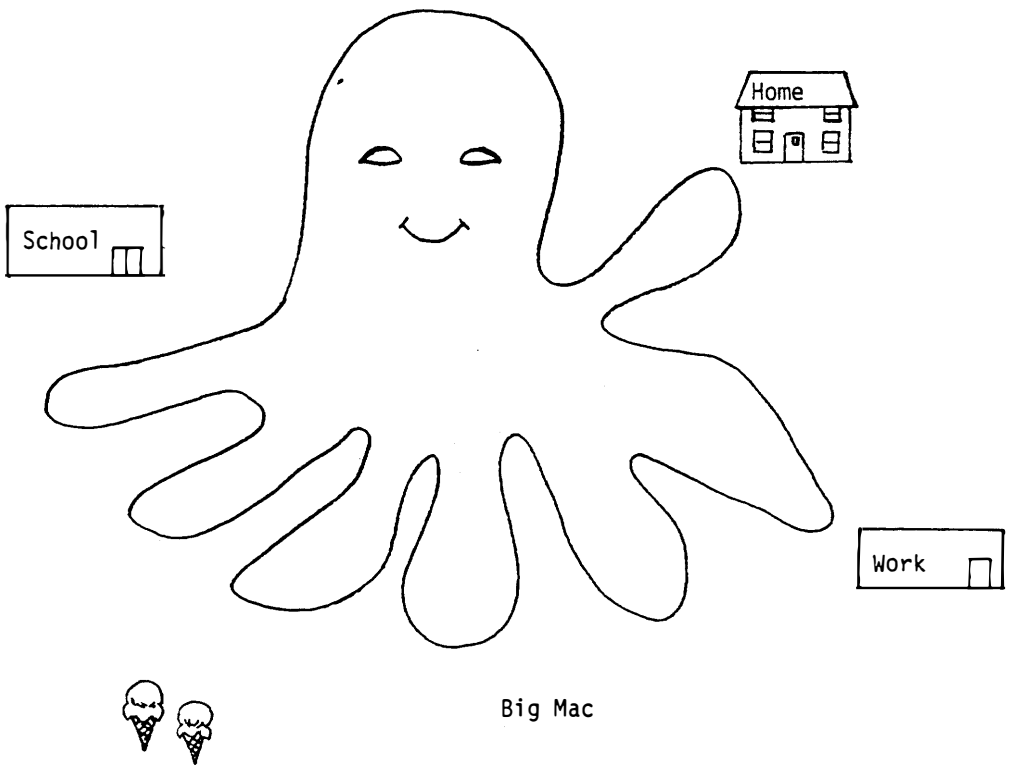
29. Which of the following breakfasts will most nearly provide 1/4 of the day's nutrient needs for a 16-year old boy?

    a. Orange pop, 2 fried eggs, sausage, 3 slices toast with butter and jam
    b. 2 waffles with maple syrup and ice cream, 1/2 grapefruit, 1 cup milk
    c. 3 doughnuts, coffee
    d. 2 scrambled eggs, 2 glasses of milk

TEEN QUESTIONNAIRE

WHAT DO I EAT?

Using the form on the following two pages please keep track of all food and beverages you eat between now and this time tomorrow. You do not need to consider water, but include everything else - milk, low-calorie soft drinks, tea, coffee, butter, gravy, mayonnaise, ketchup, salad dressing, etc. Try to estimate the amounts of food eaten as closely as possible using common measures - cups, ounces, slices, etc. Don't forget to include second helpings. If the food is a combination of several things, such as pizza or tossed salad, describe the ingredients as best you can - be a detective! Be sure to include all the food you eat - at meals and in between - even those "tastes" and "nibbles". It will be easiest to remember what you eat if you write it down as soon as possible. Take the form with you today, fill it out, and bring it back to class tomorrow.



Date_____

Food Record Form

Height_____(inches) Weight_____(pounds)

Sex _____(male)
_____(female) Age_____

	Food and Description	Amount	How many people ate with you?
1st time Food was eaten time_____a.m.___ p.m.___ where_____ who prepared_____			
2nd time Food was eaten time_____a.m.___ p.m.___ where_____ who prepared_____			
3rd time Food was eaten time_____a.m.___ p.m.___ where_____ who prepared_____			
4th time Food was eaten time_____a.m.___ p.m.___ where_____ who prepared_____			
5th time Food was eaten time_____a.m.___ p.m.___ where_____ who prepared_____			
6th time Food was eaten time_____a.m.___ p.m.___ where_____ who prepared_____			

	Food and Description	Amount	How many people ate with you?
7th time Food was eaten time_____a.m.___ p.m.___ where_____ who prepared_____			
8th time Food was eaten time_____a.m.___ p.m.___ where_____ who prepared_____			
9th time Food was eaten time_____a.m.___ p.m.___ where_____ who prepared_____			
10th time Food was eaten time_____a.m.___ p.m.___ where_____ who prepared_____			
11th time Food was eaten time_____a.m.___ p.m.___ where_____ who prepared_____			
12th time Food was eaten time_____a.m.___ p.m.___ where_____ who prepared_____			

If you ate more than 12 times use the back of this sheet.

Please indicate in the spaces below whether you were in school, at home, away from home, working at a paying job, involved in an extracurricular school or community activity <u>today</u>.

	Activities
Activities before 10 a.m.	
Activities from 10 a.m. - 2 p.m.	
Activities from 2 p.m. - 5 p.m.	
Activities from 5 p.m. - 8 p.m.	
Activities after 8 p.m.	

CIRCLE THE LETTER CORRESPONDING TO THE APPROPRIATE RESPONSE:

Information About You

1. Sex:
   a. male
   b. female

2. Age:
   a. 15 years
   b. 16 years
   c. 17 years
   d. 18 years
   e. 19 years or over

3. Race:
   a. White
   b. Black
   c. Asian
   d. American Indian
   e. Hispanic
   f. Other, please specify_____

4. Religious Preference:
   a. Jewish
   b. Mormon
   c. Seventh Day Adventist
   d. Protestant
   e. Catholic
   f. Eastern Orthodox
   g. Other, please specify_____
   h. no religious preference

5. Did you take a vitamin/mineral supplement today?
   a. yes
   b. no

   If yes, what brand(s)?_____

6. How often do you take a vitamin/mineral supplement?
   a. never
   b. less often than once a month
   c. once or twice a month
   d. once or twice a week
   e. almost every day
   f. every day

7. How much choice did you have in selecting your food today?
   a. No choices, all my food was served to me
   b. No choices for meals, but some choices for snacks.
   c. Limited choice for meals, many choices for snacks.
   d. Complete choice for some meals, limited choice for other meals, many choices for snacks.
   e. Complete choice of all food eaten today.

8. On the average, how many snacks per day do you eat?

   a. 0
   b. 1
   c. 2
   d. 3
   e. 4
   f. 5 or more, (specify number)_____

9. Have you been employed in a paying job this school year?

   a. yes
   b. no

IF YOU ARE EMPLOYED AT THE PRESENT TIME ANSWER THE NEXT 15 QUESTIONS. IF NOT EMPLOYED GO TO QUESTION NUMBER 25.

10. Where do you work? (name)_____

11. How long have you worked at this job?

   a. less than 1 month
   b. 1 month - 4 months
   c. 5 months - 8 months
   d. 9 months - 12 months
   e. more than 1 year

12. What type of work do you do?

   a. food service (such as cafeteria, restaurant, hospital kitchen)
   b. factory (industrial, manufacturer)
   c. sales (such as clerk, cashier, sales person)
   d. self-employed (such as babysitting, handyperson, lawn-mowing)
   e. other (specify)_____

13. If you are working in a food service, which type is it?

   a. cafeteria
   b. fast food restaurant
   c. full-service restaurant (waitress served)
   d. institutional kitchen (hospital, school, nursing home, etc.)
   e. other (describe)_____

14. What is your hourly rate of pay, including tips?

   a. less than $3.10
   b. $3.10 - $3.50
   c. $3.51 - $4.00
   d. $4.01 - $4.50
   e. more than $4.50
   f. on salary (not paid by the hour)

15. How much did you spend on food last week from your own earnings?

    a. less than $1.00
    b. between $1.00 and $4.99
    c. between $5.00 and $9.99
    d. between $10.00 and $20.00
    e. $20.00 or more

16. How many days per week do you usually work?

    a. 1 day or less
    b. 2 - 3 days
    c. 4 - 5 days
    d. 6 - 7 days

17. How many hours did you work last week (most recent 7 days including today)?

    a. less than 5 hours
    b. 5 - 10 hours
    c. 11 - 20 hours
    d. 21 - 30 hours
    e. 31 hours or more

18. What days did you work last week (most recent 7 days including today)?

    a. no days
    b. Monday
    c. Tuesday
    d. Wednesday
    e. Thursday
    f. Friday
    g. Saturday
    h. Sunday

19. Do you normally work on school days (Monday thru Friday)?

    a. yes
    b. no

20. How many hours do you normally work on a school day?

    a. 1 - 2 hours
    b. 3 - 4 hours
    c. 5 - 6 hours
    d. 7 - 8 hours

21. How many weekdays (Mon. - Fri.) last week did your work hours include the supper hours (5:00 - 7:00 p.m.)?

    a. 0
    b. 1
    c. 2
    d. 3
    e. 4
    f. 5

22. How many weekend days last week did your work hours include the supper hours (5:00 - 7:00 p.m.)?

    a. 0
    b. 1
    c. 2

23. How many days last week did you eat at work?

    a. 0
    b. 1
    c. 2
    d. 3
    e. 4
    f. 5
    g. 6
    h. 7

24. If you eat at work, what foods do you usually eat? Circle as many as apply. If not go on to next question.

    a. snacks from vending machine (crackers, candy, soft drinks)
    b. meal from vending machine (sandwiches, milk)
    c. food prepared where you work
    d. food brought from home
    e. food bought at nearby store
    f. food bought at nearby restaurant
    g. other, please specify_____

25. Have you participated in any extracurricular school activities this school year?

    a. yes
    b. no

IF YOU ARE PRESENTLY PARTICIPATING IN AN EXTRACURRICULAR SCHOOL ACTIVITY ANSWER THE NEXT 7 QUESTIONS. IF NOT GO ON TO QUESTION NUMBER 33.

26. In which of the following activities are you presently participating? Circle as many as apply.

    a. sports
    b. school newspaper/yearbook
    c. music
    d. student government
    e. club or organization
    f. other (describe) _____

27. If you are presently participating in sports, how often are your activities scheduled? If not, go on to next question.

    a. more than 5 days per week
    b. 4 or 5 days per week
    c. 2 or 3 days per week
    d. 1 day per week
    e. 1 day every two weeks
    f. 1 day per month

28. If you are presently participating in music activities at school, how often are your activities scheduled? If not, go on to next question.

    a. more than 5 days per week
    b. 4 or 5 days per week
    c. 2 or 3 days per week
    d. 1 day per week
    e. 1 day every two weeks
    f. 1 day per month

29. If you are presently participating in the school newspaper/yearbook, club, student government or other activity, how often are your activities scheduled? If not, go on to next question.

    a. more than 5 days per week
    b. 4 or 5 days per week
    c. 2 or 3 days per week
    d. 1 day per week
    e. 1 day every two weeks
    f. 1 day per month

30. How many hours did you spend total in extracurricular activities outside of school time last week (most recent 7 days; including today)?

    a. less than 5 hours
    b. 5 - 10 hours
    c. 11 - 20 hours
    d. 21 - 30 hours
    e. 30 hours or more

31. How many weekdays last week did your extracurricular school activity hours include the supper hours (5:00 - 7:00 p.m.)?

    a. 0
    b. 1
    c. 2
    d. 3
    e. 4
    f. 5

32. How many weekend days last week did your extracurricular school activity hours include the supper hours (5:00 - 7:00 p.m.)?

    a. 0
    b. 1
    c. 2

33. Have you participated in any regularly scheduled community or church activities (besides Sunday Worship Service) this school year?

    a. yes
    b. no

IF YOU ARE PRESENTLY PARTICIPATING IN ANY REGULARLY SCHEDULED COMMUNITY OR CHURCH ACTIVITIES (besides Sunday morning worship service) ANSWER THE NEXT 4 QUESTIONS. IF NOT GO TO QUESTION NUMBER 38.

34. In what type of community or church activity do you participate? Circle as many as apply.

a. hospital volunteer work
b. church youth group organization (including choir, music or sports group)
c. community volunteer work (including fund raising)
d. national youth organization (such as Scouts or 4-H)
e. local youth organization (such as Teen Board)
f. other (describe) _____

35. How many hours did you spend in community or church activities last week (most recent 7 days; including today)?

a. less than 5 hours
b. 5 - 10 hours
c. 11 - 20 hours
d. 21 - 30 hours
e. 31 hours or more

36. How many weekdays last week did your community and/or church activity hours include the supper hours (5:00 - 7:00 p.m.)?

a. 0
b. 1
c. 2
d. 3
e. 4
f. 5

37. How many weekend days last week did your community and/or church activity hours include the supper hours (5:00 - 7:00 p.m.)?

a. 0
b. 1
c. 2

Evening Meal Patterns

38. Do you usually have a regularly scheduled meal with other members of your household in the evening?

a. yes
b. no

39. Circle the days last week that your evening meal was eaten away from home (away from other family members).

a. no days
b. Monday
c. Tuesday
d. Wednesday
e. Thursday
f. Friday
g. Saturday
h. Sunday

40. Circle the days last week that your evening meal was eaten away from home (with one or more other family members).

a. no days
b. Monday
c. Tuesday
d. Wednesday
e. Thursday
f. Friday
g. Saturday
h. Sunday

41. When eating away from home - to which type of eating establishment do you go most often?

a. Fast food - Hamburger/Fish
b. Pizza Parlor
c. Cafeteria
d. Full Service Restaurant-Moderate price, i.e. $3 - 5/person
e. Full Service Restaurant-High price, i.e. $5/person or more

42. Who prepares most of the evening meals that you eat at home?

a. mother
b. father
c. brother or sister
d. yourself
e. other (specify) _____

43. Is the person who prepares most of the evening meals employed outside the home?

a. not employed
b. part-time
c. full-time

44. How many days did you help prepare the evening meal last week?

a. 0
b. 1
c. 2
d. 3
e. 4
f. 5
g. 6
h. 7

45. How many times did you skip eating supper last week?

a. 0
b. 1
c. 2
d. 3
e. 4
f. 5
g. 6
h. 7

46. Circle the days last week that all family members (those presently living at home; including yourself) ate at the evening meal together. Circle no days if evening meals were not eaten together last week.

a. no days
b. Monday
c. Tuesday
d. Wednesday
e. Thursday
f. Friday
g. Saturday
h. Sunday

47. Circle the days last week that you ate the evening meal by yourself at home. Circle no days if evening meals were eaten with others at home last week.

a. no days
b. Monday
c. Tuesday
d. Wednesday
e. Thursday
f. Friday
g. Saturday
h. Sunday

Family Characteristics

48. How many persons live in your household, including yourself?

a. 1
b. 2
c. 3
d. 4
e. 5 or more (specify number) _____

49. How many children and teenagers (20 years or younger) are living in your household, including yourself?

a. 1
b. 2
c. 3
d. 4
e. 5 or more (specify number) _____

50. How many adults (21 or older) are presently living in your household?

a. 1
b. 2
c. 3
d. 4
e. more than 4 (specify number) _____

51. What is your family income?

a. less than $10,000 per year
b. between $10,000 and $25,000 per year
c. more than $25,000 per year
d. I don't know

52. What food supplements does your family receive? Circle all that apply.

a. food stamps
b. free or reduced lunches at school
c. Women, Infants and Children (WIC) supplements
d. other (specify) _____
e. No supplements

53. Does your father, stepfather or a male guardian live in the same household in which you live?

a. yes
b. no

If yes, answer the next three questions.
If no, go to question 57.

54. How many hours does your father (or stepfather, or male guardian) work per week? If not employed go to question number 57.

a. less than 10 hours
b. 10 - 19 hours
c. 20 - 29 hours
d. 30 - 39 hours
e. 40 hours or more

55. Which time of day are your father's (or stepfather's, or male guardian's) hours scheduled?

a. morning hours only
b. morning and afternoon hours
c. afternoon and evening hours
d. evening hours
e. night hours (after 11:00 p.m. and before 7 a.m.)

56. Circle the days last week that your father (or stepfather or male guardian) worked(most recent 7 days; including today).

a. no days
b. Monday
c. Tuesday
d. Wednesday
e. Thursday
f. Friday
g. Saturday
h. Sunday

57. If you are presently living with or receiving financial support from your father, stepfather or male guardian, what is his education level? If not go to question number 59.

a. less than high school
b. high school graduate
c. vocational school graduate
d. some college, but no degree
e. Bachelor of Science; Bachelor of Arts
f. Master of Science, Master of Arts, Master of Fine Arts
g. Doctorate (M.D., Ph.D., Ed.D., D.DS., J.D., L.L.B.)

58. What is his present occupation? _____

59. Does your mother, stepmother or a female guardian live in the same household in which you live?

    a. yes
    b. no

    If yes, answer next three questions.
    If no, go to question number 63.

60. How many hours does your mother (or stepmother or female guardian) work outside the home per week? If not employed go to question number 63.

    a. less than 10 hours
    b. 10 - 19 hours
    c. 20 - 29 hours
    d. 30 - 39 hours
    e. 40 hours or more

61. Which time of day are your mother's (or stepmother's or female guardian's) hours scheduled? Circle as many as apply.

    a. morning hours only
    b. morning and afternoon hours
    c. afternoon and evening hours
    d. evening hours
    e. night hours (after 11:00 p.m. and before 7 a.m.)

62. Circle the days last week that your mother (or stepmother or female guardian) worked (most recent 7 days; include today).

    a. no days
    b. Monday
    c. Tuesday
    d. Wednesday
    e. Thursday
    f. Friday
    g. Saturday
    h. Sunday

63. If you are presently living with or receiving financial support from your mother, stepmother or female guardian, what is her educational level? If not, go to page 11.

    a. less than high school
    b. high school graduate
    c. vocational school graduate
    d. some college, but no degree
    e. Bachelor of Science; Bachelor of Arts
    f. Master of Science, Master of Arts, Master of Fine Arts
    g. Doctorate (M.D., Ph.D., Ed.D., D.D.S., J.D., L.L.B.)

64. What is her present occupation? _____

IF YOU ARE PRESENTLY MARRIED AND LIVING WITH SPOUSE ANSWER THE NEXT 5 QUESTIONS. IF NOT THIS IS THE END OF THE QUESTIONNAIRE.

65. What is your spouse's educational level?

a. less than high school
b. high school graduate
c. vocational school graduate
d. some college, but no degree
e. Bachelor of Science; Bachelor of Arts
f. Master of Science, Master of Arts, Master of Fine Arts
g. Doctorate (M.D., Ph.D., Ed.D., D.D.S., J.D., L.L.B.)

66. What is your spouse's present occupation? _____

67. How many hours does your spouse work per week? If not employed go on to Part II of questionnaire.

a. less than 10 hours
b. 10 - 19 hours
c. 20 - 29 hours
d. 30 - 39 hours
e. 40 hours or more

68. Which time of day are your spouse's hours scheduled? Circle as many as apply.

a. morning hours only
b. morning and afternoon hours
c. afternoon and evening hours
d. evening hours
e. night hours (after -1:00 p.m. and before 7 a.m.)

69. Circle the days last week that your spouse worked (most recent 7 days: include today).

a. no days
b. Monday
c. Tuesday
d. Wednesday
e. Thursday
f. Friday
g. Saturday
h. Sunday

THANK YOU!

APPENDIX E

Table 17--1980 Recommended Daily Dietary Allowances (RDA)[a] and nutrient allowances per 1000 kcal derived from 1980 RDA's[b] for adolescents 15-18 years old

Nutrients	RDA		RDA/1000 kcal	
	Males	Females	Males	Females
Energy	2800	2100	----	----
Protein	56	46	20	22
Calcium	1200	1200	429	571
Iron	18	18	6.4	8.6
Vitamin A (IU)	5000	4000	1785	1905
Thiamin (mg)	1.4	1.1	0.5	0.5
Riboflavin (mg)	1.7	1.3	0.6	0.6
Niacin (mg)	18	14	6	7
Ascorbic acid (mg)	60	60	21	29

[a]Adapted from Food and Nutrition Board, 1980.

[b]Adapted from Hansen and Wyse, 1980.

APPENDIX F

Table 18--Evening meal food classes with serving sizes

Categories	Types of Foods	Minimum Serving Size
Animal protein source	Meat, cheese, eggs	1 oz.
Nonanimal protein source	Beans	1/2 C
	Peanut butter	2 T
Starchy foods	Bread	1 slice
	Potatoes or pasta	1/2 C
Vitamin A vegetable	Sweet potato, spinach, kale, winter squash, carrots	1/2 C cooked
	Broccoli	1 C cooked
	Carrot	1 raw
Other vegetables	All types	1/2 C cooked
	Onion, tomato	2 slices
Salad	Coleslaw or lettuce	1/2 C
Milk	Whole, 2%, skim	1 C
	Cottage cheese	1/3 C
Other beverage	Tea, coffee, soft drinks	1 C
Fruit	Fresh or canned	1/2 C
	Orange juice	6 oz.
Dessert	Cookies, cakes, pies, jello, pudding	Any amount
Ice cream	Ice cream, milkshake	1 C
Snack foods	Chips, candy bars, crackers	Any amount
Sandwich	Main entree at the meal Meat and bread separately was not considered a sandwich	

APPENDIX G

Table 19--Least square means from nutrient analysis of 24-hour food records of a paired sample of 16-18 year-old adolescents in East Tennessee during spring 1980 and 1981

Nutrients	Least Square Mean	Least Square Mean/1000 kcal
Calories (kcal)		
Male	2989***	----
Female	2068	----
Protein (g)		
Male	104***	36*
Female	70	33
Fat (g)		
Male	136***	----
Female	92	----
Carbohydrate (g)		
Male	342***	----
Female	246	----
Calcium (mg)		
Male	1320***	445
Female	795	393
Iron (mg)		
Male	16.0***	5.5
Female	11.1	5.3
Vitamin A (IU)		
Male	4648	1576
Female	4462	2111
Thiamin (mg)		
Male	1.81***	0.62
Female	1.20	0.58
Riboflavin (mg)		
Male	2.73***	0.93**
Female	1.70	0.81
Niacin (mg)		
Male	23.4***	8.0
Female	16.7	7.8
Ascorbic acid (mg)		
Male	99	34*
Female	90	46
Total score		
Male	15.7**	14.6***
Female	14.6	13.7

[a]Each teenager working on the day of the survey was paired randomly with a non-working teenager of the same gender and race, who attended the same school.

[b]n = 148; 80 males, 68 females.

*Significantly different $p \leq 0.10$.

**Significantly different $p \leq 0.05$.

***Significantly different $p \leq 0.01$.

APPENDIX H

Table 20--Responses to a nutrition attitude test administered to 16-18 year-old adolescents in East Tennessee during spring 1980[a,b,c]

Statement	% Responses					
	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree	No Answer
1	27.7	66.8	3.2	1.4	0.5	0.5
2	6.4	31.4	35.0	22.7	4.1	0.5
3	1.8	8.6	9.5	56.8	23.2	0.0
4	7.3	22.7	27.3	33.6	8.2	0.9
5	15.5	37.3	32.3	10.0	5.0	0.0
6	5.9	36.8	9.5	38.2	9.5	0.0
7	1.4	12.3	50.9	27.7	7.7	0.0
8	31.4	50.0	11.4	6.4	0.5	0.5
9	1.8	7.7	8.2	59.5	21.8	0.9
10	7.3	35.5	39.1	16.4	1.8	0.0
11	4.1	35.0	23.2	32.7	4.1	0.9
12	7.7	54.1	11.4	25.0	1.8	0.0
13	2.7	12.3	28.2	45.0	11.4	0.5
14	1.4	3.6	8.6	69.5	16.4	0.5
15	7.3	40.9	5.5	35.9	8.6	1.8
16	5.9	35.5	26.8	28.6	1.4	1.8
17	4.5	33.6	16.4	38.6	4.1	2.7
18	10.9	45.0	17.3	20.5	4.1	2.3
19	5.0	33.2	24.5	30.9	4.5	1.8
20	21.4	60.0	10.9	5.5	0.5	1.8
21	0.9	9.1	7.7	57.3	22.7	2.3
22	0.9	3.2	16.4	62.7	15.0	1.8
23	5.4	36.4	19.1	34.1	2.7	2.3
24	2.7	10.0	6.4	64.5	14.1	2.3
25	8.2	28.6	19.5	30.9	10.5	2.3
26	5.9	40.0	15.9	30.9	5.5	1.8

[a]Random sample of seven high schools (three rural; four metropolitan).

[b]Sample includes adolescents who completed dietary-sociodemographic section of the study.

[c]n = 220.

Table 21--Responses to a nutrition knowledge test administered to 16-18 year-old adolescents in East Tennessee during spring 1980[a,b,c]

Question	% Responses				
	A	B	C	D	No Answer
1	52.7*	18.6	18.2	9.5	0.9
2	4.5	89.5*	3.2	2.3	0.5
3	2.7	8.6	86.4*	1.4	0.9
4	41.4	30.5	14.5*	12.7	0.9
5	40.5*	14.5	35.0	8.6	1.4
6	2.7	55.9	0.0	40.9*	0.5
7	42.7*	3.6	20.9	32.3	0.5
8	32.7*	26.4	16.4	24.1	0.5
9	8.2	44.5	20.9*	24.5	1.8
10	6.4	31.8	51.8	9.5*	0.5
11	43.6	17.3	7.3	30.9*	0.9
12	15.9	9.1	30.5*	43.6	0.9
13	48.6*	17.3	11.8	21.8	0.5
14	10.0	15.9	40.5*	33.2	0.5
15	20.9	52.7*	17.7	8.2	0.5
16	36.4	21.4	26.4	15.0*	0.9
17	25.5	3.6	48.6	21.4*	0.9
18	10.0*	60.9	18.6	9.5	0.9
19	43.2	9.5*	31.8	14.1	1.4
20	21.8	11.8	59.5*	5.9	0.9
21	78.2	13.6*	6.8	0.5	0.9
22	23.6	11.8	36.8	26.8*	0.9
23	49.5*	11.8	14.5	20.9	3.2
24	19.5	17.3	46.4*	11.8	5.0
25	45.5	18.2*	32.3	----	4.1
26	30.5*	28.2	15.5	22.3	3.6
27	4.1	3.2	84.1*	5.5	3.2
28	28.2	23.2*	3.6	41.8	3.2

[a]Random sample of seven high schools (three rural; four metropolitan).

[b]Sample includes adolescents who completed dietary-sociodemographic section of the survey.

[c]n = 220.

*Correct response.

Table 22--Item analysis of a nutrition knowledge test administered to 16-18 year-old adolescents in East Tennessee during spring 1980[a,b]

Question	Total Group[c] Difficulty Index % Correct	Extreme Groups[d,e] Difficulty U+L	Extreme Groups[d,e] Discrimination
1	.527	.568	.424
2	.895	.890	.220
3	.864	.847	.237
4	.145	.178	.119
5	.404	.407	.475
6	.409	.415	.322
7	.427	.492	.339
8	.327	.331	.424
9	.209	.212	.051
10	.095	.085	.136
11	.309	.246	.119
12	.305	.297	.322
13	.486	.483	.288
14	.404	.432	.356
15	.527	.559	.339
16	.150	.161	.186
17	.214	.195	.186
18	.100	.110	.186
19	.095	.102	0
20	.595	.576	.542
21	.136	.161	.119
22	.268	.305	.373
23	.495	.483	.390
24	.464	.517	.593
25	.182	.186	.136
26	.305	.297	.254
27	.841	.839	.119
28	.232	.212	.220

[a]Random sample of seven high schools (three rural; four metropolitan).

[b]Sample includes adolescents who completed dietary-sociodemographic section of the survey.

[c]n = 220.

[d]Includes individuals in upper and lower 27% of total scores.

[e]n = 59.

VITA

Nancy N. Salvetti was born in Cleveland, Ohio, October 13, 1955. Her family moved to Willow Grove, Pennsylvania in 1956. In June 1973, she graduated from Upper Moreland Senior High School, Willow Grove, Pennsylvania. The following September she attended Montgomery County Community College and, in May 1975, received an Associate degree in Humanities. After working for a year, in June 1976, she continued her undergraduate studies at The University of Tennessee, Knoxville. In March 1979, she received a Bachelor of Science degree in Home Economics with a major in Food Science.

In January 1980, she accepted a graduate research assistantship at The University of Tennessee, Knoxville and began study towards a Master of Science degree with a major in Food Science and a collateral area in Nutrition. She is a member of the Institute of Food Technologists.

The author is married to Thomas M. Salvetti. Her first son, Steven, was born in December 1981, several months before this study was completed. Her parents are James J. Hitt and Maryella D. Hitt of Willow Grove, Pennsylvania.