ANTHROPOMETRIC MEASUREMENTS AND NUTRIENT INTAKE OF KANSAS FIFTH GRADE STUDENTS

by

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INTRODUCTION

In 1966, the United States Congress passed the Child Nutrition Act, which was designed to promote the health and well-being of children by providing federal assistance for a school breakfast program and for food-service equipment purchases (1). As a result of recommendations from the 1969 White House Conference on Food, Nutrition and Health, the National School Lunch Act and the Child Nutrition Act of 1966, were amended by P.L. 91-248 (2). One of the objectives of this legislation was to strengthen child nutrition programs by providing nutrition training and education for workers, participants, and cooperators in the school lunch program.

In 1977, the Child Nutrition and School Lunch Acts were amended (P.L. 95-166) to provide funds, based on fifty cents per child enrolled in schools or institutions, for nutrition education in each state (3). The intent of this legislation was to encourage effective dissemination of scientifically valid information to children who are participants or who are eligible to participate in school lunch and related child nutrition programs and to utilize school lunch and other child nutrition programs as learning laboratories. The funds made available under Section 19 were provided to develop and conduct training programs for early childhood, elementary and secondary educational personnel, and foodservice personnel with respect to the relationship between food, nutrition, and health, educational methods and techniques and issues relating to nutrition education and principles and skills of foodservice management for cafeteria personnel.

The most important goal of nutrition education in elementary schools is to teach children to select diets that will enable them to achieve and

maintain good nutritional status. Nutritional status refers to the state of health of an individual or group as conditioned by the quantity and quality of nutrients consumed and the body's ability to utilize these nutrients to meet its metabolic needs (4).

As a part of P.L. 95-166, enacted by the United States Congress, funds were provided to the Kansas State Department of Education for a Nutrition Education and Training Program (NETP). Under a joint agreement, the Kansas State Department of Education contracted with Kansas State University, to conduct a needs assessment during the 1979-80 school year, which included a survey of nutrition knowledge, attitudes and dietary practices of teachers, school foodservice personnel and fifth grade students. In addition, a partial nutritional assessment of the students was conducted, which included measurements of height, weight, skinfold thickness and upper arm circumference. As an additional assessment of dietary behavior, 24-hour dietary recall interviews were conducted with a subsample of the students participating in the anthropometric aspects of the project. This is a report of the anthropometric measurements and nutrient intake of Kansas fifth grade students.

REVIEW OF LITERATURE

The objective of most nutritional status studies is to identify individuals at risk: those persons and groups whose nutritional status should be improved. The findings can lead to the development of educational programs to help individuals and groups improve their diets. They may also provide a basis for decisions by those who are responsible for programs relating to food consumption, such as the National School Lunch Program, to meet nutritional needs of individuals and groups at the local, state, or national level.

Methods of Nutritional Assessment

Four methods of nutritional assessment--clinical, anthropometric, biochemical, and dietary--have been used to identify the extent and distribution of malnutrition and overnutrition among specific populations. The methods of assessment used depend on the geographical area, personnel available, funding, laboratory and computer facilities and time constraints. Each method has limitations for interpreting "at risk" populations, and two or more methods are often combined for assessing nutritional status.

Clinical Assessment

The World Health Organization Committee (5) has classified clinical signs in relation to nutrition for ease in interpretation and for rapid screening. Physical signs most often associated with malnutrition will then fall into one of the following groups:

1) Signs that are considered to be of value in nutritional assessment. These often are associated with nutritional

deficiency status. Signs of malnutrition may be mixed and due to the deficiency of two or more micronutrients.

2) Signs that need further investigation. These may be related to malnutrition, perhaps of a chronic type, but are often found in populations of developing countries where other health and environmental problems, such as poverty and illiteracy, are co-existent.

3) Physical signs that have no relation to malnutrition and must be carefully delineated from them. Diagnosis usually requires the expertise of a physician or other health worker trained in nutrition.

Further investigation by dietary or biochemical assessment methods should follow clinical observations, because many symptoms may be attributed to one or more factors. Also, differences between examiners are likely, and identification of physical signs of deficiency is subjective.

Clinical examinations are most valuable in situations where the deficiency becomes physically apparent. In developed countries, such as the United States, where the overall prevalence of malnutrition is low, physical signs may be difficult to detect and, in addition, signs may not be obvious until the individual's life is in jeopardy. The physical examination, however, may uncover deficiencies not found by other means of assessment that need medical attention.

Biochemical Assessment

Biochemical estimations of nutritional status are usually confined to two easily obtainable body fluids, blood and urine. The limitation of laboratory space and facilities, skilled staff, the age groups concerned,

and time prohibit the testing of body tissues such as the liver, bone, and muscle (6).

Nutritional inadequacy may affect the digestion, absorption and metabolism of nutrients adversely. The measurement of nutrient concentration may suggest malnutrition, but does not indicate the presence, or the degree of nutritional disease. Abnormal utilization may alter the amount, and a low level also may indicate inadequate dietary intake, poor absorption, or impaired transport.

Levels of nutrients should be compared with standards of reference appropriate for age and sex. Standards have been constructed from ranges of values of normal, well-fed, healthy groups and from those of patients clinically ill with the particular form of malnutrition. Standards for some nutrients are not available, especially for children. The results are then expressed in relation to whatever data are available, even though the age-group is inappropriate (5, 6).

Anthropometric Assessment

One of the most useful criteria for judging nutritional status is physical growth assessed with anthropometric measurements. Growth is a sensitive indicator of biochemical functions which promote physical development, and may be assessed with an almost unlimited number of measurements. The pattern of growth over a time period and a person's progress along a channel are the best measures of whether the diet is supplying sufficient nutrients for growth, energy, and other physiological needs without the excess which may lead to obesity. For surveys which provide only a single contact, measurements will give a tentative evaluation of growth, identifying a very short, thin, tall, or heavy individual for his or her age (6).

Measurements that contribute the most to evaluation of growth, overnutrition, and undernutrition should be used. The choice of measurements also depends on the age of the child, his cooperation, the degree of detail desired, and the skill of the examiners (6, 7). The usual body measurements made to assess nutritional status (7) are body mass, linear dimensions, and body composition measured by weight, height, and measurement of superficial soft tissues--subcutaneous fat and muscle, respectively. At the 1968 White House Conference on Food, Nutrition, and Health (8) weight, standing height, and arm circumference measurements were recommended for assessing growth of school-age children through adolescence. Beal and Martin (6) suggested that standing height, weight, circumferences for comparison with weight (waist, upper arm, midthigh and midcalf) and skinfolds (triceps, subscapular, and chest) using specially designed calipers are helpful in the nutritional assessment of children. On the basis of data presented by Buzina and Urema (9) the anthropometric measurements that should be included in surveys for the assessment of nutritional status of children are weight, height, and arm, chest, and calf circumferences and at least one skinfold. Buzina and Urema presented statistical evidence that the prediction of body weight is improved if the shape of the skeletal frame is considered. The minimum number of measurements that could be taken conveniently by less specialized personnel includes weight, height, arm circumference and triceps skinfold.

Measurements of height and weight are the simplest to obtain and are the most common indexes of growth. Each individual, however, has a different genetic inheritance and in some cultures, boys and girls benefit or suffer nutritionally from a sex preference so that boys and girls should

be measured separately and height and weight should be considered together. Age, too, plays an important part in the assessment of height and weight. Growth is relatively even until the puberty period is reached, in girls about age 10 and boys about 11, when growth spurts occur (6).

Children with excess weight for age or weight for length can be identified using the National Center for Health Statistics (NCHS) percentiles prepared for assessing physical growth of children in the United States (10). The percentiles are based on accurate measurements made on large, nationally representative samples of children for length or stature, body weight, head circumference for age, and body weight for length or stature. These measurements simplify comparative interpretation of growth data from differing populations and facilitate uniformity in clinical appraisal for growth and nutritional status. For practical reasons the weight for height charts are appropriate for plotting values for most prepubescent boys and girls, regardless of chronological age, but not for any child showing signs of pubescence.

Fomon (11) described characteristics of those most likely to be at risk of nutritional disorders. When length or height is above the 10th percentile but weight for length is below the 5th percentile, acute, or subacute illness or nutritional deficiency may be suspected. Weight for length or stature greater than the 95th percentile suggests obesity although it is not diagnostic. For example, some children may be above the 95th percentile in weight for stature but have unusually good muscle development with little adipose tissue and are not obese. Accurate skinfold measurements are a valuable adjunct to the diagnosis of obesity.

Fomon (11) suggested total body subcutaneous fat can be calculated from skinfold measurements at the triceps, abdomen, or subscapular and

subcostal sites. Difference in muscle area shows great changes in adolescents so that evaluation of nutritional status should also include estimates of the muscle derived from the triceps skinfold and arm circumference. The following estimates of muscle size were derived by Frisancho (12):

1) Arm muscle diameter (mm) = $\frac{\text{arm circumference (mm)}}{\pi}$ - triceps skinfold (mm)

2) Arm muscle circumference (mm) was derived by computation:

   Arm muscle circumference (mm) = arm circumference - π (triceps skinfold)

3) Arm muscle area (mm^2) was calculated as follows:

   Arm muscle area (mm^2) = $\frac{\pi}{4}$ (arm diameter^2)

Frisancho (12) developed normative data from the Ten-State Nutrition Survey of 1968-70. Age- and sex-specific percentiles for arm circumference of the right arm, triceps skinfold, arm muscle diameter, arm muscle circumference and arm muscle area were calculated.

Calculations of muscle size in the upper arm are only approximations because 1) the circumference of muscle does not include an estimate of bone diameter, and any variation in humeral diameter is therefore not accountable (the deletion of humeri diameter in the calculation may result in an overestimation of male in relation to those of female values as male humeri are on the average greater in diameter than those of the female, regardless of the nutritional status of the population), 2) the equations assume that the upper arm is cylindrical in form, an assumption subject to some inaccuracy, 3) the equations do not take into account variations in skinfold compressibility, and 4) the magnitude of the measurement error cannot be qualified if the measurements of skinfolds and upper arm circumference were taken by several technicians (13).

Dietary Assessment

Dietary studies are used to determine the sources and amounts of nutrients consumed, and can indicate general food trends. Basically, two methods are used to collect dietary data: 1) records that estimate the food purchases and disposal of families or other large groups and 2) records or recalls of nutrient intake of individuals consumed over a specific period of time.

The food record requires the cooperation of the person in charge of food preparation and may create a recording problem if more than one person prepares and disposes of the food. Intake for individuals is usually not recorded, but the food consumed for the whole group is estimated. Inaccuracies attributable to over- or underestimation of amounts, forgetting food given to pets or spoiled are likely.

Food intakes from individuals vary from a qualitative type of food habit inquiry to those of a more quantitative nature and according to Christakis (5) include the following:

1) A recall by the parent or child of food intake during the previous 24 hours or longer;
2) Records of food eaten by an individual kept by weight, household measures or estimated quantities over a stated period of time;
3) A self-administered questionnaire or interview, to obtain general dietary data or information on specific foods if the study is focused on one or more nutrients;
4) Diet history, usually obtained by a trained interviewer, to determine the amounts of foods eaten over a relatively long period of time;

5) Laboratory studies in which nutritive values are determined by careful weighing and calculation of all food portions, and analysis of duplicate samples. This method is usually used only by research groups having special facilities for collection and analysis.

Less time, money, subject cooperation, and professional personnel are needed to obtain intakes by the 24-hour recall method. Diet histories and weighed intake studies require greater time, cost, cooperation, and more highly trained personnel (5).

Young et al. (14) compared the 7-day and 24-hour dietary recalls. The 7-day record included everything put into the mouth for one week and the 24-hour recall was a brief interview in which subjects were asked to recall all food or drink consumed in the past 24 hours. For an individual a 24-hour recall was not as valid as a 7-day record. For groups of fifty or more, however, the 7-day record and the 24-hour recall gave approximately the same estimates for nutrients within a 10 per cent error range.

To answer the question "how many and which days should be used in a dietary record," Chalmers et al. (15) compared data from 1-, 7-, 14-, and 28-day dietary records. They found no correlations among 7-, 14-, and 28-day records, and consecutive days were independent. Nutrient intakes on individual days did not differ significantly when large groups were sampled. A one-day record could estimate the mean intake for a group and save time, money, and personnel. Because people tended to eat a better diet when a 1-day record was used, they suggested that a 24-hour dietary recall interview could be substituted for a 1-day record.

Emmons and Hayes (16) evaluated the completeness and accuracy of 24-hour dietary recalls for children in grades 1-4. The children were interviewed by nutritionists or nutrition students on Tuesday through Friday so that a school lunch could be included. Spoons, cups, and different serving sizes of foods were used to aid in recalling foods eaten. Each mother was interviewed later by phone regarding the child's food intake and the two reports were compared. The child's recall of his school lunch and what was actually eaten correlated better than what the child recalled eating at home and the mother reported. Correlations of nutrient levels of the child's recall of lunch and the lunch actually consumed increased with each grade level until the 4th grade when all 9 nutrients analyzed in the school lunch correlated. At each grade level children were more able to recall food they had eaten at home. Emmons and Hayes concluded that young children, grade 2 and above, were able to provide information on their diet as accurately, or more accurately than their mothers.

In the initial phase of the Bogalusa Heart Study (17) the primary objective was to develop a method to assess and characterize the dietary intake of children which would be reproducible, allow the child to serve as his own respondent, and require only a small staff. The researchers stated that while chemical analysis of food actually eaten is the most accurate method for assessing diets, it is not practical for large nutrition surveys. They developed and tested a protocol for obtaining a 24-hour dietary recall and subsequently used it to train interviewers. The interview technique, methods for the identification, qualification and quantification of food items were developed and tested on 76 students, 10 to 16 years of age, in a pilot study. Ten of the students were

interviewed twice to test the reliability of the instrument and variability among interviewers.

Children, ages 10-12, who were interviewed in the Bogalusa Heart Study, were found to be eager to talk about what they had eaten, established rapport with the interviewer easily and quickly, and usually remembered the brand names of foods eaten. Frank et al. (17) concluded that 24-hour recalls were accurate when a protocol for interviews was developed, school lunches monitored and probing questions were used. Training sessions and standardized interviewing techniques helped to reduce variability among interviewers.

In a nutritional investigation of 642 New York City children Christakis et al. (13) used the 24-hour dietary recall method to study fifth and sixth grade students. This age group was considered to have fairly stabilized dietary patterns, and be mature enough to answer questions. Parental consent was obtained and four public health nurses, trained in the recall techniques, interviewed the students. Each interview required approximately 20 minutes and was designed to determine the number of servings from each of 6 food groups; indicate food preferences and meal patterns, including snacking, document and place where the noon meal was eaten and determine the use of vitamin supplements. The accuracy of the recalls was affected by language barriers, memory failure, and lack of complete comprehension by the students. Twenty-three children gave unreliable diet histories and were not included in the analysis. They cautioned that dietary histories must be carefully interpreted because the foods were not weighed, foods were placed in groups arbitrarily, portion sizes described by the children were not

assessed in great detail, and nutrient analyses were based on food composition tables and not on chemical analyses of the foods.

Nutrients were calculated and rated according to the 1964 Recommended Dietary Allowances (13). The diets were rated excellent if more than 2/3 of the RDA's were met, adequate if 1/2 to 2/3 were met and poor if they contained less than half of the RDA's. Diets were assessed also according to the number of meals missed, food groups lacking and the major source of protein.

Because all adolescents do not grow and develop at the same rate or at the same age a widely used method of characterizing the growth of adolescents (18) based on the development of secondary sex characteristics, divides the period of changes into five sex maturity ratings (SMR): Rating 1 represents prepubertal development; Rating 2 is the first visible evidence of pubertal change; Rating 3 reflects the onset of the growth spurt; Rating 4 is the period of rapid but lessening development; and Rating 5 reflects, for practical purposes, the level of adult maturity.

Nutritional Assessment of Elementary School Children

National Studies

Nutritional status studies of school children throughout the United States have been conducted by both government agencies and private institutions. Between 1947 and 1958, studies sponsored by the State Agricultural Experiment Stations, the Institute of Home Economics of the U.S. Department of Agriculture and several of the state departments of public health, were conducted to assess the nutritional status of U.S. citizens. Through the cooperative efforts of nutrition researchers in four regions

of the U.S.A., Northeast, North Central, South and West, children between the ages of 5 and 12 years, adolescents from 13 to 20 and adults from 20 to past 80 years of age were examined. In the special study of 9 to 11 year old boys and girls in Iowa, Kansas and Ohio, 10 per cent or more of the diets provided less than two-thirds of the Recommended Dietary Allowances for calcium, and vitamins A and C, especially those of girls. About 10 per cent of the 9 to 11 year old Iowa, Kansas and Ohio school children were overweight and about the same per cent were underweight (19).

The 1965 United States Department of Agriculture (USDA) Household Food Consumption Survey showed that children through age 8 generally had adequate diets, with the exception of iron intake (20). Children between the ages of 10 and 16 had the highest prevalence of unsatisfactory nutritional status. Boys between the ages of 9 and 11 years were well fed except for the slightly low calcium intakes that reflected a small decrease in consumption of milk. Girls in that same age group were already exhibiting some of the dietary patterns typical of many teenagers, resulting in inadequate intakes of calcium, iron and thiamin.

In 1968-70 the Ten State Nutrition Survey (21) was conducted to investigate areas of the United States where malnutrition was expected to exist. Five high income ratio (HIR) states (California, Massachusetts, Michigan, New York and Washington) and five low income ratio (LIR) states (Kentucky, Louisiana, South Carolina, Texas and West Virginia) were selected for the survey. Data were obtained on 24,000 families with clinical examinations and anthropometric measurements on 40,000 individuals and biochemical and dietary data on a subsample of the population. Clinical examinations revealed few signs of malnutrition in children.

The researchers concluded that clinical assessment "did not provide a useful means of identifying specific populations at increased nutritional risk."

Anthropometric measurements of children showed some evidence of growth retardation (21). Black children were more advanced in skeletal formation and were taller than white children, while whites tended to be heavier and have larger subcutaneous fat measurements. White males had the highest tendency to be obese during childhood (before puberty). Those children rated short were usually in the LIR states while children in the HIR states were taller, heavier, and fatter.

Biochemical and dietary evaluations showed deficient iron values for children in LIR states as well as HIR states (21). Calorie intakes were higher in HIR states than in LIR states. The mean dietary intakes of all nutrients, except iron, were above the recommended standards, but some very high intakes, especially for iron, vitamin A, and ascorbic acid elevated mean intakes. In general, calcium intakes were adequate; however 20 to 54 per cent of the 10 to 16 year olds had intakes below the standard.

The Health and Nutrition Examination Survey (HANES) conducted during 1971-72 (22, 23) provided for nutritional assessment (dietary, biochemical, anthropometric and clinical) of U.S. citizens, aged one to seventy-four years. Clinical data showed a fairly low prevalence of high and moderate risk nutritional deficiencies, however follicular hyperkeratosis (vitamin A deficiency) was found in Negro children, aged six to eleven years, below poverty level.

Anthropometric measurements showed that Negro girls and boys were taller than their white counterparts (23). Children in higher income

groups were taller than children below poverty. Subscapular skinfolds of white boys and girls exceeded those of Negroes. Children in the higher income levels had larger triceps skinfolds than those in low income brackets.

Twenty-four hour dietary recalls indicated higher caloric intakes for higher income and white children than for black children and those in lower income categories (22). Protein, calcium, vitamin A, and ascorbic acid mean intakes were above the standards, however intakes of vitamin A were sometimes double the standard and over 50 per cent of the children had intakes below the standard. Dietary and biochemical assessments correlated with iron intakes. Hemoglobin and hematocrit levels were lower for black than for white children in all age groups, regardless of income.

The Nationwide Food Consumption Survey of 1977-78 (the sixth nationwide survey of households by the United States Department of Agriculture) included over 9,000 24-hour dietary recalls on all ages in the 48 continental states (24). Participants of the dietary interviews identified their own meals so that nutrient intakes from breakfast, lunch (including brunch), dinner (some participants referred to dinner as the mid-day meal and some as the evening meal), supper and snacks were compared to the total day's intake for those who reported eating the meal or snack.

Expressed as per cent of the 1974 RDA, girls and boys aged 9-11 years had low intakes of calories (80 per cent for girls and boys), calcium (89 and 97 per cent, respectively), magnesium (88 and 85 per cent, respectively), and vitamin B_6 (84 and 92 per cent, respectively). Boys exceeded the allowance for iron (102 per cent) while girls' intakes were below the RDA (92 per cent). Both sexes consumed large amounts of

protein (boys 205 and girls 181 per cent) and vitamin C (boys 176 and girls 186 per cent). Over 100 per cent of the recommended allowances for phosphorus, vitamin A, thiamin, riboflavin, preformed niacin and vitamin B_{12}, was consumed by this age group.

Although boys and girls, 12-14 years, had diets comparable to 9 to 11 year olds, overall they consumed a higher per cent of the RDA for calories and a lower per cent of the nutrients. Expressed as per cent of the RDA, girls and boys aged 12-14 years, were low in energy (87 per cent for girls and boys), calcium (72 and 90 per cent, respectively), iron (64 and 85 per cent, respectively), magnesium (73 and 80 per cent, respectively), and vitamin B_6 (75 and 99 per cent, respectively), and females were slightly low in phosphorus (99 per cent). Both sexes exceeded the RDAs for protein, vitamin A, thiamin, riboflavin, preformed niacin, B_{12}, and vitamin C. Males exceeded their RDAs for phosphorus and consumed more of each nutrient analyzed than females.

The proportion of energy from the total day's intake from breakfast was 21 per cent, lunch 31 per cent, dinner 40 per cent, supper 38 per cent, and snacks 20 per cent for children 9-11 and 12-14 years of age. Approximately 92 per cent of the males, 9-14 years, and 95 per cent of females, 9-11 years, and 86 per cent of females, 12-14 years, consumed breakfast. Of those reporting eating breakfast, breakfast supplied 20-30 per cent of the total day's nutrients for males. Girls, 12-14 years, had lower nutrient and energy intakes at breakfast (17-28 per cent) than those aged 9-11 (21-37 per cent). Over three-fourths of the children reported eating lunch, which supplied 20-30 per cent of the day's nutrients. Supper provided the largest per cent of total day's nutrients (29-43 and 26-46 per cent for boys and girls, respectively), however, only slightly over

half of the children reported eating supper. Dinner provided about 28-45 per cent of the total day's nutrients for those who reported eating dinner (about 40-50 per cent). Snacks supplied about 25 per cent of the total day's intake of carbohydrate and 15-20 per cent of other nutrients analyzed (protein, calcium, iron, magnesium, phosphorus, thiamin, riboflavin, preformed niacin, and vitamins B_6, B_{12}, A and C). Girls and boys, aged 12-14 years, consumed a higher percentage of calories and all other nutrients from snacks than those aged 9-11 years.

Other Studies

In a study of 322 children, 9 to 13 years of age, from a depressed Boston community, Meyers et al. (25) found that 59 per cent of Caucasian and 42 per cent of Negro boys and 57 per cent of Caucasian and 30 per cent of Negro girls were in the 25th percentile and under for height. Fifty-five per cent of Caucasian and 40 per cent of Negro boys and 35 per cent of Caucasian and 25 per cent of Negro girls were under the 25th percentile for weight. Only 8 per cent of all children were obese. Low consumption of citrus fruits and juices, green leafy and yellow vegetables and milk was reported.

In 1967 Wakefield and Morrow (26) studied nutrient intakes of 134 low-income children, 6 to 12 years of age, and found that 14 per cent of females and 20 per cent of males were underweight; 26 per cent of males and 20 per cent of females were overweight. The underweight children consumed less than 90 per cent of the 1964 RDAs for calories, protein, calcium, iron, vitamin A, niacin, and ascorbic acid. Diets of overweight children had less than 90 per cent of the RDA for calcium, iron, vitamin A, thiamin, riboflavin, and ascorbic acid. All children studied consumed less than the RDA's for calcium, vitamin A, and ascorbic acid.

A nutritional investigation of 642 fifth and sixth grade students in New York (13) showed that almost 15 per cent missed one meal or more per day. Children who ate lunch in school had significantly better diets than those who ate lunch at home or elsewhere. Many of the children consumed less than 50 per cent of the RDAs for calcium, vitamin A, and vitamin C. Seventy-three per cent of the diets were judged to be poor, 20 per cent were considered adequate and 7 per cent were rated as excellent. The lowest range of skinfold thicknesses was found among children with excellent diet histories. Girls had significantly higher skinfold values than boys.

The Bogalusa Heart study (17) included 24-hour dietary recalls to complement a longitudinal investigation of arteriosclerosis risk factors in a random sample of 200 10 year old children. Boys generally had slightly higher intakes than girls for nutrients analyzed except for vitamins A and C. Almost 20 per cent of the boys and 25 per cent of the girls consumed less than two-thirds the 1974 RDA for calories. Most of the children consumed more than 100 per cent of the RDA for protein, riboflavin, and iron, and at least one-third of all children did not achieve two-thirds of the RDA for vitamin A, ascorbic acid, and niacin. Intake of calcium was lower for girls than boys (748 and 920 mg. respectively).

Breakfast was eaten by 92 per cent, lunch by 99 per cent, dinner by 96 per cent and snacks by 98 per cent of the children. Snacks provided the most calories, mainly from sucrose and fat, and the least number of calories was provided by breakfast. Boys and girls consumed adequate calories and protein usually exceeded the recommended allowance. Dinner provided the most protein, niacin and carbohydrate, lunch supplied the

most calcium, breakfast and dinner provided most of the day's cholesterol, vitamin A, and thiamin, and breakfast supplied the most vitamin C.

Anthropometric measurements (height, weight, and triceps skinfold) were obtained from all interviewed children (17). Boys and girls averaged 34 kg., for weight, mean height was 139 cm. for boys and 141 cm. for girls and triceps skinfold averaged 11.3 mm. for boys and 13.3 mm. for girls.

In a state-wide sample of over 1000 students, aged 6-15 years, Eppright and Swanson (27) analyzed food energy and nutrients from seven-day dietary records. Approximately one-half of the children interviewed did not have breakfast. Less than 20 per cent of the day's total calories came from breakfast for children aged 9-11, about 33-35 per cent from dinner or lunch and 15 per cent from snacks. Relative to calories, snacks furnished a high proportion of carbohydrates (20 per cent) when compared to other meals. Lunches and dinners provided about one-third of the day's nutrients each with dinner supplying slightly more calories, protein, iron, thiamin, and niacin, but less calcium than lunches.

The diets were classified into three groups. Diets in group 1 contained all nutrients in amounts not less than 100 per cent of the 1953 RDA, group 2 diets contained not less than 67 per cent of the 1953 RDA, and group 3 diets contained at least one nutrient in an amount less than 67 per cent of the 1953 RDA. Children in group 3 did not have an excessive number of snacks, but had meals that provided 20-40 per cent less energy, protein, calcium, and ascorbic acid. Snacks in group 3 provided 8 to 10 per cent less energy and 30-50 per cent less protein, calcium, and ascorbic acid. Eppright and Swanson concluded that the quantity and quality of snacks played an important part in the nutritive value of a child's diet.

Morgan et al. (28) obtained seven-day food diaries from a cross-sectional sample of U.S. families to assess the role of salted snack foods (SSFs) in the diets of children aged 5-12 years. Approximately 83 per cent of the children consumed SSFs (potato chips, popcorn, corn chips, pretzels, tortilla chips, cheese twists, potato sticks and bacon rinds) with the amount consumed increasing with age. Only about 2 per cent of the children consumed more than 10 per cent of their calories as SSFs with the majority consuming less than 3 per cent. The children tended to increase consumption of fat as calories from SSFs increased, however the majority of the children did not appear to obtain excessive amounts of sodium or fat. Those consuming greater quantities of SSFs tended to consume less protein, vitamin A, and thiamin, even though the amounts of those nutrients were not less than the 1974 Recommended Dietary Allowances. In general, the intake of all nutrients was adequate with the exceptions of magnesium and zinc, diets of children consuming and not consuming SSFs were similar.

METHODOLOGY

Developmental Phase[1]

Development of Sampling Plan

Stratified Random Sample. To obtain a sample representative of elementary schools throughout the state of Kansas, Unified School Districts (USD) were selected at random from each Board of Education District (BED) and then individual schools, or the sampling units, were selected randomly from the USD's. The number of schools selected from each BED was proportional to the number of schools in each BED. In selecting which schools would be chosen for this study, simple random sampling within BED was used with the following exceptions:

1. One or more schools from the largest USD were selected so the largest USD in each BED would be represented.
2. Minor adjustments were made to include some schools with breakfast programs.
3. The one school district in the state not participating in the National School Lunch Program was added.

The initial sample was reviewed at a meeting with the School Food Service Specialists, Kansas State Department of Education on August 31, 1980. Based on their suggestions for deletions and additions, this list was modified. For example, the initial plan included two USD's from BED 5 in the northwest area that were very similar. One of these USD's was replaced by another USD from another region of the BED that had not been included in the initial sample.

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[1] Summary of procedures during Developmental Phase and prior to on-site visits to schools is in Appendix A.

General information regarding the Kansas Education Districts and the Nutrition Education and Training Program Needs Assessment Project original sampling plan is given in Appendix B. About 10 per cent, or 103 schools, of the approximate total 1,060 Kansas elementary schools listed in the 1978-79 directory of Kansas schools were selected initially as sampling units.

The Back-up Plan. Each district superintendent was contacted by letter and asked to grant permission for the district to participate. Specific procedures for contact are described in a later section. If permission was not granted from either a superintendent or principal, the school did not include fifth graders, or was closed, the school was replaced at random with a different school from the same USD, if possible, or from another randomly selected USD in the BED. A chart of changes in the sample is given in Appendix C.

Fifteen school replacements were necessary. Eight of these were necessitated because the school selected did not include fifth grade students. Five USD's refused to participate; four were replaced according to the back-up sampling plan. One large urban district, which included four sample schools, was not replaced because a comparable district was not available in the state. In districts agreeing to participate, only three schools refused. Two were replaced by other elementary schools in the sample district. In one USD, the superintendent requested the deletion of a school that was in the sample, initially, because a special health project was being conducted there. The school was not replaced because a suitable replacement was not available. A third refusal was received one week prior to data collection. This school was not replaced because time did not permit planning for an additional

school. In addition, one school selected had been closed at the end of the 1978-79 school year.

The final sample included ninety-seven Kansas elementary schools. Figure 1 shows the geographic distribution of the resultant sample of schools.

Sample Groups. Based on the objectives of the state plan for the Kansas NET program and the focus groups identified in the federal legislation mandating NETP, the project was targeted to identify nutrition education needs of teachers, foodservice personnel, and students. Three specific groups were identified as a result of decisions of the KSU Needs Assessment Project Proposal Committee in consultation with staff of the School Food Service Section of the Kansas State Department of Education:

1. All elementary school teachers (K-6) in the selected schools.
2. All foodservice personnel involved in food preparation for selected schools, with two exceptions described below.
3. All fifth grade students attending selected schools.

Fifth graders were selected to represent elementary school children because, as upper elementary students, they reflect development through the primary years (K-4 grades) (13). It was postulated that the maturity level, cognitive skills, and reading ability of this age group would facilitate data collection since they would be able to recall foods eaten within the previous 24 hours as well as communicate orally with adults during the individual interview and be able to complete a written questionnaire. Of the total estimated number of fifth graders in Kansas, the sample represented approximately 15 per cent.

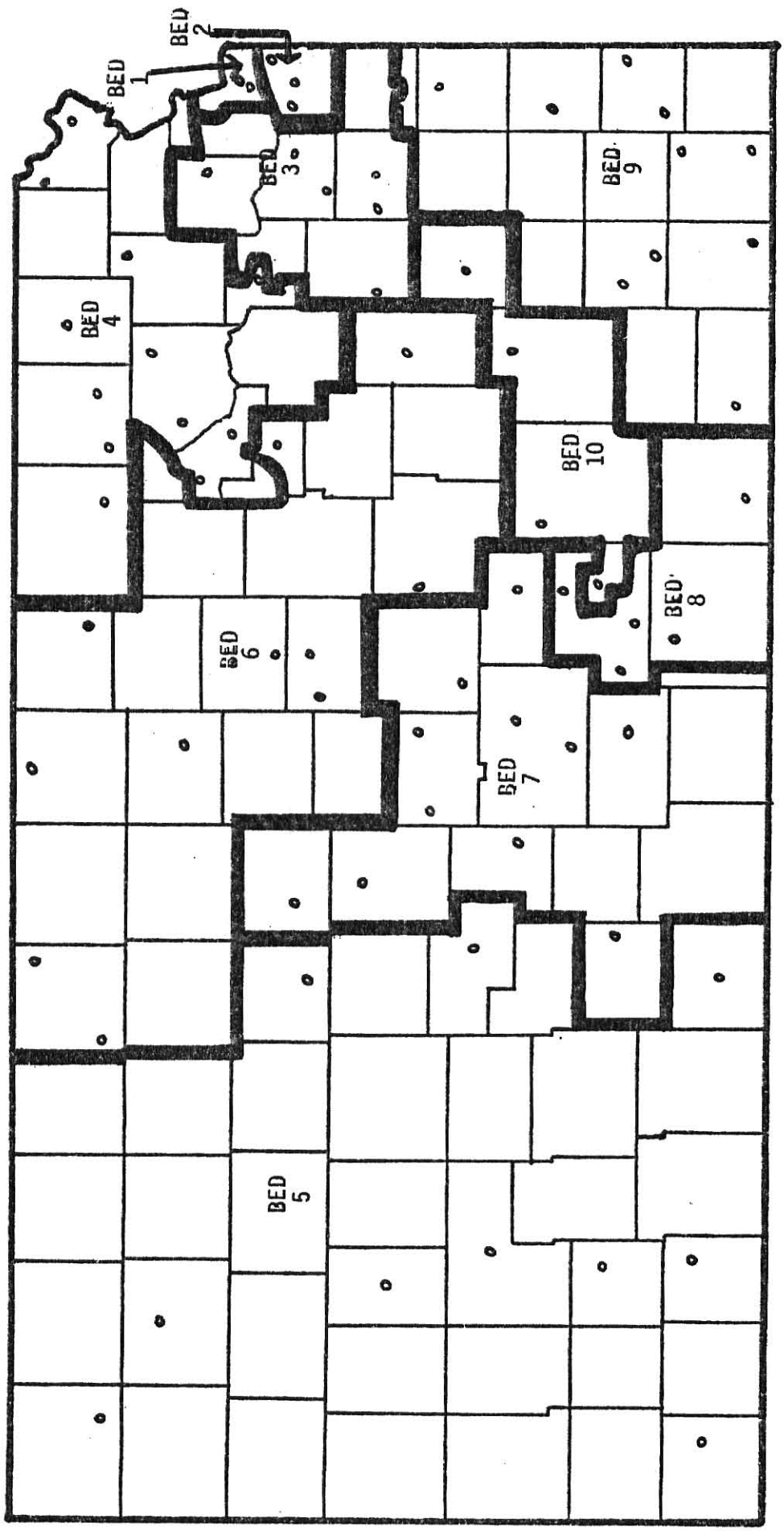
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Fig. 1. Geographic location of Unified School Districts (USD) in the study sample by Board of Education Districts (BED).

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This thesis includes a description of the data collection and analysis for the fifth grade students. On-site visits were conducted at selected schools to administer a nutrition attitudes and knowledge test, take selected anthropometric measurements, and conduct a random sample of 24-hour dietary recall interviews. The visits were conducted on Tuesday through Friday of each week during a 16-week collection period in order to include a school lunch in the dietary histories.

Development of Procedures for On-Site Visits to Schools

Standard procedures were developed through a several phase process for all aspects of the on-site visits to the schools. A protocol with step-by-step procedures for the visit was developed, with specific directions for test administration, anthropometric measurements, and dietary recall interviews. An overview is included in this section and selection of equipment is discussed in detail. Specific information on procedures and forms is included in the section on the Data Collection Phase.

Dr. Jack Smith, Deputy Director, Swanson Center for Nutrition, Inc., Omaha, Nebraska, served as consultant on procedures and equipment for the anthropometric methods and dietary recall interviews. A conference was held with Dr. Smith on November 7, 1979; he also was consulted via telephone during November and December concerning equipment and methods. The Needs Assessment Project Co-Directors, Coordinator, and Research Assistants and the State NETP Coordinator met with Dr. Smith and his staff in Omaha, Nebraska, on December 7, 1979. They conducted a one-day workshop and training session for the team on methodology for anthropometric measurements. Dr. Smith assisted in developing the on-site protocol and discussed data analysis with project directors.

Anthropometric Measurements. Plans for the Needs Assessment Project included collection of data for the following anthropometric measurements on fifth grade students: height, weight, upper arm circumference, and triceps skinfold.

Selection of Equipment. Arrangements were made for the construction of a portable height measuring apparatus[1] (Figure 2) for obtaining standing heights of the fifth grade students, similar to that used in national nutrition surveys (29, 30). A 100 centimeter metal measuring rod was obtained to check accuracy of height apparatus periodically.

A portable bench team scale[2] (Figure 3) was purchased for determining body weights. The capacity of the scale was 300 pounds with graduations of one ounce and was designed with a suspended platform construction to absorb loading shocks. The scale was calibrated to comply with requirements of the National Bureau of Standards. To facilitate transporting the scale, it was equipped with a handle and platform locking device. Three, 25-pound weights, certified by the Kansas State Department of Weights and Measures, were obtained[3] for checking accuracy of the scale.

Skinfold calipers[4] and a metal calibration block were purchased for obtaining triceps skinfold measurements. Steel measuring tapes

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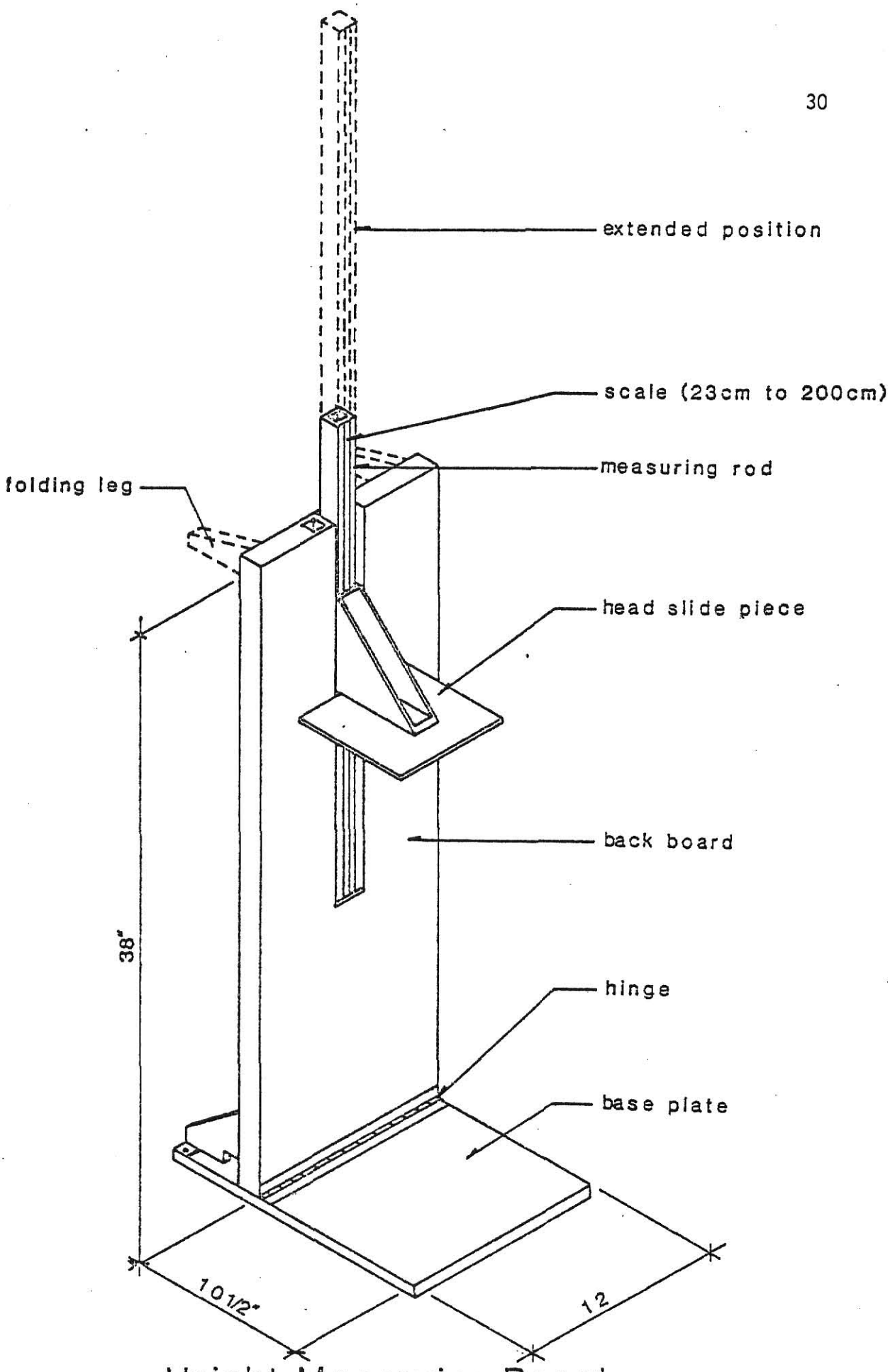
[1]Clarence E. Lind, Architect, A.I.A., Omaha, Nebraska.

[2]Accu-Weigh Model 300T, Metro Equipment Corporation, Sunnyvale, California.

[3]J & S Scale Company, Hutchinson, Kansas.

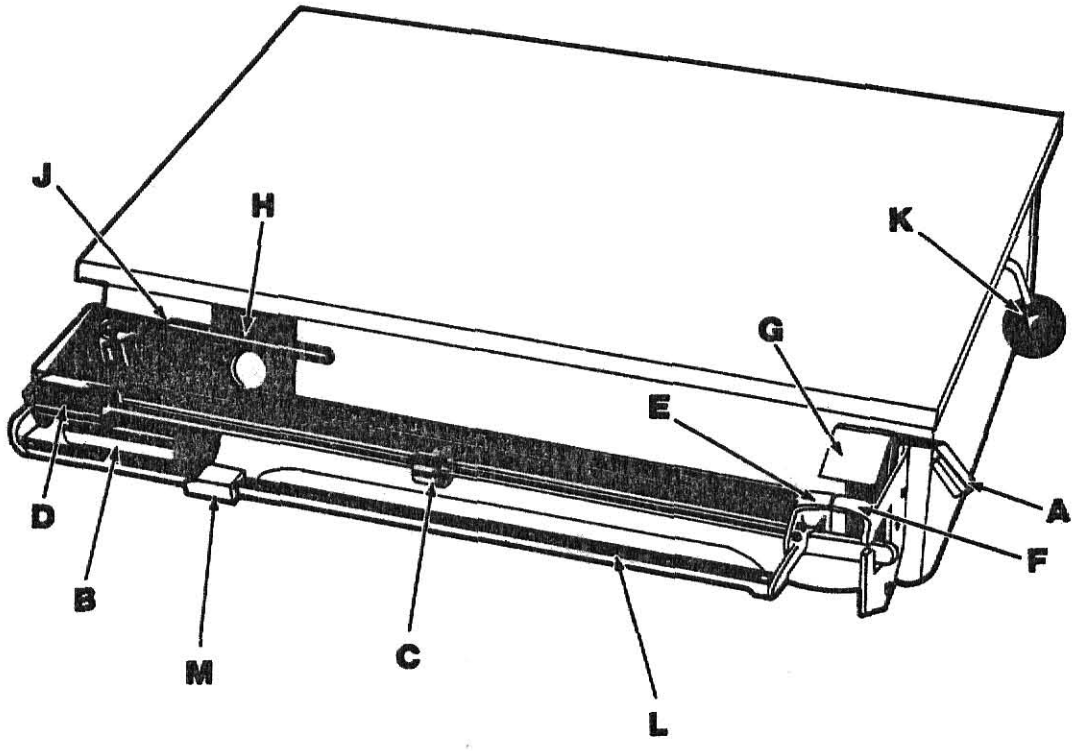
[4]Lange Skinfold Caliper, Cambridge Scientific Industries, Cambridge, Maryland.

Fig. 2. Apparatus for measuring height of Kansas fifth grade students.



Height Measuring Board

Fig. 3. Scale for measuring weight of Kansas fifth grade students.



Bench beam scale, Accu-Weigh Model 300T, Metro Equipment Corporation, Sunnyvale, California.

were ordered directly from the supplier[1] for measuring arm circumference.

Development of Procedures and Recording Forms. A form was developed for recording standardization of the equipment after transportation to each data-collection location. Procedures for obtaining anthropometric measurements and a form for recording the data during on-site visits were formulated (Appendix D). Methods were patterned after those used in the Washington State study on evaluation of school lunch and school breakfast programs (31). Also, procedures used in the National Health Survey (29, 30, 32) and those adapted by Dr. Jack Smith, Swanson Center for Nutrition, Inc., from the Interdepartmental Biological Programme Handbook (33) and the WHO Manual on Anthropometric Appraisal of Trends (34) were reviewed in developing the study protocol.

Twenty-four Hour Dietary Recalls.

Selection of Equipment and Materials. One dimension food models developed by the National Dairy Council were mounted on three 14 x 22" poster boards according to food groups and laminated for use during the dietary interviews. Aluminum measuring cups and spoons, various sizes of plastic glasses, and a 12-inch ruler were purchased to assist in estimating amounts of foods eaten. Each interviewer was provided with a portfolio for the food models and a plastic bag for the small equipment.

Development of Dietary Recall Procedures and Recording Form. A 24-hour dietary recall form was adapted from those used in related studies (6, 18, 31, 35, 36). The form included space for recording

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[1]The Cooper Group, Apex, North Carolina.

various demographic data. Probing questions and procedures for interviews were modified from those used by Frank et al. (35) and Howe and Vaden (36). Also, the dietary intake collection methods used in the Health and Nutrition Examination Survey were reviewed (37). A form for recording the school lunch and breakfast menus was developed for use during the dietary interviews (Appendix E).

In planning the protocol for the visits, it was determined that sufficient time would not be available to interview all fifth grade students at each school. Also, Dr. Jack Smith of the Swanson Center for Nutrition, Inc., and consultant to the Project, recommended that an interviewer should not conduct more than eight interviews in a day. He indicated that fatigue and loss of accuracy in securing complete recalls could result if an excessive number of interviews were conducted by a single interviewer. Therefore, the decision was made to select a random sample of participating students at each school for the dietary recall interviews.

Training of the Research Team. Three training sessions for the four Research Assistants were conducted prior to pilot studies. During the first session, procedures for the anthropometric measurements were explained and demonstrated and Research Assistants were requested to schedule practice times to develop accurate techniques. In the second session, the guidelines for dietary recalls, procedures for recall interviews and the list of probing questions were explained. Practice interviews were conducted. Research team members interviewed each other and then conducted interviews with two children similar in age to those included in the Project. In the third session, each research assistant conducted a dietary interview and measured arm circumference and triceps

skinfold on each of five elementary children. The practice interviews were recorded and evaluated by the project directors.

In further preparation for Phase 2, Data Collection, Dr. William Zuti, Associate Professor and Health Physiologist in the KSU Department of Health, Physical Education and Recreation, conducted a training session with the team on January 24. He assisted the team in refining techniques for arm circumference and skinfold measurement.

Pilot Studies. Prior to on-site data collection, pilot studies were conducted at three schools not included in the sample. The studies (Table 1) were conducted to enable the research team to gain proficiency in procedures and to assist in clarifying problem areas and to determine need for revisions or additions to the on-site protocol.

Table 1: Pilot studies for on-site visits to schools

date of pilot study	school[1]	sample
1. January 14	school 1	1 class; 16 students
2. January 23	school 2	1 class; 21 students
3. January 25	school 3	1 class; 13 students

[1]All schools in USD 383, Manhattan.

At each site, the entire project protocol was conducted: test administration, anthropometric measurements, and dietary recall interviews. The team members were rotated to enable all four graduate research assistants to gain experience in all aspects of the test administration and anthropometric measurements (height/weight, skinfold, and recorder). Also, each team member conducted two interviews as part of each of the

three visits. At School 2, each team member tape-recorded one interview, which was reviewed by one of the Project Co-Directors who then made suggestions for improving interview procedures. A representative of the STATE BOARD observed during the pilot study at School 3. Also, Dr. Zuti observed the team during the pilot study at School 3 and made suggestions on procedures.

After each of the visits, revisions and additions to the on-site protocol were made during a team conference. Based on observations during the pilot studies, the Project Co-Directors and Coordinator decided that a modified on-site protocol would be needed for collecting data in schools with two or more fifth grade classes.

Needs Assessment Project Approval Procedures. An introductory letter was sent to the superintendents of the selected districts which included an overview of the NETP and the purposes and procedures of the Needs Assessment Project. Approval was requested for data collection in the school(s) in each district which had been selected according to the sampling plan to participate in the Needs Assessment Project. A reply form to indicate approval and to list the names of the principals at selected schools and a stamped addressed return envelope were enclosed. Telephone calls were made to nonrespondents, as needed, to solicit replies and approval of the project. In two districts, review and approval of a research committee within each of the districts was required prior to the superintendent's approval. Acknowledgment letters were sent to the school district superintendents who agreed to participate (Appendix F).

Following acknowledgment of school superintendents, a letter explaining the Project was sent to each principal of the selected schools in

districts where approval was obtained. Enclosed with the letter were a reply envelope and form for listing the number of fifth graders, number of fifth grade classes, type of foodservice at the school, and the names and addresses of elementary teachers and foodservice personnel at the school. If food was not prepared at the selected school, names and addresses of foodservice personnel at the school from where food was transported also were requested. A letter was sent to the principals to acknowledge replies (Appendix F). Telephone calls were made, as needed, to solicit replies from the nonrespondents and to request information lacking from a school.

Letters describing the Needs Assessment Project, the on-site visit, data collection techniques, and the types of assistance needed were sent to the fifth grade teachers in the participating schools. A reply form was enclosed requesting the names of the fifth graders in each fifth grade class (Appendix D). A sample copy of the letter, which was sent to the teachers, was mailed to district superintendents and school principals. Telephone calls were made, as needed, to school principals requesting the class rosters from nonresponding teachers.

Scheduling of On-Site Visits. A tentative schedule of on-site visits to participating schools was planned, taking into consideration the following:

a. geographic location of schools;
b. size of schools--especially, number of fifth graders, and number of fifth grade classes;
c. length of school day;
d. minimum time for data collection;

e. established travel time between schools; and

f. day of week.

Visits were planned to begin January 29 and end May 14. The schedule was planned to visit schools in the eastern part of Kansas in the early part of Phase 2 of the Project, the Data Collection Phase, because distances from the University were shorter. Possible travel difficulties because of inclement weather were anticipated; therefore visits to the western part of the state which would require greater distances for travel were planned for the latter part of Phase 2. As recommended in the literature (37, 38), data collection was not planned on Mondays because 24-hour dietary recalls are often atypical on weekend days (15). Also, the plan was to include a weekday lunch in the 24-hour period studied in order to include foods eaten at school lunch if possible. In addition, time was needed for assembling data from visits during the prior week and for preparing for visits during the ensuing week.

Based on pilot studies, it was determined that a minimum of two and a half hours would be required in most schools to administer the test to all fifth grade students, take anthropometric measurements of all fifth grade students, and conduct dietary recall interviews with a selected sample of students. A maximum of two schools, therefore, could be scheduled on one day, because of the minimum time requirement, length of school day, and need for travel time between schools. In schools with three or more fifth grade classes and seventy or more students, an entire day was planned; also, an entire day was required for visits to a few schools in isolated areas because of travel time required between locations. A total of 59 to 60 data collection days was projected. Two

school visits were planned on all but twenty-one days during the Data Collection Phase.

Based on the tentative schedule, telephone calls were made to principals of participating schools to establish dates of the on-site visits. Revisions in the schedule were made as needed. Information provided by the principals, which necessitated adjustments in the schedule, included the following:

a. dates of district spring breaks and holidays;
b. dates of parent conference and staff in-service education days;
c. special aspects of the school schedule (e.g., time of lunch periods, music, physical education, and/or recess);
d. dates of statewide teachers meetings.

Due to the constraints listed above and difficulties in securing equipment and supplies, the original time frame for on-site visits (January 14-April 21) was adjusted in consultation with the STATE BOARD. The tentative schedule was transmitted to STATE BOARD on January 18, 1980. The initial dates were between January 29, 1980 and May 14, 1980. The starting date for on-site visits was delayed three weeks to allow additional time for obtaining tests and equipment and for the completion of plans for the on-site data collection in the selected schools. Approval from schools required more time than scheduled even with the early distribution of request letters to superintendents. Because of holiday schedules, appropriate school personnel were unavailable for scheduling on-site visits. Also, pilot testing could not be scheduled until after the holiday vacation in the schools.

Weekly schedules were prepared which indicated telephone numbers and addresses of schools to be visited and names of the principal and fifth

grade teacher(s) at each school. The confirmed monthly schedules for the period of on-site visits were filed with the STATE BOARD on February 6, 1980. Confirmed weekly schedules were transmitted to STATE BOARD as follows:

Date	Schedules
1/25/80	Weeks 1-3
2/1/80	Weeks 4-7
2/6/80	Weeks 8-11
2/12/80	Revised Weeks 8 and 9
2/13/80	Weeks 12-16
2/18/80	Schedule Change Week 13
2/27/80	Revised Schedules Weeks 6 and 13

A revised monthly schedule for March was filed on February 20, 1980 and for April on March 10, 1980 to reflect changes in weekly schedules which had been previously filed with the STATE BOARD. One change in the schedule was necessitated during Week 2 of on-site data collection due to school closing because of severe weather and road conditions. This school was rescheduled to Week 8. A final revision of the schedule for Week 16 (May 12-16) was made at the request of a principal. This school visit was rescheduled on May 15, thus extending the data collection period one day. Copies of all schedules are in Appendix G.

Data Collection Phase

Contacts with Schools Related to On-Site Visits[1]

Confirmation of Dates. Within one to four weeks following the telephone calls establishing the date of the on-site visit, the school principal was mailed a letter of confirmation of the date. The letter also identified the research team, explained the additional steps

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[1]A summary of mailings prior to on-site visits is included in Appendix H. Copies of all correspondence and forms are in Appendix I.

preceding the on-site visit, reviewed the general procedures, and identified the special requirements of the visit (space and chairs needed, time requirement, etc.). A copy of the principal letter and a transmittal memorandum were sent to the district superintendents to inform them of the scheduled date.

Parent Consent Procedures. Approximately three to four weeks prior to the scheduled on-site visits,[1] a packet was sent to each school principal which included parent consent letters. The packet included: (a) a transmittal letter to the principal, (b) a letter to each fifth grade teacher in the school, (c) a roster for each fifth grade class in the school with names of all students in the class listed for the teacher to use in recording receipt of parent consent forms, and (d) a parent letter and consent form for each student in each teacher's class with the students' names indicated on letters.

The principal letter reviewed the purpose of the parent consent procedure, asked principals to encourage student participation and parental approval, requested that the principal give the materials to appropriate teachers in the school and ask teachers to distribute the parental letters to students to take home for signatures. The teacher letter reviewed the purpose of the parent consent procedure, requested that the teacher distribute forms to students to take home to parents, and then hold the forms to give to the research team at the time of the on-site visit. The parental consent letter briefly described the Needs

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[1] Because of time constraints, the packets were mailed one to two weeks in advance of visits to schools scheduled for on-site visits during the first three weeks of the Data Collection Phase. In one school with a high ratio of Hispanic students, the principal had the letter and form translated into Spanish for distribution. A copy is in Appendix I.

Assessment Project, included a statement of informed consent, and encouraged the parents or guardians to permit their children to take part. A consent form to be signed and returned to the teacher was attached. Sample copies of the principal, teacher, and parent letters were sent to the district superintendents with a transmittal memorandum.

Final Contacts. A final mailing was sent to each school one week to ten days prior to the on-site visit to provide final instructions to the principals and fifth grade teachers. The letter to the principals repeated the established date of the on-site visit, reviewed the general procedures and requirements of the visit, and asked that the principals distribute letters to the fifth grade teachers at their schools and encourage the teachers to follow the instructions carefully.

The teacher letter repeated the date of the visit, identified the research team, reminded the teachers about the parental consent procedure and forms, reviewed the project procedures, asked that the teachers encourage student participation. Also a standard statement to be used in introducing the study to students in their classes was included. A sample copy of the teacher letter and a copy of the principal letter were sent to the district superintendents with a transmittal memorandum. Within one week after the on-site visit to each school, letters of appreciation were mailed to the district superintendent, school principal, and each fifth grade teacher.

Preparations for On-Site Visits for Data Collection from Fifth Grade Students

Preparations for On-Site Visits. The dates by week of on-site visits to the ninety-seven Kansas elementary schools in the sample are listed in Table 2. Detailed schedules are included in Appendix G. Each

Table 2: Dates of on-site visits to schools for collection of data from Kansas fifth grade students

week no.	dates of visits[1]	week no.	dates of visits
1	Jan. 29 to Feb. 1	9	March 25 to March 28
2	Feb. 5 to Feb. 7	10	April 1 to April 4
3	Feb. 12 to Feb. 15	11	April 8 to April 10
4	Feb. 19 to Feb. 22	12	April 15 to April 18
5	Feb. 26 to Feb. 29	13	April 22 to April 25
6	March 4 to March 7	14	April 29 to May 2
7	March 11 to March 14	15	May 6 to May 8
8	March 18 to March 21	16	May 13 to May 15

[1]All visits scheduled between January 29 and May 15, 1980. Weeks 2, 11, 15, and 16 included three data collection days; all other weeks were four days in length.

week included four data collection days, except weeks 2, 11, 15, and 16 which included only three days. The data collection period consisted of sixty days scheduled during a sixteen week period. Two on-site visits were scheduled on thirty-seven days and one on twenty-three of the data collection days. Table 3 shows the number of schools visited during each of the sixteen weeks. Between four and eight schools were visited each week. Morning or all day visits were scheduled to begin at 8:00 a.m., except in a few instances in which a school had a small number of students and a slightly later time was possible. Afternoon visits began between 12:00 noon and 1:00 p.m. Because of the limits of the school day (8:30 a.m. to 3:00 p.m. at most schools) and the time required for data collection and for travel between schools, scheduling visits as described was imperative.

Table 3: Number of on-site visits to randomly selected Kansas elementary schools (N = 97) each week during Data Collection Phase

weeks of on-site visits[1]	no. of schools visited[2]	weeks of on-site visits	no. of schools visited
1	7	9	5
2	6	10	7
3	6	11	5
4	7	12	8
5	8	13	6
6	6	14	5
7	6	15	6
8	5	16	4

[1]Refer to Table 2 for schedule of on-site visits.

[2]Two on-site visits were scheduled on 37 days and one on 23 of the 60 data collection days. Weeks included four data collection days, except weeks 2, 11, 15, and 16 which included only three days.

As indicated in the section on scheduling, the Monday of each data collection week was reserved for preparations for the on-site visits scheduled during the remainder of the week. Student test packets were prepared for the test administration and a sufficient number of forms for other aspects of the data collection were compiled for the visits scheduled for the week. Test response sheets had been coded with an identification (ID) number to permit linking all data (test, anthropometric, dietary recall) on a particular student. Test packets included a response sheet, test booklet, and a yellow signature card with the student ID number stamped on the card. Additional details on the test packet are included in the section on test administration.

Also in preparation for on-site visits, expandable folders were assembled for each sample school. Each folder was labeled with the USD number, name and location of the school, and scheduled date of the on-site visit to the school. General forms for each school were collated and placed in the folders in advance of visits. Folders for schools to be visited during the ensuing week were checked on Monday to determine if all forms were included and in order. These forms included the following:

Checklist of Supplies and Equipment for On-Site Visits to Elementary Schools in Sample

Report of Visit to School

School Lunch and Breakfast Menu Recording Form

Standardization of Equipment for Anthropometric Measurements

Changes in Sample Form

Class Roster(s) (one for each fifth grade class in the school)

Copies of all forms, along with the step-by-step protocols for on-site visits to schools with one fifth grade class and to schools with two or more classes are in Appendix J.

The checklist was prepared to assist in assuring that all necessary equipment and supplies had been loaded into the station wagon used for transportation to schools. All supplies and equipment needed for test administration, anthropometric measurements, and dietary recall interviews were listed on the form. The form was used for an initial check and for verification after each school visit, prior to leaving for the next site.

The Report of Visit to School form was developed to provide basic information to the Project Coordinator about each school (school name and address, names of principal and teachers) and to record general information:

schedule during visit, foodservice programs provided at school, type of foodservice system (on-site or satellite), ID numbers assigned to each fifth grade class, the school lunch menu on the day of the visit and the prior day[1] (if a morning visit), and the school breakfast menu. Also, space for comments was included. The forms were prepared with the basic school information prior to filing in the school folders.

The menu recording form was developed for preparing a copy for each of the four Research Assistants of the menus for school breakfast (if served) and lunch menus to be used in the dietary recall interviews. The standardization of equipment form was for use in checking accuracy of the height board, scale, and skinfold caliper as described in the section on equipment for anthropometric measurements. The changes in sample form was constructed to record by class in each school the number of new enrollments, number of students who had moved from the area, number of absences, and number of students failing to return parent consent forms, of those without parental consent, and those refusing themselves to take part in the Project. A column also was provided to record total number of participating students.

The class roster form was designed to assist in checking student data. Prior to on-site visits, the names of all students in each fifth grade class in each sample school were typed on the roster forms; along with the date of the visit, school name and location, and name of the teacher for the class. Students' names had been supplied in response to the initial letter to teachers during the Developmental Phase. Space was provided to record if each student was present or absent the day of the

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[1]The prior day's school lunch would be included in the twenty-four hours spanned by the dietary recall interviews during morning visits.

visit, each student's permanent ID number, and whether parental and student consents had been secured. Also, forms permitted the research team to indicate if test response sheets, anthropometric data cards, and recall forms had been collected from participating students. In addition, a column was provided to assign a number to each student in each class for purposes of selecting the random sample for the dietary recall interviews.

On the Monday preceding each data collection week, the Project Coordinator selected the tentative random sample of students for the interviews, using lists of random numbers prepared by the Project Consulting Statistician. Each of these lists contained forty numbers listed in a different random order for each fifth grade class in each of ninety-five sample schools. Random lists of eighty and 150 numbers, respectively, were used for the two schools in the sample with open classroom situations. Depending on the number and size of fifth grade classes and the number of school visits scheduled for the day, a sample of eight to sixteen students per class was selected prior to each visit. The student names on the class roster form were numbered sequentially (1-40) for the random selection. Checks were made on the class roster form to indicate students who had been selected. Also, the order of random number selection was indicated next to the check mark. The random number list then was attached to the form for use in making necessary changes at the school.

A team conference was scheduled on Monday mornings of each data collection week to review procedures and to discuss any changes in protocol or schedules, problems that may have occurred during the preceding week, and details about the schedules for travel for data collection

during the remainder of the week. Two other tasks were accomplished on the Monday of each week. Data from on-site visits during the preceding week were delivered to the KSU Statistical Laboratory for keypunching. Also, the station wagon was loaded with all necessary equipment and supplies in preparation for travel. The research team departed either on Monday afternoon or Tuesday morning, depending on the distance to the first school to be visited during the week.

On-Site Visits to Schools. Specific protocols were prepared for visits to schools with one fifth grade class and to those with two or more classes (Appendix J), which defined roles and responsibilities of research team members and included step-by-step procedures to follow from arrival to departure from schools. Procedures and forms for test administration, anthropometric measurements, and dietary recall interviews are included in Appendixes K, D, and E. Details are discussed in sections which follow this section on overall on-site visit procedures. The Project Coordinator was the overall supervisor of the Research Assistants and had responsibility for overseeing all aspects of the visits. Specific data collection responsibilities of each of the Research Assistants are listed in Table 4. Research Assistants rotated responsibilities during the Data Collection Phase to ensure all assistants maintained proficiency in research techniques and to permit task variety.

Initial Procedures. After arrival at a school, the Project Coordinator contacted the school principal to clarify arrangements and procedures. Following the initial contact, the Research Assistants unloaded all equipment and supplies, arranged equipment for anthropometric measurements and dietary recall interviews, and completed

Table 4: Data collection responsibilities of Research Assistants during on-site visits to schools

Research Assistant no.	responsibility in schools with:	
	one class[1]	two or more classes[1]
#1	test administrator[2]	test administrator[2]
#2	measurement station #1 (height and weight)	test assistant; measurement station #1
#3	measurement station #2 (arm, skinfold)	test assistant; measurement station #2
#4	test assistant; recorder for measurements	test administrator;[3] recorder for measurements

[1]All Research Assistants conducted dietary recall interviews.

[2]Research Assistant #1 initiated interviews following completion of test administration.

[3]Tests administered in two classes simultaneously. If more than two classes, test administrators proceeded to additional classrooms as soon as possible to initiate test procedures.

standardization procedures for anthropometric measurement equipment. The Project Coordinator confirmed the schedule and reviewed the protocol with the fifth grade teacher(s). Also, the Coordinator reviewed class rosters with teachers and collected parental consent forms. Research Assistants revised lists of students and alphabetized and checked parental consent forms to determine number of participating students.

Data Collection Protocol. At the scheduled time, Research Assistants responsible for test administration (Table 4) proceeded to assigned classrooms. Initially, fifth grade students with parental consent were given informed consent information and asked to sign consent forms. The

number of participating students then was determined and test packets secured from the Project Coordinator. Tests were administered following standard procedures. As time permitted the Coordinator completed the Report of School Visit form, contacted school foodservice personnel concerning school breakfast and lunch menus, and completed the menu recording forms for Research Assistants to use during dietary recall interviews.

Research Assistants not involved in test administration initiated anthropometric measurements as soon as students had completed tests. All Assistants were involved in test administration in multi-class situations (Table 4). After test instructions were completed in these situations, test assistants proceeded to the measurement area to initiate anthropometric measurements. The Project Coordinator escorted the fifth grade students to the measurement area in groups of approximately five students.

Following completion of test administration, one Research Assistant began conducting dietary recall interviews, while the other three Assistants collected anthropometric measurement data. After height, weight, and arm measurements were complete on all participating students and equipment was prepared for reloading, all Research Assistants conducted interviews. As in the measurement procedures, the Project Coordinator directed students selected for recall interview sample to the area where interviews were being conducted. During the interview period, the Project Coordinator reviewed class rosters and data forms to determine if all data were in order. All data forms were filed in the expandable school folder. Also, the changes in sample form was completed.

Project Co-Directors were present during all on-site visits during the first week and during those to large schools (i.e., those with three or more classes and eighty or more students). The Co-Directors assisted with test administration, as needed, in the large schools to permit tests to be given in three classrooms simultaneously. Also, they served as data recorders during anthropometric measurements to permit two Research Assistants to begin interviews.

Departure Procedures. After all recall interviews were complete, equipment, supplies, and data were repacked in the station wagon for travel to the next site. The Project Coordinator held a brief exit conference with appropriate school staff and checked with Research Assistants to determine if all equipment and supplies were loaded and in order.

Test Administration. At each of the ninety-seven elementary schools in the final sample, the nutrition knowledge and attitude test was administered to all fifth grade students with parental approval and who were willing to be participants. According to the protocol, the Project Coordinator collected the parental consent forms and teacher's roster for return of forms from the fifth grade teacher(s) and distributed the forms to Research Assistants responsible for test administration. The Research Assistants alphabetized and reviewed the forms and then revised the list(s) of fifth grade students. The test administrator (refer to Table 4 for responsibilities of Research Assistants) in each classroom reviewed the class roster with the teacher to determine absences and clarify additions or deletions. Arrangements were made with the teacher for assignments for nonparticipating students.

Standard instructions for test administration were followed in all ninety-seven schools. Prior to distribution of test packets students were given informed consent information and asked to indicate on a form (Appendix I) whether they were willing to participate in the study. The Research Assistant responsible for test administration gave a brief overview of the project and with the aid of the test assistant demonstrated the procedures for measuring triceps skinfold and arm circumference. After student consent forms were collected, the number of participating students was determined and the appropriate number of test packets was secured from the Project Coordinator. The Project Coordinator recorded the inclusive ID numbers of tests used in the class on the Report of Visit to School form. Standard test instructions were given and those agreeing to participate were given the test packet, consisting of the test booklet, green response sheet, and a 3" x 5" yellow signature card. Both the response sheet and card contained a four-digit number (0001-3236) which served as the permanent student ID number.

Four questions to obtain demographic information from the students were included at the beginning of the response sheet that was clipped to the test booklet. Students were asked to write their first and last names and their birthdates (the month, day, and year of birth) on the yellow cards. Students were asked to keep the card to bring with them to the anthropometric measurement area at the appropriate time.

The Protocol for On-Site Visits to Elementary Schools (Appendix I) was referred to for procedures and assigned tasks to be completed during test administration. While students were completing the test, answers to students' questions were limited to clarifying test directions and pronouncing unfamiliar terms. As students handed completed answer sheets

to the test administrator, the ID numbers were recorded on the class roster form.

The test administrator or assistant updated the random sample for the dietary recall interviews during the testing period to account for absences and students not consenting or without parental consent. If a new student had been added to the class roster, then that student was assigned a number to be included in random selection and the sample was re-ordered using the random number list attached to the class roster. At the end of the testing, the test administrator listed the names of the students selected for the recall sample on the chalkboard in each classroom.

The test booklets were collected and later checked for marks which were erased to permit re-use of the test booklets. Upon completion of the test administration in each class, the test booklets, alphabetized response sheets, and class roster were collected by the Project Coordinator who completed the form for reporting the actual number of students participating and reasons for nonparticipation.

Number of Students Participating in Test Administration and Anthropometric Measurements. Details on changes in sample are included in Appendix L. In Table 5, data are summarized on a weekly basis for the sixteen week data collection period. The initial number of students, according to reports supplied in response to requests for schools to participate in the Needs Assessment Project, was 4,017, which was adjusted based on new enrollments and departures from the school.

Absences on the day of data collection averaged 4.9 per cent, ranging from 1.8 to 8.2 per cent on a weekly basis. As expected, school

Table 5: Changes in Kansas fifth grade student sample

weeks of on-site visits[1]	initial no. of students[2]	new enroll-ments	no. students moving from school	adjusted no. of students	reasons for non-participation				no. of partici-pating students	
					absences	no parent form	parent non-consent	student non-consent		
					%[3]				N	%[4]
1	283	4	4	283	7.4	9.5	3.2	1.1	223	78.7
2	183	--	--	183	5.5	--	6.6	1.0	159	86.9
3	291	5	4	292	8.2	7.2	9.3	--	220	75.3
4	226	5	--	231	7.8	1.7	6.5	2.2	189	81.8
5	320	10	5	325	5.2	5.2	7.8	1.2	262	80.6
6	268	4	6	266	7.1	7.9	6.8	--	208	78.2
7	357	7	11	353	2.5	6.8	10.5	0.3	282	79.9
8	297	21	16	302	7.0	6.0	8.9	0.3	235	77.8
9	351	11	6	356	2.5	15.4	9.0	0.3	259	72.8
10	314	4	11	307	5.5	10.7	4.9	0.4	241	78.5
11	201	4	7	198	3.0	1.0	3.0	0.6	183	92.4
12	292	5	7	290	3.1	6.6	5.5	0.3	245	84.5
13	205	6	1	210	3.7	4.8	6.7	1.4	178	84.8
14	193	3	4	192	3.6	2.6	9.4	0.5	161	83.9
15	159	5	1	163	1.8	12.3	4.3	2.5	129	79.1
16	77	--	7	70	2.9	1.4	11.4	2.9	57	81.4
Total	4,017	94	90	4,021	4.9	6.9	7.0	0.8	3,231	80.4

[1] Refer to Table 2 for dates of on-site visits to schools.

[2] Number of students reported in reply to request for participation of school in Needs Assessment Project.

[3] % of adjusted no. of students not participating in Project for the various reasons cited.

[4] % of adjusted no. of students participating in test and anthropometric measurements aspects of Project.

attendance was somewhat lower early in the data collection period, which was during the winter months.

Almost 7 per cent of the students failed to return completed parental consent forms. Parents of another 7 per cent of the students refused to grant permission for their child to participate and less than 1 per cent of the students refused to take part in the Project. As a result, a total of 3,231 fifth grade students in the ninety-seven schools, or 80.4 per cent, were involved in the test administration and anthropometric measurements.

Anthropometric Measurements. Detailed procedures for anthropometric measurements are in Appendix D. A copy of the data recording form for measurements also is included in Appendix D. According to the protocol, upon arrival to each school Research Assistants unloaded all equipment, set up the area designated for measurements by the principal and checked the accuracy of the height board, scale, and skinfold calipers. In a single class situation, as fifth graders completed the test they were directed in small groups (three to five) from the classroom to the measurement area. In a multiple class situation, as soon as possible after testing had been initiated in the last classrooms two Research Assistants began the measurement procedures with the assistance of the Project Coordinator as recorder until a third Research Assistant was available. Students were asked to bring their yellow signature card to the area, which was handed to the data recorder to identify the child. The name, ID number, and birthdate of the child were recorded on the anthropometric measurement recording form from the signature card. Ethnic group was observed and recorded. Teachers were consulted if the recorder was unsure about a particular child.

Students were asked to remove shoes and excess clothing (hats, coats, sweaters, etc.) and empty pockets before height and weight were measured. Care was taken on the part of the Project Coordinator and Research Assistants to protect the privacy of each student and not to ask any child to remove an article of clothing (e.g., a shirt over a tightly-fitting undershirt) if it would cause embarrassment to the child.

Height and weight of each student was measured by one Research Assistant and a second Research Assistant determined upper arm midpoint and measured arm circumference and triceps skinfold. Procedures are summarized below:

Height: The subject stood on the outline of feet attached to the horizontal platform against the measuring board with heels and back in contact with the board, without shoes, looking directly forward and head held straight. A right angle board (or leveler) was slid down the height board until the bottom surface touched the subject's head. Reading was taken to the nearest tenth of a centimeter, while holding the right angle board firmly against the measuring board.

Weight: Subjects were weighed in indoor clothing, less jackets, sweaters, and footwear. Reading was taken to the nearest ounce.

Arm Circumference: Subject stood with left arm flexed 90°. Measurement was taken at the midpoint between the left shoulder (tip of the acromion process) and the elbow (tip of the olecranon process). With the left arm flexed, the midpoint of the upper arm was determined. The arm circumference was measured with the tape in a horizontal plane in light contact with the skin, with shirts off or sleeves rolled up if possible. Reading was taken to the nearest tenth of a centimeter. If shirt or blouse could not be pushed up to shoulder, length of upper arm was measured over clothing; then, if possible, the sleeve was pushed up to measure circumference and skinfold. If sleeve could not be pushed up or rolled above midpoint, measurement was over clothing.

Triceps Skinfold: The triceps skinfold was measured at the upper arm midpoint. Subjects were asked to let their arm hang freely and relaxed when the skinfold measurement was taken. The skinfold (long axis vertical) was picked up between thumb and forefinger about 1 cm. above the level marked on the skin and directly in line with the point of the elbow or olecranon

process. The caliper jaws were applied at exactly the level marked. Reading was taken to the nearest half (5/10) of a millimeter. Two readings were taken on each subject; if the two readings were not the same, a third reading was taken. Thickness of fabric was recorded if measurement was taken over clothing.

For all measurements, except weight, the Research Assistant taking measurements reported the reading loudly enough to be heard by the recorder, who repeated the measurement as an accuracy check. Weight was reported quietly, to avoid possible embarrassment for a child. After all participating fifth grade students had been measured, the recorder alphabetized the forms for each class, labeled them with the teacher's name, and gave them to the Project Coordinator for filing in the school folder.

Dietary Recall Interviews. The minimum number of interviews to be conducted at each school was determined by the Project Coordinator prior to on-site visits during each week as described above. Factors determining the minimum number included: size of class; number of fifth grade classes in school; number of schools scheduled in one day; and fatigue of interviewers. Although the schedule varied from school to school, generally, random samples were used in classes with greater than twelve fifth graders. In multiple class schools, interview samples were representative of size of each class. For example, if each class had an equal number of twenty students each, then eight students were selected from each class.

As time permitted, additional students were selected by the Project Coordinator so as not to exceed a maximum of thirty-two interviews per

day,[1] or eight per interviewer. School activities, such as music and physical education classes and recess, and travel time between schools affected the maximum number of interviews conducted at each school. Table 6 indicates tht total number of dietary recall interviews conducted each week during the sixteen week period. An average of 40.5 per cent of the students participating in the test and the anthropometric measurements were interviewed (N = 1,309).

Four separate interview stations were set up by the Research Assistants in extra classrooms or hallways, as school space permitted. Each station included two chairs and a desk or table provided by the school (portable trays were used if a desk was unavailable). Each interviewer set up the station with the food model posters and other aids.

To assist the interviewers, the school breakfast and lunch menus for the current and/or previous day and the type of milk served was obtained from school foodservice personnel by the Project Coordinator and recorded on a form, which was then distributed to each interview station.

The Research Assistant who was test administrator began conducting interviews upon completion of testing in all classes. Following anthropometric measurements, all Research Assistants conducted dietary interviews using established procedures and guidelines (Appendix E). Fifth graders were directed to the recall area by the Project Coordinator who distributed recall forms to Research Assistants as needed.

The dietary recall form was printed as a four page booklet (Appendix E) which included several general questions on the first page

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[1] As reported in the section on the Developmental Phase, eight interviews is considered the maximum number for an interviewer in a single day.

Table 6: Number and percentage of Kansas fifth grade students selected randomly for 24-hour dietary recall interviews

weeks of on-site visits[1]	no. of participating students[2]	students selected for recall interviews[3]	
		N	%
1	223	77	34.5
2	159	65	40.9
3	220	73	33.2
4	189	91	48.2
5	262	92	35.1
6	208	88	42.3
7	282	105	37.2
8	235	99	42.1
9	259	99	38.2
10	241	102	42.3
11	183	60	32.8
12	245	101	41.2
13	178	76	42.7
14	161	69	42.9
15	129	68	52.7
16	57	44	77.2
total	3,231	1,309	40.5

[1]Refer to Table 2 for schedule of on-site visits.

[2]No. of Kansas fifth grade students participating in test administration and anthropometric measurements.

[3]No. and % of students selected randomly for 24-hour dietary recall interviews from total no. of participating students.

(parents' occupation, number in family, persons responsible for preparing food, frequency of eating out, supplements taken, and information on special diet). The listing of foods eaten were recorded on pages 2 and 3. Spaces were provided for a meal code and where food was eaten code. Interviewers entered a description of the foods eaten and quantities consumed. Columns were provided for food item numbers and quantity codes to permit coding for keypunching direct from the form.

Initially, interviewers asked general questions to put the students at ease; then students were asked to report all foods eaten during the previous twenty-four hours, beginning with the most current foods consumed and progressing backwards. A list of probing questions was used by interviewers to assist in securing complete information from students on both food eaten and quantities.

Procedures to Check Accuracy of Data Collection Techniques. To ensure reliability and validity of data collection techniques of the research team, several procedures were followed. At intervals of approximately four weeks, each team member tape recorded a dietary recall interview and test administration instructions during actual data collection. Tapes were evaluated by each individual, by the research team, and by the Project Co-Directors. At weekly team conferences discussion included suggestions for improving techniques.

At two intervals during the Data Collection Phase anthropometric measurement techniques were checked under the supervision of a health physiologist, Dr. William Zuti, Associate Professor of Health, Physical Education and Recreation (KSU). According to standard anthropometric procedures ten subjects similar in age to those in the study sample were measured by members of the research team and Dr. Zuti. Each member's

measurement procedures were evaluated by Dr. Zuti. Also consistency of measurements among team members was assessed. These measurement checks were conducted on March 3, 1980 and April 11, 1980. Related correspondence is in Appendix D with other anthropometric measurement details.

Results of the analysis of variance of anthropometric measurements taken by the health physiologist and research team members are presented in Tables 7 and 8. Measurement variance among the ten subjects was greater than the measurement variance of the measures (health physiologist and research assistants). The means, standard deviations, and coefficient of variation of anthropometric measurements taken by the health physiologist and research team members are listed in Table 9. The mean differences in arm circumference (-0.27 cm.) and triceps skinfold measurements (0.28 mm.) were small. Based on the analysis of the measurements on ten subjects, it was postulated that most of the variation in measurements of the fifth grade students measured by the same research assistants would be attributable to differences among students rather than differences among measures.

Data Analysis

Preparation of Anthropometric and Recall Data

The anthropometric data were keypunched directly; prior coding was unnecessary. Coding information on the demographic section of the dietary recall form is included in Appendix M, along with details on coding food intake data. Codes were established for recording occupation(s) of each student's father and/or mother, using job classifications from the Dictionary of Occupational Titles (39). Information reported about

Table 7: Analysis of variance of anthropometric measurements taken by health physiologist and research team members

	source of variation		
	subject	measurer	error
d.f.	8	5	28
expected mean squares	$\sigma^2+K_1^{\dagger}\sigma_M^2+K_2\sigma_s^2$	$\sigma^2+K_3^{\dagger}\sigma_M^2$	σ^2
mean squares			
arm circumference, cm.			
without sleeve			
first measurement	29.95	1.11	0.10
second measurement	25.70	1.69	0.13
difference*	0.37	0.38	0.16
with sleeve	24.42	2.85	0.78
triceps skinfold measurement, mm.			
without sleeve			
first measurement	76.08	4.98	1.79
second measurement	67.64	15.09	1.78
difference	12.27	15.94	3.74
with sleeve	68.41	8.85	2.52

*Difference is equal to the first measurement - the second measurement.

†K_1 varied 0.04-0.13.
K_2 varied 3.6-5.0.
K_3 varied 6.0-7.5.

Table 8: Variance component estimates of anthropometric measurements taken by health physiologist and research team members

	variance component		
	$\sigma^2_{subject}$	$\sigma^2_{measurer}$	σ^2_{error}
arm circumference in cm.			
without sleeve			
first measurement	6.67	0.15	0.10
second measurement	6.39	0.21	0.13
difference*	0.07	0.04	0.16
with sleeve	5.93	0.28	0.78
triceps skinfold in mm.			
without sleeve			
first measurement	14.86	0.44	1.79
second measurement	16.51	1.78	1.78
difference*	2.13	1.81	3.74
with sleeve	16.55	0.84	2.52

*Difference is equal to the first measurement - the second measurement.

Table 9: Means, standard deviations, and coefficient of variation of anthropometric measurements taken by health physiologist and research team members

	mean	standard deviation	coefficient of variation
arm circumference in cm.			
without sleeve			
first measurement	22.60	0.32	1.41
second measurement	22.90	0.36	1.57
difference	-0.27	0.40	*
with sleeve	24.58	0.88	3.60
triceps skinfold in mm.			
without sleeve			
first measurement	15.62	1.34	8.57
second measurement	15.54	1.33	8.58
difference	0.28	1.93	*
with sleeve	17.86	1.59	8.88

*Coefficient of variation for these variables is meaningless.

nutrient supplements taken was coded to permit calculation of nutrient intake.

The data base of the DIETCHECK package developed at the University of Nebraska Extension Service was used for nutrient input data for a program developed to convert food intake data into nutrient value by meals. The data base for DIETCHECK was adapted from the USDA nutrient data set (40). The USDA food data included ten nutrients and calories; data on eight additional nutrients had been added, as well as a number of food items.

Food code and quantity code numbers from DIETCHECK for all foods reported as eaten by students during the 24-hour period covered by the interview were recorded on space provided on the recall form. Initially, the school lunch menus for each school were coded to assist data coders in assigning consistent codes.[1] A list of foods eaten by students that were not included in the DIETCHECK code book was compiled. Food codes and quantity codes were assigned and nutrient data for these foods were compiled from various sources (41-47). Because food composition data were incomplete for saturated, oleic, and linoleic fatty acids, pantothenic acid, vitamin B_{12}, folic acid, and vitamin E, those analyses are not presented. If a recipe type food item not in the data base was reported, the DIETCHECK program was used to generate nutrient values. Recipes in well-known cookbooks (48-50) were selected and analyzed. Approximately 200 foods were added to the data base. Also, data on nutrient supplements were added to the file. Since students interviewed frequently were not aware of the brand, the value of a standard multivitamin supplement[2] was used for recording the vitamin consumed unless a specific type or brand was reported. Data on supplements were secured at local pharmacies.

Information was given to the data coders on portion sizes of selected food items to assist in determining quantity codes. The meal at which foods were consumed was coded: breakfast, lunch, dinner; a.m., p.m., or evening snack. Supplements were coded as a seventh meal to permit analysis of nutrient intake by meal and for the total day with or without

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[1] The form used is in Appendix M.

[2] Miles Laboratory, "One A Day" brand.

nutrient supplements. "Where eaten" codes were recorded for each meal; i.e., school lunch, home, restaurant, etc. Energy and intake of selected nutrients were calculated on the basis of all of the fifth grade students included in the dietary recall interviews and only those students who reported eating each meal. The same analyses for energy and nutrient intake were computed as percentages of the Recommended Dietary Allowances (51). The original interview sample included 1,309 fifth grade students; seven of those interviews were omitted because of incomplete reporting by the students.

Analysis of Anthropometric and Dietary Recall Data

The general linear models (51) analysis of variance was used to analyze anthropometric measurements. Independent variables included in the initial analysis were the following: Board of Education District (BED), Unified School District (USD), and sampled schools. Means, standard deviations, and coefficients of variation were computed for heights, weights, arm circumferences, triceps skinfold, and muscle circumferences of Kansas fifth grade girls and boys, separately. Analysis of variance also was used to study relationships between selected demographic variables and anthropometric measurements. The demographic variables considered in the analysis of anthropometric data were sex and place of residence, town or farm. Anthropometric measurements were analyzed for girls and boys separately because of the differing growth patterns between the sexes. Details of the statistical analysis used for each physical measurement are discussed with the results of the measurement.

Two of the anthropometric measurements taken on Kansas fifth grade girls and boys were triceps skinfold and upper arm circumference

described earlier in the report. Whenever possible, shirts were removed or sleeves rolled up for those measurements. When freeing the arm of clothing was not possible, measurements were taken over the sleeve and the thickness of the material was measured with the skinfold caliper and recorded for adjustment of the measurements later.

During the period of data collection, two sessions were conducted to check the accuracy of the measurements of triceps skinfold and arm circumferences of the Research Assistants. Ten children similar in age to those in the Needs Assessment Project served as subjects for the accuracy checks. The sessions were supervised by Dr. William Zuti, Associate Professor in the KSU Department of Health, Physical Education and Recreation. During the second session, data were collected for determining the necessary adjustments for the triceps skinfold and arm circumference measurements taken over clothing. The data were analyzed by Dr. Arthur Dayton, the Consulting Statistician on the Needs Assessment Project; several methods for adjustments were compared. He concluded that the most accurate method for adjusting the measurements was as described below.

To determine the adjustment for the arm circumference measurements of fifth grade students, the mean arm circumferences with and without sleeves of all girls and all boys were computed separately. A ratio was computed between the mean for girls without sleeves and those with sleeves; the same computation was completed for boys with and without sleeves. The resulting ratio (R) was used as follows to adjust arm circumference:

adjusted arm circumference = R × arm circumference with sleeve

Triceps skinfold measurements of the fifth grade girls and boys taken

over sleeves were adjusted by subtracting the thickness of the sleeve material recorded at the time of the measurement.

The general linear models (52) analysis of variance was used to analyze energy and nutrient intake for the total day (with and without supplements), breakfast, lunch, dinner, and snacks. Independent variables included in the initial analysis were the following: Board of Education District (BED), Unified School District (USD), and sampled schools. Means, standard deviations, and coefficients of variation were computed for energy and thirteen nutrients (protein, total fat, carbohydrate, vitamin A, ascorbic acid, thiamin, riboflavin, niacin, vitamin B_6, calcium, phosphorus, magnesium, and iron). Percentages of the Recommended Dietary Allowances (RDA) (51) were computed using the same analyses for energy and eleven nutrients. Carbohydrate and fat were omitted because recommended allowances have not been established for these two nutrients. Percentage of calories from fat were determined, however, because of the current interest in reducing fat in the diet (51). Also, fat content of lunches consumed by students were analyzed in light of recent federal regulations (54) recommending decreasing fat in school lunches.

Initially, percentages of Recommended Dietary Allowances were computed for energy and eleven nutrients based on allowances in the 7-10 and 11-14 year-old categories for girls and boys. A closer examination of the data indicated that 92.1 per cent of those less than 11 years old were between 10.5 and 10.9 years. Application of the RDA for 7-10 year old children gave a skewed distribution to the data. After a telephone conversation with Dr. Jack Smith, Deputy Director, Swanson Center for Nutrition, Inc., and consultant on the Needs Assessment Project, the decision was made to apply the RDAs for 11-14 year-old boys and girls to

all intakes (Table 41) and to eliminate data from those students younger than 10.5 since that was a very small group.

Similar to the procedure for analyzing anthropometric and test data, analysis of variance for selected variables was used to evaluate nutrient intakes. The variables considered were sex and place of residence. In addition, analysis of variance was used to determine effects of school lunch on nutrient intakes. Sex and source of lunch were variables in this analysis. A nutrient rating procedure also was used to analyze diets which is described in a later section.

RESULTS AND DISCUSSION

Description of Sample

Participating fifth grade students were divided equally between males and females, with 50 per cent of the students falling in either category (Table 10). Approximately 95 per cent of the students were Caucasian and about 3 per cent were Black Americans. The remaining 2 per cent were classified as Hispanic, Oriental, or American Indian. Ages of participating students ranged from 9.58 years (115 months) to 13.42 years (161 months), with the majority being between 10.5 and 11.9 years of age.

Over three-fourths of the students lived in town, while slightly less than one-fourth lived on a farm. About one-third of the participants used a bus as a major transportation mode to school with the majority spending 15 to 30 minutes on the bus. Over one-third of the students walked to school, about one-fourth rode in a car, and less than 10 per cent rode their bikes to school.

Anthropometric Measurements of Kansas Fifth Grade Students

Analysis of Variance of Age and Anthropometric Measurements of Fifth Grade Students

Effects of BED, USD, and School. Results of the initial analysis of variance of age and anthropometric measurements of fifth grade girls are presented in Tables 11 to 13 and for boys in Tables 14 to 16. The age and anthropometric measurements of the students in BED's, USD's, and schools did not differ significantly. Individual differences among the girls accounted for 87.8 to 98.8 per cent of the variance and the boys ranged from 89.3 to 98.4 per cent of the variance (Tables 12 and 15).

Table 10: Characteristics of Kansas fifth grade students

characteristics	response category	N[1]	per cent
sex	female	1616	50.0
	male	1615	50.0
age, years	<10.5	96	3.0
	10.5-10.9	1177	36.3
	11.0-11.4	1405	43.3
	11.5-11.9	416	12.8
	≥12.0	149	4.6
ethnic group	Caucasian	3013	94.2
	Black	109	3.4
	Oriental	21	0.6
	American Indian	7	0.2
	Hispanic	50	1.6
place of residence	farm	685	21.9
	town	2446	78.1
transportation mode used to get to school	walk	1133	35.3
	ride a bike	218	6.8
	ride in a car	760	23.7
	ride in a bus	1100	34.2
length of bus ride, if applicable	15 minutes	453	42.0
	30 minutes	333	30.9
	45 minutes	175	16.2
	1 hour	117	10.9

[1] N varies because of nonresponses.

Table 11: Analysis of variance of age and anthropometric variables for Kansas fifth grade girls

	source of variation			
	BED	USD/BED	school/USD/BED	error[1]
d.f.	9	63	24	1,516
expected mean squares	$\sigma^2+24.93\sigma^2_s+45.43\sigma^2_{USD}+159.17\sigma^2_{BED}$	$\sigma^2+14.69\sigma^2_s+18.32\sigma^2_{USD}$	$\sigma^2+18.25\sigma^2_s$	σ^2
mean squares				
age, years	0.45	0.18	0.18	0.17
height, cm	109.66	82.75	63.13	53.16
weight, kg	135.82	78.01	64.61	0.73
arm circumference, mm	1136.00	821.52	1280.21	847.82
triceps skinfold, mm	141.58	64.54	73.33	22.52
muscle circumference, mm	1443.41	801.92	750.28	390.53

[1]Between individual fifth grade girls.

Table 12: Variance component estimates of age and anthropometric variables of Kansas fifth grade girls

	variance component			
	σ^2_{BED}	$\sigma^2_{USD/BED}$	$\sigma^2_{school/USD/BED}$	σ^2_{error}[1]
age, years				
variance component	0.00	0.00	0.00	0.17
per cent	1.01	0.00	0.38	98.61
height, cm				
variance component	0.00	1.18	0.54	53.16
per cent	0.00	2.14	0.99	96.86
weight, kg				
variance component	0.28	0.64	0.00	0.73
per cent	0.38	0.87	0.00	98.75
arm circumference, mm				
variance component	3.93	0.00	23.69	847.82
per cent	0.45	0.00	2.71	96.84
triceps skinfold, mm				
variance component	0.00	0.00	0.03	0.22
per cent	1.15	0.24	10.85	87.77
muscle circumference, mm				
variance component	1.63	6.65	19.71	390.53
per cent	0.39	1.59	4.71	93.31

[1]Between individual fifth grade girls.

Table 13: Means, standard deviations, and coefficients of variation of age and anthropometric variables for Kansas fifth grade girls

	mean	standard deviation	coefficient of variation
			%
age, years	11.09	0.41	4
height, cm.	145.44	7.29	5
weight, kg.	39.05	8.54	22
arm circumference, mm.	222.23	29.12	13
triceps skinfold, mm.	15.06	4.74	32
muscle circumference, mm.	174.92	19.76	11

Table 14: Analysis of variance of age and anthropometric variables for Kansas fifth grade boys

	source of variation			
	BED	USD/BED	school/USD/BED	error[1]
d.f.	9	64	23	1,511
expected mean squares	$\sigma^2+24.00\sigma^2_s+41.95\sigma^2_{USD}+158.97\sigma^2_{BED}$	$\sigma^2+15.00\sigma^2_s+18.52\sigma^2_{USD}$	$\sigma^2+17.74\sigma^2_s$	σ^2
mean squares				
age, years	0.47	0.24	0.15	0.20
height, cm	102.92	52.17	44.36	43.59
weight, kg	135.27	103.05	110.31	65.09
arm circumference, mm	2117.88	1616.35	1285.13	783.19
triceps skinfold, mm	98.03	82.89	59.86	27.73
muscle circumference, mm	1226.21	879.47	760.12	381.96

[1]Between individual fifth grade boys.

Table 15: Variance component estimates of age and anthropometric variables of Kansas fifth grade boys

	variance component			
	σ^2_{BED}	$\sigma^2_{USD/BED}$	$\sigma^2_{school/USD/BED}$	σ^2_{error}[1]
age, years				
variance component	0.00	0.00	0.00	0.20
per cent	0.49	2.00	0.00	97.51
height, cm				
variance component	0.25	0.43	0.04	43.59
per cent	0.57	0.97	0.10	98.36
weight, kg				
variance component	0.06	0.00	2.55	65.09
per cent	0.09	0.00	3.76	96.15
arm circumference, mm				
variance component	0.00	22.07	23.29	783.19
per cent	0.00	2.65	3.39	93.96
triceps skinfold, mm				
variance component	0.00	0.02	0.02	0.28
per cent	0.00	4.87	5.83	89.30
muscle circumference, mm				
variance component	0.00	9.60	21.31	381.96
per cent	0.00	2.33	5.16	92.51

[1]Between individual fifth grade boys.

Table 16: Means, standard deviations, and coefficients of variation of age and anthropometric variables for Kansas fifth grade boys

	mean	standard deviation	coefficient of variation
			%
age, years	11.13	0.45	4
height, cm	144.98	6.60	4
weight, kg	39.02	8.07	21
arm circumference, mm	221.65	27.98	13
triceps skinfold, mm	13.72	5.27	38
muscle circumference, mm	178.54	19.54	11

The means, standard deviations, and coefficients of variation are listed in Tables 13 and 16 for the total number of Kansas fifth grade girls and boys, respectively.

Anthropometric Measurements and Selected Characteristics of Fifth Grade Students. Analysis of variance (Tables 17, 18) indicated that there were differences in age and anthropometric measurements of Kansas fifth grade students attributable to sex and place of residence and there was interaction between sex and place of residence. Least square means and standard errors for age and selected anthropometric measurements from analysis of effects of selected variables are listed in Table 18. Boys were slightly older ($P \leq 0.05$) and their muscle circumferences were greater ($P \leq 0.01$) than those of girls. Height and triceps skinfolds were greater ($P \leq 0.05$ and $P \leq 0.001$, respectively) for girls than boys. Farm students weighed more ($P \leq 0.05$) and their triceps skinfolds were

Table 17: F ratios for analysis of effects of selected variables in height, weight, arm circumference, triceps skinfold, and muscle circumference

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
age, yrs.	0.19	4.24*	0.05	1.08
height, cm.	49.58	5.28*	0.27	2.08
weight, kg.	69.60	1.65	4.37*	4.71*
arm circumference, mm.	837	2.06	1.56	3.45
triceps skinfold, mm.	28	32.68***	7.09**	0.01
muscle circumference, mm.	412	7.07**	0.14	6.78**

* $P \leq 0.05$ ** $P \leq 0.01$ *** $P \leq 0.001$

Table 18: Least square means and standard error for selected anthropometric measurements of Kansas fifth grade students from analysis of effects of selected variables[1]

	least square means and standard errors					
	age	height	weight	arm circumference	triceps skinfold	muscle circumference
	yrs.	cm.	kg.	mm.	mm.	mm.
sex:						
female	11.04 ± 0.04	144.95 ± 0.68			14.90 ± 0.51	176.75 ± 1.95
male	11.08 ± 0.04	144.24 ± 0.66			13.59 ± 0.50	179.10 ± 1.92
place of residence:						
farm			40.07 ± 0.83		14.56 ± 0.53	
town			39.31 ± 0.76		13.94 ± 0.48	
sex × place:						
female-farm			40.70 ± 0.90			177.73 ± 2.18
female-town			39.15 ± 0.78			175.77 ± 1.91
male-farm			39.44 ± 0.88			177.78 ± 2.14
male-town			39.47 ± 0.77			180.42 ± 1.87

[1]Data presented only for significant findings.

greater ($P \leq 0.01$) than those for urban students. Farm girls weighed more ($P \leq 0.05$) and their muscle circumferences were greater ($P \leq 0.01$) than for girls living in town. Muscle circumferences of urban boys exceeded ($P \leq 0.01$) those of farm boys.

Categorization into Groups. Frequency distributions were compiled for students by age in months; thirty-four age groups resulted. Because of the small number of fifth graders who were younger than 10.5 years, those students were combined to form one group, also the small number of students who were older than 11.6 years were combined in one group, which made a total of fourteen groups. Means, standard deviations, selected percentiles and coefficients of variation for height, weight, arm circumference, triceps skinfold and muscle circumference were computed for those groups (Appendix N and O). Data for girls are listed in Appendix N, and those for boys in Appendix O. The number of age groups was reduced again into five groups and means, standard deviations, selected percentiles, and coefficients of variation for the anthropometric variables were computed. The results of the latter analysis are discussed below by type of measurement (height, weight, and circumference, triceps skinfold, and arm circumference).

Percentiles for Height. The means, standard deviations, selected percentiles, and coefficients of variation for height in centimeters and inches[1] of Kansas fifth grade students by age are listed in Tables 19 and 20, respectively. Since the majority of the students (N = 2,899) were

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[1]Data are presented in inches to facilitate interpretation; however, since national norms were reported (10) in centimeters, comparisons were done using that unit of measure.

Table 19: Means, standard deviations, selected percentiles, and coefficients of variation for height in centimeters of Kansas fifth grade students by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		cm.	cm.							
girls											
<127	<10.58	86	143.63 ± 6.77	132.0	135.7	138.3	143.4	148.6	153.1	156.4	4.71
127-131	10.58-10.92	561	143.35 ± 6.89	132.3	134.6	138.3	143.2	148.0	152.2	155.0	4.80
132-137	11.00-11.42	723	146.80 ± 7.41	134.7	137.3	141.9	146.2	152.0	156.5	159.2	5.05
138-143	11.50-11.91	184	146.78 ± 7.46	134.8	137.7	141.9	146.0	151.5	156.9	159.8	5.08
≥144	≥12	66	147.22 ± 7.42	135.5	136.4	142.2	146.8	152.5	156.9	158.5	5.04
boys											
<127	<10.58	78	143.43 ± 7.29	131.5	134.0	138.5	143.6	147.6	152.2	156.1	5.08
127-131	10.58-10.92	550	143.18 ± 6.13	133.5	135.7	139.1	143.0	147.3	151.1	153.8	4.28
132-137	11.00-11.42	675	145.68 ± 6.50	135.1	137.4	141.0	145.4	149.8	154.5	157.2	4.46
138-143	11.50-11.91	206	146.21 ± 7.04	134.9	137.5	141.5	146.0	151.1	155.6	157.1	4.82
≥144	≥12	104	148.24 ± 6.68	136.9	141.0	143.5	148.0	152.1	157.8	159.7	4.50

Table 20: Means, standard deviations, selected percentiles, and coefficients of variation for height in inches of Kansas fifth grade students by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		in.	in.							
girls											
<127	<10.58	86	56.55 ± 2.67	52.0	53.4	54.4	56.4	58.5	60.3	61.6	4.71
127-131	10.58-10.92	561	56.44 ± 2.71	52.1	53.0	54.4	56.4	58.3	59.9	61.0	4.80
132-137	11.00-11.42	723	57.79 ± 2.92	53.0	54.0	55.9	57.6	59.8	61.6	62.7	5.05
138-143	11.50-11.91	184	57.79 ± 2.94	53.1	54.2	55.9	57.5	59.6	61.8	62.9	5.08
≥144	≥12	66	57.96 ± 2.92	53.4	53.7	56.0	57.8	60.0	61.8	62.4	5.04
boys											
<127	<10.58	78	56.47 ± 2.87	51.8	52.8	54.5	56.5	58.1	59.9	61.5	5.08
127-131	10.58-10.92	550	56.37 ± 2.41	52.6	53.4	54.8	56.3	58.0	59.5	60.6	4.28
132-137	11.00-11.42	675	57.36 ± 2.56	53.2	54.1	55.5	57.2	59.0	60.8	61.9	4.46
138-143	11.50-11.91	206	57.56 ± 2.77	53.1	54.1	55.7	57.5	59.5	61.3	61.8	4.82
≥144	≥12	104	58.36 ± 2.63	53.9	55.5	56.5	58.3	59.8	62.1	62.9	4.50

10.5 to 11.5 years of age, this discussion is limited to heights at those ages. The Kansas data were compared to height in centimeters for children from the National Center for Health Statistics (10) at the 5th, 50th, and 95th percentiles (Table 21).

At the 5th, 50th, and 95th percentiles Kansas girls, aged 10.5 and 10.9 years, were taller than girls of comparable age in national surveys (Tables 19 and 21). At 11.5 years of age Kansas girls were shorter at the 5th and 50th percentiles and about the same height at the 95th percentile as 11.5 year-old girls, nationally.

Kansas boys, aged 10.5 and 11 years, were taller at the 5th and 95th percentiles than boys of that age in national studies (Tables 19 and 21). Heights at 11.5 years of age were less than those for boys in national surveys at all three percentiles.

For comparison of the heights of Kansas fifth grade girls and boys with their counterparts in national surveys (10), five groups were defined using percentiles from the National Center for Health Statistics (Table 22):

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

According to Hamill et al. (10), measurements between the 25th and 75th percentiles are likely to represent normal growth.

Table 23 lists the percentages of Kansas fifth grade girls and boys in groups based on national percentiles for height by age. About one-half of the Kansas girls (47.5 per cent) in all age groups were in the middle percentile ($\geq$ 25th to $\leq$ 75th) for height; approximately one-fourth were in the upper ($>$ 75th to $\leq$ 95th); 16.5 per cent in the low ($>$ 5th to

Table 21: Selected percentiles for height of children from the National Center for Health Statistics[1]

	percentiles						
age	5th	10th	25th	50th	75th	90th	95th
yrs.	cm.						
girls							
10.5	130.4	132.5	136.7	141.5	146.1	150.4	152.8
11.0	133.5	135.6	140.0	144.8	149.3	153.7	156.2
11.5	136.6	139.0	143.5	148.2	152.6	156.9	159.5
12.0	139.8	142.3	147.0	151.5	155.8	160.0	162.7
boys							
10.5	130.1	132.6	136.0	140.3	144.6	148.7	151.5
11.0	132.6	135.1	138.7	143.3	147.8	152.1	154.9
11.5	135.0	137.7	141.5	146.4	151.1	155.6	158.5
12.0	137.6	140.3	144.4	149.7	154.6	159.4	162.3

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Table 22: Height groups defined using percentiles from National Center for Health Statistics[1]

age	group designation and percentiles				
	lower ≤ 5th percentile	low > 5th to < 25th percentile	middle ≥ 25th to ≤ 75th percentile	upper > 75th to ≤ 95th percentile	high > 95th percentile
yrs.	cm.				
girls					
10.5	≤ 130.4	> 130.4 to < 136.7	≥ 136.7 to ≤ 146.1	> 146.1 to ≤ 152.8	> 152.8
11.0	≤ 133.5	> 133.5 to < 140.0	≥ 140.0 to ≤ 149.3	> 149.3 to ≤ 156.2	> 156.2
11.5	≤ 136.6	> 136.6 to < 143.5	≥ 143.5 to ≤ 152.6	> 152.6 to ≤ 159.5	> 159.5
boys					
10.5	≤ 130.1	> 130.1 to < 136.0	≥ 136.0 to ≤ 144.6	> 144.6 to ≤ 151.5	> 151.5
11.0	≤ 132.6	> 132.6 to < 138.7	≥ 138.7 to ≤ 147.8	> 147.8 to ≤ 154.9	> 154.9
11.5	≤ 135.0	> 135.0 to < 141.5	≥ 141.5 to ≤ 151.1	> 151.1 to ≤ 158.5	> 158.5

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Table 23: Percentages of Kansas fifth grade girls and boys in groups based on national percentiles[1] for height by age

		groups based on national percentiles for height				
age groups	N	lower	low	middle	upper	high
yrs.		%				
girls						
10.5-10.9	584	1.5	15.6	49.0	24.8	9.1
11.0-11.4	723	3.0	13.6	47.6	24.9	10.9
11.5-12.0	207	8.7	29.5	43.0	14.0	4.8
all age groups	1514	3.2	16.5	47.5	23.4	9.4
boys						
10.5-10.9	585	1.0	10.9	49.1	30.1	8.9
11.0-11.4	675	1.5	12.3	30.7	46.6	8.9
11.5-12.0	241	4.2	19.0	53.1	20.8	2.9
all age groups	1501	1.7	12.9	41.5	36.0	7.9

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

< 25th); slightly less than 10 per cent were in the high (> 95th) and only 3.2 per cent in the lower (< 5th) percentile. Distribution of percentiles for height for girls, aged 10.5-10.9 and 11.0-11.4 years, were similar to those for all age groups, but between 11.5 and 12.0 years more heights were in the lower and low percentiles and fewer in the upper and high percentiles than for the other two age groups.

Approximately 40 per cent of the Kansas boys in all age groups (Table 23) were in the middle percentile; over one-third were in the upper; 12.9 per cent in the low; and 7.9 per cent and 1.7 per cent in the high and lower percentiles, respectively. Distribution of percentiles for height for boys among the three age groups differed more than those for girls.

Percentiles for Weight. The means, standard deviations, selected percentiles, and coefficients of variation for weights in kilograms and pounds[1] for Kansas fifth grade students by age are listed in Tables 24 and 25, respectively. Weights in kilograms of Kansas children were compared to comparable weight data from the National Center for Health Statistics (10) (Table 26). Kansas girls weighed more at ages 10.5 and 11.0 years than girls of the same age in the national surveys. At age 11.5 years, however, Kansas girls weighed slightly less at the 5th, 50th, and 95th percentiles than those nationally. At each percentile Kansas boys at ages 10.5, 11.0, and 11.5 years were heavier than boys of comparable age in national surveys.

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[1] Data are presented in pounds to facilitate interpretation; however, since national norms were reported (10) in kilograms, comparisons were done using that unit of measure.

Table 24: Means, standard deviations, selected percentiles, and coefficients of variation for weight in kilograms of Kansas fifth grade students by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		kg.	kg.							
girls											
<127	<10.58	86	37.19 ± 7.33	27.1	28.1	32.0	35.7	41.8	48.4	52.4	19.71
127-131	10.58-10.92	561	37.57 ± 7.84	27.6	29.0	31.8	36.1	41.8	48.6	52.1	20.88
132-137	11.00-11.42	723	39.81 ± 8.60	28.0	30.2	33.6	38.5	45.2	51.4	55.0	21.61
138-143	11.50-11.91	184	40.31 ± 9.17	27.9	29.8	33.9	38.5	47.0	51.6	57.2	22.75
≥144	≥12	66	42.39 ±10.92	28.0	30.1	33.6	40.3	49.7	55.2	62.0	25.76
boys											
<127	<10.58	78	38.52 ± 9.70	28.2	29.4	32.8	35.9	42.0	51.6	58.7	25.17
127-131	10.58-10.92	551	37.34 ± 7.37	28.4	29.8	32.7	36.2	40.0	45.9	52.5	19.73
132-137	11.00-11.42	675	39.50 ± 8.15	29.7	31.4	33.8	37.6	43.6	50.1	55.5	20.63
138-143	11.50-11.91	206	40.64 ± 8.96	29.6	31.7	34.5	38.7	44.3	54.1	56.4	22.04
≥144	≥12	104	41.67 ± 8.59	31.4	33.4	35.2	39.2	47.1	52.2	59.1	20.62

Table 25: Means, standard deviations, selected percentiles, and coefficients of variation for weight in pounds of Kansas fifth grade students by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		lbs.	lbs.							
girls											
<127	<10.58	86	82.01 ± 16.17	59.8	61.9	70.6	78.6	92.3	106.6	115.6	19.71
127-131	10.58-10.92	561	82.85 ± 17.30	60.9	64.1	70.1	79.6	92.2	107.1	114.9	20.88
132-137	11.00-11.42	723	87.79 ± 18.98	61.7	66.6	74.1	85.0	99.7	113.3	121.4	21.61
138-143	11.50-11.91	184	88.88 ± 20.22	61.6	65.7	74.8	85.0	103.8	113.8	126.1	22.75
≥144	≥12	66	93.48 ± 24.08	61.7	66.4	74.1	88.9	109.5	121.8	136.7	25.76
boys											
<127	<10.58	78	84.95 ± 21.38	62.2	64.9	72.3	79.1	92.5	113.8	129.5	25.17
127-131	10.58-10.92	551	82.34 ± 16.25	62.7	65.7	72.1	79.8	88.3	101.2	115.7	19.73
132-137	11.00-11.42	675	87.10 ± 17.97	65.4	69.3	74.5	82.9	96.1	110.4	122.3	20.63
138-143	11.50-11.91	206	89.62 ± 19.75	65.3	70.0	76.0	85.4	97.8	119.4	124.4	22.04
≥144	≥12	104	91.90 ± 18.95	69.3	73.8	77.6	86.3	104.0	115.2	130.4	20.62

Table 26: Selected percentiles for weight of children from the National Center for Health Statistics[1]

	percentiles						
age	5th	10th	25th	50th	75th	90th	95th
yrs.	kg.						
girls							
10.5	25.8	27.3	30.6	34.7	40.2	46.8	50.6
11.0	27.2	29.0	32.5	37.0	42.8	50.0	54.0
11.5	28.8	30.7	34.5	39.2	45.5	53.0	57.4
12.0	30.5	32.5	36.5	41.5	48.1	56.0	60.8
boys							
10.5	25.5	26.8	29.6	33.3	38.0	43.6	48.3
11.0	26.8	28.2	31.2	35.3	40.4	46.6	51.5
11.5	28.2	29.7	33.1	37.5	43.0	49.6	54.7
12.0	29.8	31.5	35.1	39.8	45.8	52.7	58.1

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Five percentile groups were defined similar to those for height groups (Table 27). The percentages of Kansas fifth grade girls and boys in groups based on these national percentiles (10) for weight by age are listed in Table 28. According to Hamill et al. (10), measurements between the 25th and 75th percentiles are likely to represent normal growth. Measurements between the 10th and 25th and the 75th and 90th percentiles may or may not be normal depending on genetic and environmental factors affecting the child. Children with height or weight below the 10th percentile may be underweight and those above the 90th

Table 27: Weight groups defined using percentiles from National Center for Health Statistics[1]

age	group designation and percentiles				
	lower ≤ 5th percentile	low > 5th to < 25th percentile	middle ≥ 25th to ≤ 75th percentile	upper > 75th to ≤ 95th percentile	high > 95th percentile
yrs.	kgs.				
girls					
10.5	≤ 25.8	> 25.8 to < 30.6	≥ 30.6 to ≤ 40.2	> 40.2 to ≤ 50.6	> 50.6
11.0	≤ 27.2	> 27.2 to < 32.5	≥ 32.5 to ≤ 42.8	> 42.8 to ≤ 54.0	> 54.0
11.5	≤ 28.8	> 28.8 to < 34.5	≥ 34.5 to ≤ 45.5	> 45.5 to ≤ 57.4	> 57.4
boys					
10.5	≤ 25.5	> 25.5 to < 29.6	≥ 29.6 to ≤ 38.0	> 38.0 to ≤ 48.3	> 48.3
11.0	≤ 26.8	> 26.8 to < 31.2	≥ 31.2 to ≤ 40.4	> 40.4 to ≤ 51.5	> 51.5
11.5	≤ 28.2	> 28.2 to < 33.1	≥ 33.1 to ≤ 43.0	> 43.0 to ≤ 54.7	> 54.7

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Table 28: Percentages of Kansas fifth grade girls and boys in groups based on national percentiles[1] for weight by age

age groups	N	groups based on national percentiles for weight				
		lower	low	middle	upper	high
yrs.		%				
girls						
10.5-10.9	584	1.8	16.3	50.7	25.2	6.0
11.0-11.4	723	2.7	16.9	48.7	26.1	5.6
11.5-12.0	207	6.8	22.2	42.5	23.2	5.3
all age groups	1514	2.9	17.4	48.6	25.3	5.8
boys						
10.5-10.9	585	0.7	8.0	53.0	26.2	12.1
11.0-11.4	675	0.4	9.0	53.5	24.9	12.2
11.5-12.0	241	0.8	14.5	56.1	14.5	14.1
all age groups	1501	0.6	9.5	53.7	23.7	12.5

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $\geq$ 5th to < 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $\geq$ 75th to $\leq$ 95th percentile
High - > 95th percentile

percentile may be overweight. Below the 5th percentile, acute or sub-acute illness or nutritional deficiency may be suspected. Above the 95th percentile suggests obesity but is not diagnostic, since some children have unusually good muscle development with little adipose tissue and are not obese.

Approximately 50 per cent of the Kansas girls were in the middle percentile; slightly over 25 per cent were in the upper and 17.4 per cent in the low percentiles. Almost 6 per cent were in the high and 2.9 per cent were in the lower percentiles. Distribution of percentiles for weights for girls, aged 10.5 to 10.9 and 11.0 to 11.4, was similar to those for all age groups. The 11.5 to 12.0 age group tended to have more students in the low and lower percentiles and less in the middle.

Slightly over 50 per cent of the Kansas boys in all age groups were in the middle percentile (Table 28); about one-fourth were in the upper and 9.5 per cent in the low percentiles. Approximately 13 per cent were in the high and less than 1 per cent in the lower percentiles. A higher percentage of weights for boys 11.5 to 12.0 years of age were in the low percentile and a lower percentage in the upper percentile than was true for any other age group. Distribution of percentiles for weights for 10.5 to 10.9 and 11.0 to 11.4 year-old boys were similar to the overall distribution.

Percentiles for Arm Circumference Measurements. In Table 29, the means, standard deviations, selected percentiles, and coefficients of variation for arm circumference in millimeters for Kansas fifth grade students are listed. Measurements of the Kansas girls and boys at the 5th, 50th, and 95th percentiles were compared to similar age groups in the Ten-State Nutrition Survey (12) (Table 30). Kansas girls, 10.5

Table 29: Means, standard deviations, selected percentiles, and coefficients of variation for arm circumference of Kansas fifth grade students by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		mm.	mm.							
girls											
<127	<10.58	85	218.95 ± 25.59	181.5	185.6	200.0	215.0	235.0	255.8	265.0	11.69
127-131	10.58-10.92	560	220.52 ± 30.47	185.0	190.0	200.0	215.0	236.0	257.9	270.0	13.82
132-137	11.00-11.42	723	222.84 ± 27.79	185.0	191.0	202.0	220.0	240.0	260.0	272.6	12.47
138-143	11.50-11.91	184	225.34 ± 30.99	184.2	190.0	200.0	224.0	244.2	263.5	280.0	13.75
≥144	≥12	66	226.83 ± 32.21	182.8	193.5	203.2	224.5	245.8	265.1	296.0	14.20
boys											
<127	<10.58	78	221.14 ± 32.05	184.0	185.9	200.0	215.0	232.8	256.0	283.6	14.50
127-131	10.58-10.92	551	217.86 ± 27.04	181.6	190.0	200.0	213.0	230.0	255.0	270.0	12.41
132-137	11.00-11.42	675	222.60 ± 28.81	188.0	192.0	201.0	217.0	237.0	262.4	276.2	12.94
138-143	11.50-11.91	206	226.54 ± 31.13	185.0	190.0	205.0	220.9	241.2	272.9	287.6	13.74
≥144	≥12	104	225.28 ± 28.76	190.0	195.0	205.0	220.0	240.0	258.5	289.0	12.77

Table 30: Comparisons of selected percentiles for arm circumference of Kansas fifth graders and children in the Ten-State Nutrition Survey[1]

Kansas fifth graders					Ten State children				
		percentiles					percentiles		
age	N	5th	50th	95th	age	N	5th	50th	95th
yrs.		mm.			yrs.		mm.		
girls					girls				
<10.58	85	181.5	215.0	265.0	9.5-10.4	276	170	203	263
10.58-10.92	560	185.0	215.0	270.0	10.5-11.4	268	173	210	280
11.00-11.42	723	185.0	220.0	272.6					
11.50-11.91	184	184.2	224.0	280.0	11.5-12.4	267	185	220	275
≥12	66	182.8	224.5	296.0					
boys					boys				
<10.58	78	184.0	215.0	283.6	9.5-10.4	315	170	200	255
10.58-10.92	551	181.6	213.0	270.0	10.5-11.4	294	177	208	276
11.00-11.42	675	188.0	217.0	276.2					
11.50-11.91	206	185.0	220.9	287.6	11.5-12.4	294	184	216	291
≥12	104	190.0	220.0	289.0					

[1]Source: Frisancho, A.R.: Triceps skinfold and upper arm muscle size norms for assessment of nutritional status. Am. J. Clin. Nutr. 27:1052, 1974.

to 10.9 and 11.0 to 11.4 years, had larger arm circumferences at the 5th and 50th percentiles and smaller circumferences at the 95th percentile than girls aged 10.5 to 11.4 in the national survey. Kansas girls, aged 11.5 to 11.9 years, had smaller arm circumferences at the 5th percentile, but larger circumferences at the 50th and 95th percentiles than girls aged 11.5 to 12.4 years of age in the Ten-State Survey. Arm circumferences of Kansas boys in all three age categories exceeded those of boys of comparable ages at the three percentiles in the Ten-State Survey, except those at the 95th percentile for boys aged 10.5 to 10.9 and 11.5 to 11.9 years.

Percentiles for Triceps Skinfold Measurements. The means, standard deviations, selected percentiles, and coefficients of variation for triceps skinfold measurements in millimeters of Kansas fifth grade girls and boys are listed in Table 31. Triceps skinfold measurements of Kansas students were compared to measurements of girls and boys of comparable age in the Ten-State Nutrition Survey (12) (Table 32). Kansas girls and boys had larger triceps skinfold measurements at the 5th and 50th percentiles and smaller measurements at the 95th percentile than their counterparts in the Ten-State Survey.

Percentiles for Muscle Circumference Measurements. Muscle development is an indicator of nutritional status, especially in early childhood. Direct physical anthropometry of a limb is a practical field method for the assessment of muscle mass (7). In practice, measurement of the mid-upper arm appears to be most useful because it is roughly circular, heavily muscled, and the region is accessible. The arm circumference is measured with a flexible steel tape and the triceps region with a skinfold

Table 31: Means, standard deviations, selected percentiles, and coefficients of variation for triceps skinfold of Kansas fifth grade students by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		mm.	mm.							
girls											
<127	<10.58	86	14.16 ± 4.77	7.1	8.3	10.3	13.5	17.8	20.8	23.0	33.68
127-131	10.58-10.92	561	15.19 ± 5.20	9.0	9.8	12.0	14.2	17.2	22.0	25.5	34.20
132-137	11.00-11.42	723	15.01 ± 4.90	9.0	10.0	11.7	14.0	17.2	21.5	24.6	32.67
138-143	11.50-11.91	184	14.94 ± 5.24	7.8	9.0	11.3	14.0	18.0	22.2	24.5	35.08
≥144	≥12	66	15.96 ± 5.33	8.0	9.3	12.3	15.4	19.0	24.2	27.7	33.39
boys											
<127	<10.58	78	14.02 ± 4.88	7.6	8.2	10.8	13.2	16.6	20.5	23.5	34.81
127-131	10.58-10.92	551	13.38 ± 5.19	7.0	7.8	10.0	12.7	15.3	19.5	22.6	38.76
132-137	11.00-11.42	675	13.76 ± 5.67	7.0	8.0	10.0	12.7	16.0	21.1	24.4	41.25
138-143	11.50-11.91	206	14.15 ± 5.39	7.0	8.0	10.2	13.3	16.2	22.3	25.5	38.11
≥144	≥12	104	14.06 ± 7.10	5.9	7.0	10.0	12.1	16.3	23.2	26.5	50.49

Table 32: Comparisons of selected percentiles for triceps skinfold of Kansas fifth graders and children in the Ten-State Nutrition Survey[1]

Kansas fifth graders					Ten State children				
		percentiles					percentiles		
age	N	5th	50th	95th	age	N	5th	50th	95th
yrs.		mm.			yrs.		mm.		
girls					girls				
<10.58	86	7.1	13.5	23.0	9.5-10.4	276	6	12	24
10.58-10.92	561	9.0	14.2	25.5	10.5-11.4	268	7	12	29
11.00-11.42	723	9.0	14.0	24.6					
11.50-11.91	184	7.8	14.0	24.5	11.5-12.4	267	6	13	25
≥12	66	8.0	15.4	27.7					
boys					boys				
<10.58	78	7.6	13.2	23.5	9.5-10.4	315	5	10	22
10.58-10.92	551	7.0	12.7	22.6	10.5-11.4	294	6	10	25
11.00-11.42	675	7.0	12.7	24.4					
11.50-11.91	206	7.0	13.3	25.5	11.5-12.4	294	5	11	26
≥12	104	5.9	12.1	26.5					

[1]Source: Frisancho, A.R.: Triceps skinfold and upper arm muscle size norms for assessment of nutritional status. Am. J. Clin. Nutr. 27:1052, 1974.

caliper. From these two measurements, it is possible to calculate the inner circle which is composed principally of muscle, with a small central core of bone. The bone is assumed to be relatively constant in size. The calculated value, the arm-muscle circumference, is a gauge of muscle tissue. Arm muscle circumference in millimeters is derived by computation (12) as follows:

$$\text{arm muscle circumference (mm.)} = \text{arm circumference} - \pi\,(\text{triceps skinfold, mm.})$$

The means, standard deviations, selected percentiles, and coefficients of variation for muscle circumference measurements of Kansas fifth grade girls and boys are listed in Table 33. Muscle circumference measurements of Kansas fifth grade students at selected percentiles were compared to those of children of comparable ages in the Ten-State Nutrition Survey (12) (Table 34). Kansas girls, ages 10.5 to 10.9, had larger muscle circumferences at the 5th percentile than girls in the national study, ages 10.5 to 11.4 years, but slightly smaller measurements at the 50th and 95th percentiles. Within the same age range, 10.5 to 10.9, Ten-State and Kansas boys had similar muscle circumferences at the 5th and 50th percentiles, but Kansas boys had smaller measurements at the 95th percentile. Kansas girls and boys aged 11.0 to 11.4 years had larger arm circumferences at all percentiles than Ten-State girls and boys, 10.5 to 11.4 years of age. At age 11.5 to 11.9 years, Kansas girls had smaller muscle circumferences at the 5th and 50th percentiles than Ten-State girls aged 11.5 to 12.4 years, but larger at the 95th percentile. Muscle circumferences for boys in these age groups were smaller for Kansas boys than Ten-State boys at the 5th percentile, the same at the 50th; but Kansas boys' circumferences were larger at the 95th percentile.

Table 33: Means, standard deviations, selected percentiles, and coefficients of variation for muscle circumference of Kansas fifth grade students by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		mm.	mm.							
girls											
<127	<10.58	85	174.16 ± 18.53	149.1	152.2	161.4	171.2	185.0	200.7	213.3	10.64
127-131	10.58-10.92	560	172.76 ± 20.81	145.4	150.5	158.4	170.1	183.7	196.8	208.1	12.05
132-137	11.00-11.42	723	175.68 ± 19.82	146.2	152.3	160.7	174.5	189.4	200.5	209.2	11.28
138-143	11.50-11.91	184	178.39 ± 21.42	148.9	155.6	162.4	176.4	192.0	207.7	217.8	12.01
≥144	≥12	66	176.68 ± 22.21	142.8	152.9	164.4	173.9	185.6	210.2	221.0	12.57
boys											
<127	<10.58	78	177.08 ± 22.86	146.0	150.3	159.4	175.9	188.2	203.0	224.8	12.91
127-131	10.58-10.92	551	175.82 ± 18.44	150.0	155.1	164.4	173.9	186.2	199.3	209.8	10.49
132-137	11.00-11.42	675	179.38 ± 20.28	153.0	157.8	167.3	177.7	189.5	205.6	212.8	11.31
138-143	11.50-11.91	206	182.08 ± 21.19	149.5	154.9	167.0	181.0	192.3	211.4	222.7	11.64
≥144	≥12	104	181.11 ± 23.85	152.6	158.1	171.3	179.9	196.1	209.1	215.4	13.17

Table 34: Comparisons of selected percentiles for muscle circumference of Kansas fifth graders and children in the Ten-State Nutrition Survey[1]

Kansas fifth graders					Ten State children				
		percentiles					percentiles		
age	N	5th	50th	95th	age	N	5th	50th	95th
yrs.		mm.			yrs.		mm.		
girls					girls				
<10.58	85	149.1	171.2	213.3	9.5-10.4	276	139	163	196
10.58-10.92	560	145.4	170.1	208.1	10.5-11.4	268	140	171	209
11.00-11.42	723	146.2	174.5	209.2					
11.50-11.91	184	148.9	176.4	217.8	11.5-12.4	267	150	179	212
≥12	66	142.8	173.9	221.0					
boys					boys				
<10.58	78	146.0	175.9	224.8	9.5-10.4	315	142	168	202
10.58-10.92	551	150.0	173.9	209.8	10.5-11.4	294	150	174	211
11.00-11.42	675	153.0	177.7	212.8					
11.50-11.91	206	149.5	181.0	222.7	11.5-12.4	254	153	181	221
≥12	104	152.6	179.9	215.4					

[1]Source: Frisancho, A.R.: Triceps skinfold and upper arm muscle size norms for assessment of nutritional status. Am. J. Clin. Nutr. 27:1052, 1974.

Relationship of Weight and Height. Weight in kilograms and pounds for Kansas fifth grade girls and boys by age and height are listed in Appendix P, and height in centimeters and inches for those groups by age and weight are listed in Appendix Q. Tables 35 and 36 list the percentages of Kansas fifth grade girls and boys at ages 10.5 to 10.9, 11.0 to 11.4, and 11.5 to 12.0 years distributed among height and weight groups based on national percentiles by age (10). Similar data for Kansas fifth grade girls and boys for these age groups combined are listed in Table 37.

Slightly over 3 per cent of all the girls were in the lower height percentile group and were distributed evenly among the lower and low percentiles for weight. Less than 1 per cent were in the middle and none in the upper and high percentiles (Table 37). Approximately 1 per cent of the girls in the low height percentile were in the lower weight percentile and 0.7 per cent were in the upper percentile. About 15 per cent of the girls in the low percentile for height were divided between the low and middle percentiles; no girls were found in the high percentile for weight.

Almost one-third of all the girls in the sample were in the middle percentile for height and weight, between 7 and 8 per cent were in the low and upper, respectively, and less than 1 per cent were in the lower and 1.2 per cent in the high percentiles for weight (Table 37). Slightly over 20 per cent of the girls in the upper height percentile were distributed almost evenly among the middle and upper percentiles for weight, 2 per cent were in the high percentile, only 0.1 per cent were in the low and none in the lower percentile for weight. There were no girls in the high percentile for height and in the lower and low percentiles for weight, whereas about 6 per cent of these girls were at the upper

Table 35: Percentages of Kansas fifth grade girls distributed among height and weight groups based on national percentiles[1] by age

groups based on national percentiles for height	groups based on national percentiles for weight				
	lower	low	middle	upper	high
	%				
girls, 10.5-10.9 yrs. (N=584)					
lower	0.9	0.5	0.2	--	--
low	0.9	8.6	5.6	0.5	--
middle	0.2	7.0	33.6	7.5	0.7
upper	--	0.2	10.4	11.8	2.4
high	--	--	0.9	5.3	2.8
girls, 11.0-11.4 yrs. (N=723)					
lower	1.2	1.7	0.1	--	--
low	0.8	7.5	4.8	0.4	--
middle	0.6	7.6	31.0	7.3	1.1
upper	--	0.2	11.3	11.5	1.9
high	--	--	1.3	6.8	2.9
girls, 11.5-12.0 yrs. (N=207)					
lower	3.9	3.9	1.0	--	--
low	2.9	12.1	12.6	1.9	--
middle	--	6.3	23.7	10.1	2.9
upper	--	--	4.8	7.7	1.4
high	--	--	0.5	3.3	1.0

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.
Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

Table 36: Percentages of Kansas fifth grade boys distributed among height and weight groups based on national percentiles[1] by age

groups based on national percentiles for height	groups based on national percentiles for weight				
	lower	low	middle	upper	high
	%				
boys, 10.5-10.9 yrs. (N=585)					
lower	0.2	0.7	0.2	--	--
low	0.3	4.6	5.8	0.2	--
middle	0.2	2.7	35.0	9.7	1.4
upper	--	--	11.3	12.5	6.3
high	--	--	0.7	3.8	4.4
boys, 11.0-11.4 yrs. (N=675)					
lower	0.3	1.2	--	--	--
low	0.2	4.9	6.8	0.4	--
middle	--	2.4	23.1	4.3	0.9
upper	--	0.6	22.7	16.6	6.8
high	--	--	0.9	3.6	4.3
boys, 11.5-12.0 yrs. (N=241)					
lower	0.4	1.7	2.1	--	--
low	0.4	9.5	8.7	0.4	--
middle	--	3.3	39.0	7.0	3.7
upper	--	--	6.3	6.7	7.9
high	--	--	--	0.4	2.5

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

Table 37: Percentages of Kansas fifth grade girls and boys distributed among height and weight groups based on national percentiles[1]

groups based on national percentiles for height	groups based on national percentiles for weight				
	lower	low	middle	upper	high
	%				
girls (N=1514)					
lower	1.4	1.5	0.3	--	--
low	1.1	8.5	6.2	0.7	--
middle	0.3	7.2	31.0	7.8	1.2
upper	--	0.1	10.1	11.1	2.0
high	--	--	1.1	5.8	2.6
boys (N=1501)					
lower	0.3	1.1	0.4	--	--
low	0.3	5.5	6.7	0.3	--
middle	0.1	2.7	30.3	6.9	1.5
upper	--	0.3	15.6	13.4	6.8
high	--	--	0.7	3.1	4.0

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.
Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

percentile for weight and the remainder were in the middle or high percentiles.

Less than 2 per cent of Kansas boys were in the lower percentiles for height (Table 37). Just over 1 per cent of those were in the low percentile group for weight and the remainder were either in the lower or middle percentiles for weight. There were no boys in the upper and high percentiles for weight in the lower percentile for height. Among boys in the low percentile for height, most were found in the low and middle percentiles for weight, 5.5 and 6.7 per cent, respectively. There were none in the high percentile and 0.3 per cent in each of the lower and upper percentiles for weight.

Almost 40 per cent of the boys were in the middle percentile for height and most of those (30.3 per cent) also were in the middle percentile for weight. Only 0.1 per cent were in the lower and 1.5 per cent in the high percentiles, 2.7 per cent were in the low percentile, and about 7 per cent of those in the middle height group were in the upper percentile for weight. Almost 35 per cent of the boys were in the upper percentile for height, with about 15 per cent in each of the middle and upper percentiles for weight, 6.8 per cent were in the high and 0.3 per cent in the low weight percentiles. None of the boys in the upper percentile for height had weights in the lower percentile. Of the 7.8 per cent of the boys with heights in the high percentile, almost all were in the upper or high weight groups.

As discussed earlier, when height is at or above the low percentile (> 5th) and weight is in the lower percentile (≤ 5th), acute or subacute illness or nutritional deficiency may be suspected. The percentages of Kansas girls and boys in these categories were 1.4 and 0.4 per cent,

respectively. Weight for height in the high percentiles (> 95th) suggest obesity; 5.8 per cent of the Kansas girls and 12.3 per cent of the boys were in that group.

Triceps Skinfold in Selected Height-Weight Groups. The height-weight relationship, commonly used as an index of fatness, does not discriminate between a person who is heavy because of large muscle mass and one who is heavy because of obesity. Skinfold thickness, on the other hand, has been found to correlate rather well with fat content of the body in 8½ to 12-year-old children according to Parizková and Roth (53). Triceps skinfold for Kansas fifth grade girls and boys in height-weight groups based on national percentiles are listed in tables in Appendixes R and S.

As discussed above, the groups of particular concern are children who are relatively tall and have low body weight and those who are short and are relatively heavy. To examine those groups more carefully, the triceps skinfold measurements were analyzed further for the following selected groups to determine the extent of extreme underweight and overweight of Kansas fifth grade students:

height-weight	height percentile	weight percentile
low-lower	> 5th to < 25th percentile	≤ 5th percentile
low-middle	> 5th to < 25th percentile	≥ 25th to ≤ 75th percentile
middle-high	≥ 25th to ≤ 75th percentile	> 95th percentile
upper-high	> 75th to ≤ 95th percentile	> 95th percentile
high-high	> 95th percentile	> 95th percentile

Triceps skinfold measurements for girls and boys, aged 9.5 to 10.4, 10.5 to 11.4 and 11.5 to 12.4 years, at the 5th and 95th percentiles in

the Ten-State Survey were averaged to establish limits[1] for comparison of Kansas and national data (Table 38).

Triceps skinfold of children in Ten-State Survey (12)

	percentiles	
	5th	95th
	mm.	
girls	6.3	26.0
boys	5.3	24.3

Percentages of students in the height-weight groups who fell into groups based on national triceps skinfold percentiles, as shown in Table 38, were determined.

Seventeen of the 1,514 Kansas girls and four of the 1,501 Kansas boys were in the low-lower height-weight group (Table 38). No Kansas boys had triceps skinfold measurements at or below the 5th percentile, however 11.8 per cent of the seventeen girls in the low-lower height-weight group were at that level. Those girls may or may not have acute or subacute illnesses or nutritional deficiencies.

Kansas girls and boys in the high weight categories with triceps skinfold measurements at the 95th percentile also are listed in Table 38. There were eighteen girls and twenty-three boys in the middle-high height-weight group with 50 per cent of the girls and 52.2 per cent of the boys at or above the 95th percentile for triceps skinfold measurement. Over one-fourth of the thiry-one girls and about one-third of the 102 boys in the upper-high height for weight group and 27.5 per cent of forty

[1]Refer to Table 33 for detailed national data on triceps skinfold measurements.

Table 38: Selected percentiles of triceps skinfold for Kansas fifth grade girls and boys for height-weight groups based on national percentiles

height-weight groups based on national percentiles[1]	N	percentage of students at selected triceps skinfold percentiles[2]	
		5th	95th
ht.-wt.		%	%
girls (n = 1514)			
low-lower	17	11.8	--
low-middle	94	--	--
middle-high	18	--	50.0
upper-high	31	--	29.0
high-high	40	--	27.5
boys (n = 1501)			
low-lower	4	--	--
low-middle	101	--	--
middle-high	23	--	52.2
upper-high	102	--	32.4
high-high	62	--	24.2

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Combined height-weight groups defined by using percentiles from National Center for Health Statistics:

height-weight	height percentiles	weight percentiles
low-lower	> 5th to < 25th percentile	≤ 5th percentile
low-middle	> 5th to < 25th percentile	≥ 25th to ≤ 75th percentile
middle-high	≥ 25th to ≤ 75th percentile	> 95th percentile
upper-high	> 75th to ≤ 95th percentile	> 95th percentile
high-high	> 95th percentile	> 95th percentile

[2]Source: Frisancho, A.R.: Triceps skinfold and upper arm muscle size norms for assessment of nutritional status. Am. J. Clin. Nutr. 27:1052, 1974 (Triceps skinfold measurements for girls and boys, aged 9.5-10.4, 10.5-11.4 and 11.5-12.4 years at the 5th and 95th percentiles in the Ten-State Survey were averaged for comparison of Kansas and national data--Table 20).

girls and 24.2 per cent of sixty-two boys in the high-high height-weight group were at or above the 95th percentile for triceps skinfold measurements. Those girls and boys above the 95th percentile for skinfold and in the high weight groups may be obese. These data must be interpreted cautiously because a growth spurt or marked increase in growth velocity occurs in girls at about 10 years of age and at 11.5 years in boys and may account for those observations (10).

Correlations of Anthropometric Measurements. Correlations among anthropometric measurements for the Kansas fifth grade boys and girls are listed in Tables 39 and 40. All measurements for both girls and boys were correlated significantly ($P \leq 0.001$) and positively. Highest correlations were between weight and arm circumferences and between arm and muscle circumferences for boys and girls. The weakest relationship for girls was between height and triceps skinfold and for boys, between triceps skinfold and muscle circumference.

Energy and Nutrient Intakes of Kansas Fifth Grade Students from 24-Hour Dietary Recall Interviews

General Information. Data on the additional demographic information collected from the students in the interview sample are given in Table 42. General descriptive information about the sample is in Table 10 (page 71).

About one-third of the students' fathers were employed as skilled laborers and about 10 per cent were in each of the professional or technical, managerial, and agricultural categories. Three per cent worked part-time in various occupations and 0.5 per cent were retired. About 35 per cent of the mothers of the fifth graders were homemakers, 15 per cent worked in service and clerical positions, slightly over 10

Table 39: Correlation coefficients[1] of anthropometric measurements of Kansas fifth grade girls

anthropometric measurement	height	weight	arm circumference	triceps skinfold	muscle circumference
height					
weight	0.714				
arm circumference	0.428	0.852			
triceps skinfold	0.222	0.612	0.742		
muscle circumference	0.440	0.744	0.853	0.284	

[1]All coefficients are significant at $P \leq 0.001$.

Table 40: Correlation coefficients[1] of anthropometric measurements of Kansas fifth grade boys

anthropometric measurement	height	weight	arm circumference	triceps skinfold	muscle circumference
height					
weight	0.671				
arm circumference	0.421	0.877			
triceps skinfold	0.240	0.684	0.730		
muscle circumference	0.399	0.673	0.810	0.192	

[1]All coefficients are significant at $P \leq 0.001$.

Table 41: Recommended Dietary Allowances, 1980[1]

	males	females
age, years	11-14	11-14
weight		
kg.	45	46
lb.	99	101
height		
cm.	157	157
in.	62	62
energy, kcal.	2,700	2,200
protein, gm.	45	46
fat-soluble vitamins		
vitamin A, I.U.	5,000	4,000
water-soluble vitamins		
vitamin C, mg.	50	50
thiamin, mg.	1.4	1.1
riboflavin, mg.	1.6	1.3
niacin, mg.	18	15
vitamin B_6, mg.	1.8	1.8
minerals		
calcium, mg.	1,200	1,200
phosphorus, mg.	1,200	1,200
magnesium, mg.	350	300
iron, mg.	18	18

[1]Source: Food & Nutr. Bd.: Recommended Dietary Allowances. 8th rev. ed. Washington, D.C.: Natl. Acad. Sci., 1980.

Table 42: General information from Kansas fifth grade students in dietary recall sample

characteristics	response category	N[1]	per cent
father's first occupation	full time		
	professional, technical	168	13.9
	managerial	137	11.3
	clerical	21	1.7
	sales	82	6.8
	service	94	7.8
	agriculture	128	10.6
	skilled	388	32.0
	unskilled	102	8.4
	unemployed	32	2.6
	homemaker	2	0.2
	student	4	0.3
	military	12	0.9
	part-time (in various occupations)	35	2.9
	retired	6	0.5
mother's first occupation	full time		
	professional, technical	138	11.1
	managerial	39	3.1
	clerical	182	14.6
	sales	58	4.7
	service	180	14.5
	agriculture	9	0.7
	skilled	85	6.8
	unskilled	69	5.5
	unemployed	13	1.0
	homemaker	434	34.9
	student	17	1.4
	part-time (in various occupations)	20	1.7
number of persons in family	2	29	2.2
	3	155	11.9
	4	444	34.2
	5	353	27.2
	6	186	14.3
	more than 6	131	10.1

[1] N varies because occupations of parents not living, or separated and in cases where children did not know the parents occupation no response was recorded.

Table 42: (cont.)

characteristics	response category	N	per cent
person who usually prepares meals	mother	1101	85.2
	father	28	2.2
	older sister	18	1.4
	older brother	3	0.2
	self	16	1.2
	other	42	3.2
	combination	86	6.6
frequency of eating away from home, excluding school lunch	rarely or never	755	58.2
	once a week	379	29.2
	twice	106	8.2
	3 times	38	2.9
	4 times	7	0.5
	5 times	4	0.3
	6 or more	9	0.7
take vitamin, mineral supplements	yes	567	43.8
	no	679	52.5
	sometimes	48	3.7
number of supplements taken	1 daily	254	82.6
	2 daily	32	10.5
	3 or more daily	21	6.9

per cent in professional or technical occupations, and about 2 per cent were employed part-time in a variety of jobs.

The majority of the students came from four- (34.2 per cent) or five-member (27.2 per cent) families, another 15 per cent from six-member families; about 15 per cent from families with three or fewer members, the remainder were from larger families (> 6 members). Most of the students (85.2 per cent) reported that their mother usually prepared the meals. Over half of the fifth graders rarely or never ate meals away from home, about 30 per cent ate away from home once a week, 8 per cent approximately two times per week, and less than 5 per cent ate out three or more times each week.

Among the fifth grade students interviewed 52.5 per cent reported that they were not taking a vitamin or mineral supplement. Of those who reported taking supplements (43.8 per cent), over three-fourths took a supplement daily and about 15 per cent reported they took two or more supplements each day. About 6 per cent of the students were on special diets, primarily for weight reduction or food allergies.

The numbers of fifth grade students consuming breakfast, lunch, dinner, snacks, and supplements on the day of the 24-hour recall are listed in Table 43. Meal skipping was infrequent among students interviewed; 8 per cent reported omitting breakfast and only 1 and 3 per cent, respectively, skipped lunch and dinner. Almost all of the students (76 per cent) had consumed an afternoon snack; a morning or evening snack had been eaten by 9 and 49 per cent, respectively. On the day of the interview, almost two-thirds of the students (63 per cent) did not consume a vitamin or mineral supplement.

Table 43: Number of students (N = 1307) consuming breakfast, lunch, dinner, snacks, and supplements on day of 24-hour dietary recall interview

	those consuming	those not consuming
	%	%
breakfast	92	8
a.m. snack	9	91
lunch	99	1
afternoon snack	76	24
dinner	97	3
p.m. snack	49	51
supplement	37	63

In the USDA Household Food Consumption Survey of 1977-78 (24), 24-hour dietary recall interviews with children, aged 9-14, showed that over 90 per cent consumed breakfast, but only 86 per cent of females, 12-14 years, consumed that meal. About 80 per cent of all children interviewed consumed lunch, over 40 per cent reported eating dinner and over 50 per cent reported eating supper. As described above, children identified their own meals and some referred to dinner as the noon meal and some referred to it as the evening meal. Over 60 per cent of the children 9-14 years reported consuming snacks.

Breakfast consumption was better in this study and in the USDA Survey of 1977-78 than in earlier studies. Callahan (55) reported that 13 per cent of Massachusetts school children surveyed did not eat breakfast. In a study among school children in Iowa (27), approximately one-half of the children did not have breakfast.

Sources of meals of Kansas fifth grade students on the day of the 24-hour dietary recall interview are listed in Table 44. The majority of children (96.7 per cent) had eaten breakfast at home, slightly less than 3 per cent at school, and less than 1 per cent had obtained breakfast from other sources. Over three-fourths of the students (82.7 per cent) had eaten lunch at school, 9.9 per cent had carried lunch from home, and less than 10 per cent had eaten lunch at home or some other place. Dinner had been consumed at home by over 90 per cent of the fifth graders and at a fast food location or a restaurant by 5.5 per cent. The afternoon and evening snacks were eaten most often at home by the students. The majority of the morning snacks (79.5 per cent) were eaten at school.

Analysis of Variance of Energy and Nutrient Intakes of Fifth Grade Students. Effects of BED, USD, and School. Details of the initial analysis of variance of energy and nutrient intake of those students who reported eating various meals and for all students are listed in Appendixes T, U, X, and Y, respectively. The energy and nutrient intake of the students in BED's, USD's, and schools did not differ greatly. Individual differences among the students accounted for the majority of the variance, between 70.0 to 100.0 per cent.

Because of the extensive detail and the large number of variables included in the analyses, only the tables listing means and related statistics are included in the body of the report. Details on statistical analysis are in the Appendixes.

The means, standard deviations, and coefficients of variation of energy and nutrient intake of Kansas fifth grade students from the total day (with and without supplements) and from breakfast, lunch, dinner,

Table 44: Sources of meals of Kansas fifth grade students from 24-hour dietary recall interviews

	type of meal					
	breakfast	a.m. snack	lunch	afternoon snack	dinner	evening snack
	%					
school	2.3	79.5	82.7	2.3	--	0.6
carried lunch from home	--	--	9.9	--	0.1	--
home	96.7	15.4	6.5	86.8	92.5	95.5
other home	0.1	0.8	0.2	0.7	0.5	0.8
vending machine	--	--	--	--	--	0.2
grocery	0.1	--	--	0.4	--	0.3
fast food	--	--	0.3	0.4	3.2	0.6
restaurant	0.2	--	0.3	0.1	2.3	0.3
other	0.2	1.7	--	1.1	1.2	1.1
combination	0.4	2.6	0.1	8.2	0.3	0.6

and snacks are listed in Tables 45 and 46, respectively. Intakes of vitamin A, ascorbic acid, thiamin, riboflavin, niacin, vitamin B_6, calcium, and iron were increased when supplements were taken by the students (Table 45). Energy, protein, fat, carbohydrate, vitamin A, riboflavin, niacin, phosphorus, and iron intakes were greater at lunch and dinner than at breakfast (Table 46). Breakfast provided more ascorbic acid than either lunch or dinner. Thiamin, vitamin B_6, and magnesium were supplied almost equally by the three meals; whereas lunch provided greater amounts of phosphorus, calcium, and carbohydrate than breakfast or dinner. Snacks contributed slightly more energy, fat, and carbohydrates than breakfast.

Effects of Selected Characteristics of Fifth Grade Students. Analysis of variance (Appendixes V and W) indicated that there were few differences in energy and nutrient intake attributable to place of residence. Differences were significant, however, between girl's and boy's total day's intake (with and without supplements) of energy and all nutrients except ascorbic acid. Intakes of protein, fat, carbohydrate, vitamin A, thiamin, riboflavin, niacin, vitamin B_6, calcium, phosphorus, magnesium, and iron were significantly higher ($P \leq 0.001$) for boys than girls (Table 47).

Energy and nutrient intakes at breakfast were higher ($P \leq 0.001$ or 0.01) for boys than girls, except for ascorbic acid. Boys had higher intakes at lunch than girls for energy, protein, fat, carbohydrate, niacin, vitamin B_6, calcium, phosphorus, iron ($P \leq 0.001$), magnesium ($P \leq 0.01$), and riboflavin ($P \leq 0.05$), but their intakes of vitamin A, ascorbic acid, and thiamin did not differ significantly. At dinner, boys had higher intakes of energy, protein, fat, carbohydrate, niacin, vitamin B_6, calcium, phosphorus, magnesium, iron ($P \leq 0.001$), ascorbic acid,

Table 45: Means, standard deviations, and coefficients of variation of total day's energy and nutrient intake (with and without supplements) of Kansas fifth grade students (N = 1302) from 24-hour dietary recall interviews

	total day's meals (excluding supplements)			total day's meals (including supplements)		
	mean	standard deviation	coefficient of variation	mean	standard deviation	coefficient of variation
			%			%
energy, kcal	2422	841	35	2422	841	35
protein, gm.	87.9	32.8	37	87.9	32.8	37
fat, gm.	105.4	45.9	44	105.4	45.9	44
carbohydrate, gm.	290.3	108.9	38	290.3	108.9	38
vitamin A, I.U.	6077	5579	92	6961	5993	86
ascorbic acid, mg.	107.3	100.8	94	183.7	177.4	96
thiamin, mg.	1.58	0.90	57	1.84	1.03	56
riboflavin, mg.	2.58	1.62	63	2.77	1.68	61
niacin, mg.	16.8	8.4	50	20.3	10.6	52
vitamin B_6, mg.	1.7	0.9	54	2.0	1.1	55
calcium, mg.	13.44	7.13	53	14.77	10.56	71
phosphorus, mg.	1310.9	560.9	43	1311	561	43
magnesium, mg.	183.2	96.5	53	183.3	96.6	53
iron, mg.	13.44	7.13	53	14.77	10.56	71

Table 46: Means, standard deviations, and coefficients of variation of energy and nutrient intake from breakfast, lunch, dinner, and snacks of Kansas fifth grade students who consumed each meal from 24-hour dietary recall interviews

	breakfast (N = 1193)			lunch (N = 1283)			dinner (N = 1265)			snacks (N = 1165)		
	mean	standard deviation	coefficient of variation	mean	standard deviation	coefficient of variation	mean	standard deviation	coefficient of variation	mean	standard deviation	coefficient of variation
			%			%			%			%
energy, kcal	488	287	59	757	333	44	805	421	52	503	429	85
protein, gm.	16.8	10.7	63	28.8	14.0	48	33.8	19.6	58	12.6	14.3	113
fat, gm.	17.2	15.7	91	34.0	22.9	67	38.8	24.2	62	20.7	22.9	110
carbohydrate, gm.	67.4	41.8	62	87.5	36.6	42	81.9	53.4	65	70.1	58.1	83
vitamin A, I.U.	1778	1683	95	1625	2446	150	2203	4569	207	789	1306	166
ascorbic acid, mg.	38.8	59.4	153	25.5	31.2	122	29.4	46.2	157	20.2	46.1	228
thiamin, mg.	0.50	0.46	93	0.43	0.30	70	0.50	0.57	113	0.24	0.38	162
riboflavin, mg.	0.70	0.53	76	0.77	0.55	72	0.75	0.86	114	0.50	1.01	204
niacin, mg.	3.4	3.9	112	5.0	4.0	81	7.0	4.6	65	2.2	3.7	171
vitamin B_6, mg.	0.5	0.6	105	0.48	0.29	60	0.5	0.4	78	0.23	0.40	168
calcium, mg.	352	263	74	433	213	49	322	318	99	243	298	122
phosphorus, mg.	331	261	79	426	185	44	398	270	68	225	261	116
magnesium, mg.	55.7	51.8	93	50.1	29.7	59	58.5	51.6	88	28.9	38.9	134
iron, mg.	3.19	5.28	165	4.10	1.99	48	5.10	2.90	57	1.68	2.63	156

Table 47: Least square means and standard errors for energy and nutrient intake for total day and by meal of Kansas fifth grade students from 24-hour dietary recall interviews

	N	least square means[1] and standard errors													
		energy	protein	fat	carbo-hydrate	vita-min A	ascorbic acid	thiamin	ribo-flavin	niacin	vita-min B_6	calcium	phos-phorus	magne-sium	iron
		kcal	gm.	gm.	gm.	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
total day's intake	1230														
female		2180 ±127	79.2 ±4.9	98.2 ±7.1	262.1 ±16.6	4884 ±878	118.4[a] ±15.6	1.38 ±0.14	2.16 ±0.25	15.3 ±1.3	1.3 ±0.1	1093 ±96	1150 ±86	164.8 ±14.7	13.85 ±1.09
male		2578 ±126	96.3 ±4.8	115.8 ±7.0	304.6 ±16.4	6029 ±865	132.5 ±15.4	1.67 ±0.14	2.68 ±0.25	19.0 ±1.2	1.7 ±0.1	1342 ±95	1399 ±85	205.1 ±14.5	16.80 ±1.07
total day's intake with supplement	1230														
female		2180 ±127	79.2 ±4.9	98.2 ±7.1	262.1 ±16.6	5878 ±942	203.8[a] ±27.5	1.71 ±0.16	2.47 ±0.26	19.7 ±1.6	1.6 ±0.2	1123 ±97	1150 ±86	164.8 ±14.7	15.20 ±1.63
male		2578 ±126	96.3 ±4.8	115.8 ±7.0	304.6 ±16.4	6923 ±928	208.6 ±27.1	1.94 ±0.16	2.95 ±0.26	22.6 ±1.6	2.0 ±0.2	1371 ±96	1400 ±85	205.4 ±14.5	18.32 ±1.60
breakfast	1126[2]														
female		523 ±44	21.5 ±1.6	23.6 ±2.4	57.4 ±6.6	1319 ±264	42.4[a] ±9.3	0.41 ±0.07	0.70 ±0.08	3.0 ±0.6	0.4 ±0.1	372 ±41	361 ±40	56.2 ±8.0	4.45 ±0.82
male		631 ±44	24.8 ±1.6	26.9 ±2.4	73.2 ±6.4	1933 ±259	44.2 ±9.2	0.55 ±0.07	0.83 ±0.08	4.1 ±0.6	0.5 ±0.1	436 ±40	435 ±40	69.5 ±7.9	5.84 ±0.81
lunch	1213														
female		669 ±54	24.0 ±2.2	30.3 ±3.7	76.6 ±6.2	1708[a] ±410	26.7[a] ±5.3	0.40[a] ±0.05	0.63 ±0.09	4.5 ±0.6	0.4 ±0.0	331 ±35	349 ±30	42.1 ±5.1	3.70 ±0.34
male		776 ±53	28.4 ±2.2	36.3 ±3.6	85.6 ±6.1	1746 ±404	30.2 ±5.3	0.42 ±0.05	0.71 ±0.08	5.5 ±0.6	0.4 ±0.0	394 ±34	406 ±30	49.0 ±5.0	4.19 ±0.33
dinner	1196														
female		644 ±64	25.5 ±3.0	30.6 ±3.7	79.7 ±8.1	1376[a] ±703	26.0 ±7.1	0.43 ±0.09	0.51 ±0.13	5.7 ±0.7	0.4 ±0.1	226 ±49	286 ±41	41.3 ±7.9	4.26 ±0.44
male		774 ±64	32.7 ±2.9	36.6 ±3.7	91.5 ±7.9	1814 ±692	32.2 ±7.0	0.53 ±0.09	0.65 ±0.13	7.0 ±0.7	0.5 ±0.1	307 ±48	370 ±41	56.6 ±7.8	5.19 ±0.44
snacks	1103														
female		411 ±73	10.1 ±2.4	16.2 ±3.9	57.8[a] ±9.8	597[a] ±222	28.6[a] ±7.7	0.17[a] ±0.07	0.39 ±0.18	2.5[a] ±0.6	0.2 ±0.1	196 ±51	186 ±44	31.2 ±6.6	1.71[a] ±0.44
male		484 ±71	13.2 ±2.4	19.4 ±3.8	65.7 ±9.7	717 ±218	31.1 ±7.5	0.21 ±0.06	0.58 ±0.17	3.0 ±0.6	0.2 ±0.1	247 ±50	232 ±43	37.7 ±6.4	2.02 ±0.44

[1] Superscript a indicates nonsignificant differences between means.

[2] For breakfast, lunch, dinner, and snacks, includes only those students who reported eating each meal.

thiamin, and riboflavin ($P \leq 0.01$) intakes than girls; differences in vitamin A were nonsignificant. There were fewer differences between boys and girls in their nutrient intake from snacks than at meals. Energy, fat, vitamin B_6, calcium, phosphorus, and magnesium ($P \leq 0.05$), protein and riboflavin ($P \leq 0.01$) intakes from snacks were higher for boys than for girls.

The Nationwide Food Consumption Survey of 1977-78 (24) included over 9,000 dietary recall interviews in the 48 continental states. For children, 9-14 years, energy from the total day's intake from breakfast was 21 per cent, lunch 31 per cent, dinner 40 per cent, supper 38 per cent, and snacks 20 per cent. Approximately 92 per cent of the males, 9-14 years, and 95 per cent of the females, 9-11 years, and 86 per cent of females, 12-14 years, consumed breakfast. Of those reporting eating, breakfast supplied 20-30 per cent of the total day's nutrients for males. Girls, 12-14 years, had lower nutrient intakes at breakfast (17-28 per cent) than those 9-11 years (21-37 per cent). Over three-fourths of the children reported eating lunch, which supplied 20-30 per cent of the day's nutrients. Supper provided the largest per cent of total day's nutrients (29-43 and 26-46 per cent for boys and girls, respectively) however, only slightly over half of the children reported eating supper. Dinner provided about 28-45 per cent of the total day's nutrients for those who reported eating dinner (about 40-50 per cent). Snacks supplied about 25 per cent of the total day's intake of carbohydrate and 15-20 per cent of other nutrients analyzed (protein, calcium, iron, magnesium, phosphorus, thiamin, riboflavin, preformed niacin, and vitamins B_6, B_{12}, A, and C). Girls and boys, 12-14 years, consumed a higher percentage of calories and all other nutrients from snacks than those aged 9-11 years.

Analysis of Variance of Percentages of Recommended Dietary Allowances for Energy and Nutrient Intakes of Fifth Grade Students. Effects of BED, USD, and School. The results of the initial analysis of variance of percentages of Recommended Dietary Allowances for energy and nutrient intake of the students in relation to RDAs did not differ greatly among BED's, USD's, and schools. Individual differences among the students who reported eating accounted for 70.0 to 100.0 per cent of the variance and between 77.0 to 100.0 per cent for all the students interviewed.

The means, standard deviations, and coefficients of variation for the percentages of Recommended Dietary Allowances for total day and by meal of Kansas fifth grade students who reported eating on the day of the 24-hour dietary recall interviews are listed in Tables 48 and 49. On the recall day, almost all of the RDA for energy (99 per cent) was met by the students. Breakfast contributed 20 per cent.

The intake of protein greatly exceeded the RDA (194.2 per cent) with the highest consumption at dinner (74.7 per cent) and at lunch (63.6 per cent). Breakfast and snacks contributed about one-third of the RDA for protein, 37.2 and 27.8 per cent, respectively.

The total day's intake of vitamin A exceeded the RDA, 137 per cent, and increased with supplements to 157 per cent. Each meal contributed one-third to one-half of the allowance and snacks provided less than one-fourth. Ascorbic acid intake was double the RDA (214.7 per cent) without supplements and 367.6 per cent with supplements. The mean RDA for ascorbic acid from meals was 77.6 per cent, 51.1 per cent, 58.8 per cent for breakfast, lunch, and dinner respectively, and 40.4 per cent in snacks.

Table 48: Means, standard deviations, and coefficients of variation for percentages of Recommended Dietary Allowances for total day's energy and nutrient intake (with and without supplements) of Kansas fifth grade students (N = 1204) from 24-hour dietary recall interviews

	total day's meals (excluding supplements)			total day's meals (including supplements)		
	mean	standard deviation	coefficient of variation	mean	standard deviation	coefficient of variation
			%			%
energy, kcal	99	33	33	99	33	33
protein, gm.	194.2	73.2	38	194.2	73.3	38
vitamin A, I.U.	137	128	94	157	138	88
ascorbic acid, mg.	214.7	201.5	94	367.6	354.8	96
thiamin, mg.	127.52	73.05	57	148.61	85.30	57
riboflavin, mg.	178.80	111.23	62	192.78	116.59	60
niacin, mg.	102.1	49.3	48	123.5	64.4	52
vitamin B_6, mg.	93.7	51.2	55	109.5	60.7	55
calcium, mg.	107	53	49	108	53	49
phosphorus, mg.	110	47	43	110	47	43
magnesium, mg.	56.7	29.5	52	56.7	29.5	52
iron, mg.	75.14	39.98	53	82.61	59	71

Table 49: Means, standard deviations, and coefficients of variation for percentages of Recommended Dietary Allowances from breakfast, lunch, dinner, and snacks of Kansas fifth grade students who consumed each meal from 24-hour dietary recall interviews

	breakfast (N = 1193)			lunch (N = 1282)			dinner (N = 1264)			snacks (N = 1164)		
	mean	standard deviation	coefficient of variation	mean	standard deviation	coefficient of variation	mean	standard deviation	coefficient of variation	mean	standard deviation	coefficient of variation
			%			%			%			%
energy, kcal.	20	11	57	31	13	42	33	17	52	21	18	85
protein, gm.	37.2	23.8	64	63.6	31.0	49	74.7	43.40	58	27.8	31.6	114
vitamin A, I.U.	40	36	92	37	58	159	50	105	212	18	29	165
ascorbic acid, mg.	77.6	118.9	153	51.1	62.5	122	58.8	92.4	157	40.4	92.4	228
thiamin, mg.	39.88	35.33	88	34.89	25.41	73	40.64	48.44	119	19.13	31.97	167
riboflavin, mg.	48.72	37.11	76	53.50	41.08	77	52.26	60.12	115	34.28	66.08	193
niacin, mg.	20.8	23.0	110	30.2	23.1	77	42.9	27.5	64	13.1	22.6	172
vitamin B_6, mg.	29.0	30.5	105	26.9	16.0	60	29.9	23.2	78	13.1	22.0	168
calcium, mg.	30	22	75	54	27	49	27	27	99	20	25	122
phosphorus, mg.	28	22	79	36	16	44	33	23	68	19	22	116
magnesium, mg.	17.2	15.7	91	15.5	9.2	59	18.1	15.8	87	8.9	12.0	134
iron, mg.	17.94	29.44	164	23.11	11.45	50	28.72	16.62	58	9.44	14.70	156

The mean intake of thiamin with and without supplements exceeded the Recommended Dietary Allowance (127.52 per cent and 148.61 per cent). Breakfast supplied 39.88 per cent, lunch 34.89 per cent, dinner 40.64 per cent, and snacks 19.13 per cent. Supplements containing riboflavin increased the total day's intake from 178.80 per cent to 192.78 per cent of the RDA. Each meal supplied about one-half of the recommended allowance and snacks about one-third.

Slightly more than the RDA for niacin (102.1 per cent) was consumed by the students and supplements increased the mean percentage intake to 123.5 per cent. Vitamin B_6 was slightly less (93.7 per cent) than the RDA; with supplements, the mean percentage RDA increased to 109.5 per cent. Each meal provided almost 30 per cent of the RDA and snacks, 13.1 per cent.

The mean intake of calcium consumed by the students was slightly more than the RDA (107 per cent) for the total day with lunch supplying the most, 54 per cent, and breakfast, dinner, and snacks, contributing 30, 27, and 20 per cent respectively. Intakes of phosphorus for the total day exceeded the recommended allowance (110 per cent). Each meal contributed about one-third of the RDA and snacks, 19 per cent.

The mean percentage of magnesium consumed was only about half of the recommended allowance. Breakfast, lunch, dinner, and snacks contributed 17.2, 15.5, 18.1, and 8.9 per cent respectively. Morgan et al. (28) found that children not consuming any salted snack foods had marginal intakes of magnesium and zinc. Iron intake was increased with supplements from 75.14 per cent for the total day to 82.61 per cent, which was still below the RDA for iron. Lunch and dinner supplied 23.11 and 28.72

per cent respectively, breakfast, 17.94 per cent and snacks, 9.44 per cent of the RDA.

In the Nationwide Food Consumption Survey of 1977-78 (24), over 9,000 individuals, including children 9-14 years of age, were interviewed. Nutrient intakes were calculated as percentages of the 1980 Recommended Dietary Allowances. Expressed as per cent of the RDA, girls and boys aged 9-11 years had low intakes of calories (80 per cent for girls and boys), calcium (89 and 97 per cent, respectively), magnesium (88 and 85 per cent, respectively), and vitamin B_6 (84 and 92 per cent, respectively). Boys exceeded the allowance for iron (102 per cent) while girls' intakes were below the RDA (92 per cent). Both sexes consumed large amounts of protein (boys 205 and girls 181 per cent) and vitamin C (boys 176 and girls 186 per cent). Over 100 per cent of the RDA for phosphorus, vitamin A, thiamin, riboflavin, preformed niacin and vitamin B_{12}, was consumed by this age group.

Although boys and girls, 12-14 years, had diets comparable to 9-11 year olds, overall, they consumed a higher per cent of the RDAs for calories and a lower per cent of the nutrients. Expressed as per cent of the RDA, girls and boys aged 12-14 years, were low in energy (87 per cent for girls and boys), calcium (72 and 90 per cent, respectively), iron (64 and 85 per cent, respectively), magnesium (73 and 80 per cent, respectively), and vitamin B_6 (75 and 99 per cent, respectively), and females were slightly low in phosphorus (99 per cent). Both sexes exceeded the RDAs for protein, vitamin A, thiamin, riboflavin, preformed niacin, B_{12}, and vitamin C. Males exceeded their RDAs for phosphorus and consumed more of each nutrient analyzed than females.

The Ten-State Nutrition Survey (21) conducted in 1968 showed that a large percentage of the ten- to sixteen-year-old adolescents had low intakes of calcium, iron, and vitamin A. Eppright and Swanson (27) reported breakfast provided 15-20 per cent of the caloric value, lunches, 32-34 per cent, dinners, 33-35 per cent, and snacks, 13-17 per cent in diets of Iowa children. These data are not directly comparable to those in this study because they used the 1953 RDA for the standard of comparison. The distribution of nutrients among meals was comparable to that of calories, although breakfasts of the Iowa students were low in vitamin A and niacin and dinners were low in calcium and ascorbic acid. Snacks provided almost as many calories as did breakfast, were proportionately high in carbohydrate and low in all nutrients except ascorbic acid, for certain age groups.

Effects of Selected Characteristics of Fifth Grade Students. Analysis of variance (Appendixes Z and AA) indicated that there were few differences in mean percentage intake attributable to place of residence, but there were significant differences between girls and boys. The least square means and standard errors for percentages of the Recommended Dietary Allowances for energy and nutrient intake for the total day (with and without supplements) and by meal are listed in Table 50. A higher ($P \leq 0.05$) percentage of the RDA for energy was met by boys than girls at lunch, but differences at other meals and for the total day were non-significant. Protein intake as a percentage of the RDA was higher ($P \leq 0.001$) for boys than girls at meals and snacks, their vitamin A intake was higher at breakfast ($P \leq 0.05$).

The mean percentages of RDA's for thiamin, riboflavin, and niacin contributed by meals were not higher for boys than girls except for

Table 50: Least square means and standard errors for percentages of Recommended Dietary Allowances for energy and nutrient intake for total day and by meal of Kansas fifth grade students from 24-hour dietary recall interviews

	N	least square means[1] and standard errors											
		energy	protein	vitamin A	ascorbic acid	thiamin	ribo-flavin	niacin	vitamin B_6	calcium	phos-phorous	magne-sium	iron
		kcal	gm.	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
total day's intake	1230												
female		99[a]	172.6	124[a]	237.0	127.17[a]	166.87[a]	102.5[a]	71.5	91	96	55.4[a]	77.17
		±5	±10.8	±20	±31.2	±11.51	±17.42	±7.6	±7.8	±8	±7	±4.6	±6.08
male		95	214.4	120	265.1	119.65	165.32	105.7	93.1	112	117	58.9	93.50
		±5	±10.6	±20	±30.7	±11.34	±17.16	±7.5	±7.7	±8	±7	±4.5	±5.99
total day's intake with supplement	1230												
female		99[a]	172.6	149[a]	407.7[a]	155.84	188.96[a]	131.1[a]	91.0	94	96	55.4[a]	84.63
		±5	±10.8	±22	±55.1	±13.34	±18.21	±10.0	±9.3	±8	±7	±4.6	±9.05
male		95	214.4	137	417.2	138.76	182.66	125.9	108.8	114	117	59.0	101.96
		±5	±10.6	±21	±54.3	±13.14	±17.94	±9.8	±9.2	±8	±7	±4.5	±8.92
breakfast	1126												
female		13[a]	47.0	34	84.9[a]	37.70[a]	52.85[a]	20.7[a]	21.8	31	30	18.9[a]	24.79
		±2	±3.6	±6	±18.6	±5.49	±5.59	±3.6	±4.7	±3	±3	±2.4	±4.59
male		13	55.0	39	88.5	39.34	52.25	23.6	29.8	36	36	20.3	32.48
		±2	±3.5	±6	±18.3	±5.40	±5.50	±3.5	±4.6	±3	±3	±2.4	±4.51
lunch	1213												
female		30	52.1	41[a]	53.4[a]	37.17	48.69	30.1[a]	20.1	41	29	14.2[a]	20.65
		±2	±4.9	±10	±10.7	±4.27	±6.38	±3.8	±2.8	±4	±2	±1.6	±1.90
male		28	63.2	34	60.5	30.24	42.95	30.4	24.5	49	34	13.8	23.32
		±2	±4.8	±10	±10.5	±4.20	±6.29	±3.7	±2.8	±4	±2	±1.6	±1.87
dinner	1196												
female		30[a]	55.5	37[a]	51.9	40.00[a]	41.14[a]	38.5[a]	21.1	19	24	14.2[a]	23.72
		±3	±6.5	±16	±14.1	±7.49	±9.39	±4.2	±3.5	±4	±3	±2.4	±2.46
male		28	72.9	36	64.5	38.07	39.85	38.3	27.8	26	31	16.0	28.88
		±3	±6.4	±16	±13.9	±7.38	±9.25	±4.2	±3.5	±4	±3	±2.4	±2.4
snacks	1103												
female		19[a]	21.9	16[a]	57.1[a]	16.29[a]	30.36[a]	16.3[a]	10.3	16	16	10.2[a]	9.54[a]
		±3	±5.3	±5	±15.3	±5.52	±11.63	±3.8	±3.7	±4	±4	±2.0	±2.46
male		19	29.4	14	62.3	15.53	36.48	16.9	13.9	21	19	10.9	11.26
		±3	±5.2	±5	±15.1	±5.42	±11.43	±3.7	±3.7	±4	±4	±2.0	±2.42

[1]Superscript a indicates nonsignificant difference between means.

[2]For breakfast, lunch, dinner, and snacks, includes only those who reported eating each meal.

thiamin for total day's intake with supplement ($P \leq 0.01$) and riboflavin ($P \leq 0.05$) and thiamin ($P \leq 0.001$) at lunch. The mean percentages of RDA for vitamin B_6, calcium, and phosphorus were higher ($P \leq 0.001$) for boys than girls at each meal and for snacks. Magnesium intake expressed as a percentage of the RDA showed no significant differences between girls and boys. Boys had a higher mean percentage of RDA for iron for the total day with and without supplements and at breakfast ($P \leq 0.001$), lunch ($P \leq 0.01$), and dinner ($P \leq 0.001$).

Analysis of Lunch Intakes by Source of Meal. The nutrient goal recommended by the USDA is to provide approximately one-third of the RDA for 10-12 year-old children (56). Over 80 per cent of the Kansas fifth grade students ate lunch at school and about 20 per cent reported lunch from other sources (refer to Table 44). The least square means and standard errors for energy and nutrient intakes and percentages of RDAs at lunch by source of meal for Kansas fifth grade students are listed in Table 51. F ratios are listed in a table in Appendix BB. Students' intakes of vitamin B_6, magnesium, and iron were less than one-third of the RDA, regardless of source of lunch.

Energy consumed at school lunch was slightly less than the recommended one-third of the daily allowance. This was not a concern, however, because of the relatively high level of energy consumed from snacks and other meals. Students who ate school lunch had significantly higher intakes of vitamin B_6 and iron than those eating lunch from another source; although magnesium intakes were significantly higher for nonparticipants. In a national study Murphy et al. (57) analyzed the nutrient composition of school lunches and found that magnesium and iron

Table 51: Least squares means and standard errors for energy and nutrient intake and percentages of Recommended Dietary Allowances at lunch by source of meal for Kansas fifth grade students (N = 1274)[1]

	intake by source of lunch		% RDA by source of lunch	
	school lunch	other source	school lunch	other source
	least squares means and std. dev.			
energy, kcal	750 ±11	803 ±24	31 ±0	33 ±1
protein, gm.	29.2 ±0.4	27.3 ±10.0	64.4[a] ±1.0	60.2[a] ±2.2
fat, gm.	33.3 ±0.7	37.9 ±1.6		
carbohydrate, gm.	86.6 ±1.2	93.1 ±2.7		
vitamin A, I.U.	1665 ±81	1442 ±178	37[a] ±2	33 ±4
ascorbic acid, mg.	25.8 ±1.1	24.0 ±2.3	51.7[a] ±2.1	48.0 ±4.6
thiamin, mg.	0.43 ±0.01	0.45 ±0.02	34.42[a] ±0.87	36.87 ±1.91
riboflavin, mg.	0.78 ±0.02	0.71 ±0.04	54.30[a] ±1.26	49.47 ±2.76
niacin, mg.	4.7 ±0.1	6.4 ±0.3	28.5 ±0.7	38.2 ±1.6
vitamin B_6, mg.	0.5 ±0.0	0.4 ±0.0	27.7 ±0.6	23.2 ±1.2

[1]Data presented by source of lunch only; intakes of females and males are included in Table 125. Includes data for only those students who reported eating lunch.

[a]Indicates nonsignificant differences.

Table 51: (cont.)

	intake by source of lunch		% RDA by source of lunch	
	school lunch	other source	school lunch	other source
	least squares means and std. dev.			
calcium, mg.	450 ±7	360 ±15	56 ±1	45 ±2
phosphorus, mg.	433 ±6	400 ±13	36 ±0	33 ±1
magnesium, mg.	49.2 ±1.0	55.3 ±2.2	15.2 ±0.3	17.0 ±0.7
iron, mg.	4.18 ±0.07	3.77 ±0.15	23.44 ±0.39	21.01 ±0.85

were among the nutrients that did not meet the nutritional goal set by the USDA of meeting one-third of the Recommended Dietary Allowances.

Also, there were higher percentage intakes in relation to RDAs for protein, vitamin A, ascorbic acid, riboflavin, calcium, and phosphorus in lunch consumed at school than from other sources. The differences for protein, vitamin A, ascorbic acid, thiamin, and riboflavin were not significant.

The lunch patterns of Massachusetts school children studied by Callahan (58) showed those purchasing the Type A meal were eating more nutritious lunches than those who ate at home or brought sack lunches. More children who ate lunch at school in the nutritional investigation of 642 fifth and sixth grade students in New York (13) had diets rated as excellent and had significantly better lunches than those eating lunch at home or elsewhere.

Analysis of Percentage of Calories from Fat. The mean, standard deviation, and coefficients of variation for percentage of calories from fat in the total day's and lunch intakes of Kansas fifth grade students from 24-hour dietary recall interviews are listed in Table 52. Individual differences among the students accounted for 90.99 and 67.13 per cent of the variation in the two variables, respectively (Appendix BB). The mean percentage of calories from fat consumed in the total day's meals (without supplements) was 38.7 per cent and at lunch 39.2 per cent.

Analysis of variance (Appendix BB) indicated there were no significant differences based on sex or place of residence for fat consumed for total day and lunch. There was however, a lower intake of fat ($P \leq 0.001$) consumed at school lunches than in lunches not consumed at school (Table 53). The National Research Council (53) recommends total fat intake,

Table 52: Means, standard deviations, and coefficients of variation for per cent fat in total day's and lunch energy intake of Kansas fifth grade students (N = 1283) from 24-hour dietary recall interviews

	mean	standard deviation	coefficient of variation
	%		%
total day's meals (excluding supplements)			
fat, gm.	38.7	6.9	18
lunch			
fat, gm.	39.2	8.1	21

Table 53: Least square means and standard errors for per cent of fat from total day's and lunch of Kansas fifth grade students from 24-hour dietary recall interviews

	sex		source of lunch	
	female	male	school lunch	other source
	%		%	
total day's meals (excluding supplements)				
fat, gm.	40.0 ±1.1	40.0 ±1.1	38.6 ±0.2	39.0 ±0.5
lunch				
fat, gm.	39.6 ±1.5	40.4 ±1.4	38.8 ±0.3	41.3 ±0.6

particularly in diets below 2,000 kcal, should be not more than 35 per cent of dietary energy.

Evaluation of Dietary Intakes by Levels of RDA. The daily energy and nutrient intake for the fifth grade students were classified using the following five categories:

Intake of -

$\geq$ 125% of the RDA

100 to < 125%

66 to < 100%

50 to < 66%

< 50%

Frequency distributions were compiled to determine the percentages of students with dietary intakes in each of the RDA levels defined. These distributions were compiled for energy and eleven nutrients (protein, vitamin A, ascorbic acid, thiamin, riboflavin, niacin, vitamin B_6, calcium, phosphorus, magnesium, and iron). In Table 54, data are presented for students' intakes from food (i.e., breakfast, lunch, dinner, and snacks) on the day of the 24-hour dietary recall. In Table 55, distributions of students with intakes from meals plus nutrient supplements at the various RDA levels are presented. Discussion is centered on Table 55 since those data represent total nutrient intake.

Over 80 per cent of the girls (82.2 per cent) and boys (83.1 per cent) interviewed met or exceeded two-thirds of the RDA for energy. Energy intake exceeded 125 per cent of the RDA for 15.9 per cent of the girls and 20.3 per cent of the boys. Very low (< 50 per cent of the RDA) energy intakes were consumed by 4.2 per cent and 2.2 per cent of the girls and boys, respectively.

Table 54: Percentages of Kansas fifth grade students consuming selected levels of Recommended Dietary Allowances from breakfast, lunch, dinner, and snacks

	level of RDA intake[1]				
	≥ 125%	100 to < 125%	66 to < 100%	50 to < 66%	< 50%
energy					
female	15.9	27.6	42.6	9.6	4.2
male	20.3	24.9	42.0	10.7	2.3
protein					
female	85.3	8.1	5.1	1.0	0.4
male	93.5	4.9	1.4	0.2	0.0
vitamin A					
female	44.4	15.2	21.3	9.5	9.6
male	48.8	12.0	20.1	8.8	10.4
ascorbic acid					
female	59.0	5.6	12.9	7.4	15.2
male	60.4	7.7	14.0	6.5	11.3
thiamin					
female	40.4	19.4	28.9	7.1	4.5
male	42.4	22.0	27.3	5.9	2.7
riboflavin					
female	60.4	11.9	14.6	2.6	1.6
male	74.5	11.2	11.2	1.8	1.4
niacin					
female	21.3	16.7	38.1	14.4	9.5
male	29.4	20.6	33.0	10.5	6.5
vitamin B_6					
female	18.9	15.6	29.1	14.6	21.8
male	30.1	17.5	29.7	10.0	12.6
calcium					
female	36.2	19.2	22.0	10.4	12.0
male	52.0	14.7	20.3	6.1	7.0

[1] Percentages of Recommended Dietary Allowances, 1980 (67).

Table 54: (cont.)

	level of RDA intake				
	≥ 125%	100 to < 125%	66 to < 100%	50 to < 66%	< 50%
phosphorus					
female	38.6	18.0	27.5	8.1	7.8
male	54.6	18.0	20.6	4.3	2.6
magnesium					
female	3.9	5.1	25.2	21.5	44.3
male	6.7	8.6	27.1	19.8	37.8
iron					
female	16.5	14.6	29.7	18.3	20.9
male	30.1	13.7	31.4	13.6	11.2

Table 55: Percentages of Kansas fifth grade students consuming selected levels of Recommended Dietary Allowances from all meals and supplements

	level of RDA intake[1]				
	≥ 125%	100 to < 125%	66 to < 100%	50 to < 66%	< 50%
energy					
female	15.9	27.6	42.6	9.6	4.2
male	20.3	24.9	42.0	10.7	2.2
protein					
female	85.3	8.1	5.1	1.1	0.5
male	93.5	4.9	1.4	0.2	0.0
vitamin A					
female	55.4	14.3	16.2	6.6	7.5
male	56.0	12.4	17.2	6.2	8.1
ascorbic acid					
female	73.1	4.2	8.6	4.4	9.8
male	73.5	5.1	9.2	4.2	8.0
thiamin					
female	55.3	13.7	21.6	6.0	3.4
male	53.1	18.2	21.8	5.1	1.8
riboflavin					
female	74.2	10.1	12.2	2.1	1.5
male	77.8	9.6	9.9	1.4	1.3
niacin					
female	40.7	14.0	27.2	10.7	7.5
male	43.4	17.7	25.5	8.4	4.9
vitamin B_6					
female	32.1	15.9	23.7	11.0	17.3
male	41.3	15.8	24.6	7.7	10.7
calcium					
female	36.5	18.9	22.5	10.4	11.7
male	52.0	15.0	20.1	5.9	7.0

[1]Percentages of Recommended Dietary Allowances, 1980 (67).

Table 55: (cont.)

	level of RDA intake				
	≥ 125%	100 to < 125%	66 to < 100%	50 to < 66%	< 50%
phosphorus					
female	38.6	18.0	27.5	8.1	7.8
male	54.6	18.0	20.6	4.3	2.6
magnesium					
female	3.9	5.1	25.2	21.5	44.3
male	6.9	8.6	27.0	19.8	37.8
iron					
female	20.4	13.8	28.2	17.6	20.0
male	32.7	13.6	30.0	12.9	10.8

Protein intakes of the Kansas fifth graders were quite high; 85.3 per cent of the girls and 93.5 per cent of the boys exceeded 125 per cent of the RDA for protein. Very few students had low protein intakes (i.e., < 66 per cent of the RDA), only 1.6 per cent of the girls and 0.2 per cent of the boys.

About two-thirds of the students met 100 per cent or more of the allowance for vitamin A, 69.7 per cent and 68.4 per cent of the girls and boys, respectively. About 15 per cent of the girls and boys had low intakes of vitamin A (< 66 per cent of RDA).

About three-fourths of the students had high intakes of ascorbic acid ($\geq$ 125 per cent of RDA), 73.1 and 73.5 per cent of the girls and boys, respectively. Between 12 and 14 per cent of the students, however, had low intakes of vitamin C (< 66 per cent of the RDA).

Of the four B vitamins studied (thiamin, riboflavin, niacin, and vitamin B_6), more students had lower intakes of niacin and B_6 than was true for riboflavin or thiamin. Only 3.6 per cent of the girls and 2.7 per cent of the boys had low intakes of riboflavin and 9.4 per cent of the girls and 6.9 per cent of the boys consumed low amounts of thiamin (< 66 per cent of the RDA). However, 28.3 per cent of the girls had low intakes of vitamin B_6, as did 17.7 per cent of the boys. Although niacin intakes were somewhat low for some of the students, with the high protein levels reported, niacin intake was probably sufficient because of tryptophan conversion.

More boys than girls (52.0 and 36.5 per cent, respectively) exceeded 125 per cent of the RDA for calcium and for phosphorus (54.6 for boys and 38.6 per cent for girls). Over 20 per cent of the girls (21.1 per cent) consumed less than 66 per cent of the RDA for calcium,

as did 12.9 per cent of the boys. The percentage of girls with low intakes of phosphorus was higher than was true for the boys (15.9 and 6.9 per cent, respectively).

The majority of the students (girls, 65.8 and boys, 57.6 per cent) did not meet two-thirds of the allowance for magnesium. About one-fourth of the students met 66 to 100 per cent (girls, 25.2 and boys, 27.0 per cent). The remainder had intakes of 100 per cent or higher.

Sizable numbers of students consumed relatively low levels of iron; this was particularly true for the girls. Almost 40 per cent of the girls had intakes (37.6 per cent) below 66 per cent of the RDA; only 34.2 per cent met or exceeded the RDA. Almost half of the boys (46.3 per cent) had iron intakes of 100 per cent of the RDA or higher; however, 21.7 per cent had low intakes (< 66 per cent of the RDA).

Evaluation of Dietary Quality by Levels of RDA. The analysis of variance and variance component estimates of a diet rating index of Kansas fifth grade students based on 24-hour dietary recall interviews are listed in Appendix BB. The means, standard deviations, and coefficients of variation of the diet rating index are listed in Table 56.

The diet rating index, adapted from Schafer (59), was a measure of overall diet quality based on the level of nutrient intake of six nutrients: protein, vitamin A, ascorbic acid, thiamin, calcium, and iron. A four-point scoring system was used for each nutrient:

1 = nutrient intake less than 50% RDA

2 = nutrient intake between 50% and less than 66% RDA

3 = nutrient intake between 66% and less than 100% RDA

4 = nutrient intake greater than or equal to 100% RDA

The overall quality of the diet was attained by the summation of scores

Table 56: Means, standard deviations, and coefficients of variation of diet rating index of Kansas fifth grade students based on 24-hour dietary recall interviews

index[1]	mean	standard deviation	coefficient of variation
			%
diet rating index (without supplements)	20.29	3.45	17
diet rating index (with supplements)	20.84	3.26	16

[1]Diet rating index = measure of overall diet quality based on level of nutrient intake of six nutrients (protein, vitamin A, ascorbic acid, thiamin, calcium, iron):

score	level of intake
4	$\geq$ 100%
3	66 to < 100%
2	50 to < 66%
1	< 50%

Index = Σ of nutrient scores.

for each of the six nutrients. A maximum score of 24 indicates that 100 per cent or more of the Recommended Dietary Allowance of each nutrient was met and the minimum score of 6, that less than 50 per cent of the RDA for all six nutrients was consumed. The index was compiled for the total nutrient intake with and without supplements, in order to assess intake from meals and snacks independent of vitamin, mineral, or other dietary supplements. The students' overall diet rating was similar for the total day's diet with and without supplements (Table 56).

F ratios for analysis of effects of sex, place of residence, and source of lunch on the diet rating index of the Kansas fifth grade students are listed in Appendix BB; the least square means and standard

errors are listed in Table 57. Males had a significantly higher rating than did the girls for the total day's nutrient intake both without and with supplements. Also, students eating lunch at school had diets with higher ratings than students who consumed lunch at another location, indicating that school lunch made a positive contribution to the overall diet.

Table 57: Least square means and standard errors for diet rating index of Kansas fifth grade students based on 24-hour dietary recall interviews

	sex		source of lunch	
index[1]	female	male	school lunch	other source
diet rating index (without supplements)	20.17 ±0.53	21.13 ±0.52	20.48 ±0.11	19.53 ±0.22
diet rating index (with supplements)	20.81 ±0.49	21.65 ±0.48	21.01 ±0.10	20.18 ±0.21

[1]Diet rating index = measure of overall diet quality based on level of nutrient intake of six nutrients (protein, vitamin A, ascorbic acid, thiamin, calcium, iron):

score	level of intake
4	≥ 100%
3	66 to < 100%
2	50 to < 66%
1	< 50%

Index = Σ of nutrient scores.

SUMMARY

The most important goal of nutrition education in elementary schools is to teach children to select diets that will enable them to achieve and maintain a good nutritional state. Nutritional status studies help to identify individuals at risk, those persons and groups whose nutrition should be improved.

As a part of the Kansas Nutrition Education and Training Program Needs Assessment Project a partial nutritional assessment of students in ninety-seven randomly selected elementary schools was conducted. Anthropometric data including height, weight, arm circumference and triceps skinfold were collected from 3,231 fifth grade students and a subsample of 1,309 were randomly selected to be interviewed for 24-hour dietary recalls.

Kansas girls and boys were taller and heavier than those in national studies. Compared to the Ten-State Nutrition Survey, Kansas girls and boys had larger arm circumferences and triceps skinfold measurements. These data, coupled with the tendency toward greater weight, suggest a higher incidence of overweight among Kansas children than among elementary children, nationally. However, findings should be interpreted with caution, since the Kansas sample also was somewhat taller than the national sample. In addition, muscle circumferences, calculated from arm circumferences and triceps skinfold measurements, were similar for Kansas boys but smaller for Kansas girls than their counterparts in the Ten-State Survey.

According to the 24-hour dietary recall interviews, Kansas fifth grade students rarely missed meals. Almost all of the students reported eating breakfast, lunch, and dinner (92, 99, and 97 per cent,

respectively). Also, most of the students (76 per cent) ate an afternoon snack, and 49 per cent consumed an evening snack. School lunch participation was high with 82.7 per cent eating school lunch on the day of the interviews.

School lunches provided higher percentages of the RDAs for protein, vitamin A, ascorbic acid, riboflavin, vitamin B_6, calcium, phosphorus, and iron than lunches carried from home or those from other sources. Snacks provided between 10 and 40 per cent of the RDAs for the nutrients analyzed.

Almost half of the girls and boys had calorie levels exceeding 100 per cent of the Recommended Dietary Allowances (RDA) (44.5 and 45.2 per cent respectively). Protein intakes were high with over 90 per cent consuming over 125 per cent of the RDA.

The majority of the students (girls, 65.8 and boys, 57.6 per cent) did not meet two-thirds of the allowance for magnesium and 37.6 per cent of the girls and 23.7 per cent of the boys did not meet two-thirds of the RDA for iron. More of the boys than girls exceeded 125 per cent of the RDA for calcium (52.0 and 36.5 per cent, respectively). Conversely, more girls than boys consumed low intakes of calcium (21.1 and 12.9 per cent, respectively).

Vitamin B_6 intake was the lowest of all of the B vitamins studied with 28.3 per cent of the girls and 18.4 per cent of the boys consuming less than 66 per cent of the RDA. Although vitamins A and C were consumed in adequate amounts by most of the students, between 12 and 15 per cent had low intakes of these two vitamins. Overall, boys had higher intakes of energy and nutrients than girls.

Data suggest that calorie control should be emphasized in nutrition education efforts among Kansas elementary children, since energy intakes tended to be high and weight of the Kansas students tended to be above the national norms. Intakes of iron, magnesium, calcium, and vitamin B_6 need to be increased for some children.

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APPENDIXES

APPENDIX A

Protocol Prior to On-Site Visits to Schools

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

PROTOCOL PRIOR TO ON-SITE VISITS TO ELEMENTARY SCHOOLS IN SAMPLE AND PROTOCOL FOR SURVEY OF TEACHERS AND FOODSERVICE PERSONNEL

1. School districts (USD's) and schools (N=105) were selected according to the sampling plan developed by the statistician on Project.

2. An introductory letter was sent to superintendents of school districts selected, which described the Needs Assessment Project purposes (assessment of nutrition knowledge and attitudes and dietary behavior of students, teachers, and foodservice personnel), procedures and sample groups (mail survey of elementary teachers and foodservice personnel and on-site data collection from fifth grade students), indicated school(s) selected in the district, and requested approval of Project in selected schools. A reply form was enclosed to indicate approval and to list names of principals at selected schools, along with a stamped and addressed return envelope.

3. Telephone calls were made, as needed, to nonrespondents to solicit reply and approval of Project. In two school districts, policies required that the Project be reviewed and recommended by the district research committee, prior to approval by the superintendent.

4. Acknowledgment letters were sent to school district superintendents who agreed to participate. If school(s) selected did not include fifth graders, another school within the district was selected according to the back-up sampling plan. Eight replacement schools were selected as a result. One school replacement was necessitated because the school selected had closed at the end of the 1978-79 school year.

5. If superintendent in a selected district declined approval, another district was selected according to the back-up sampling plan, with one exception, and steps 2 to 4 above were repeated. Superintendents in five USD's in the original sample refused approval of the Project; four were replaced. One large urban district, which included four sample schools, was not replaced because a comparable district was not available in the state. In one USD, the superintendent requested that a school be deleted which was forced into the sample initially because of a special health project being conducted there. The school was not replaced because a comparable replacement was not available.

6. Letters were sent to principals of selected schools in districts in which superintendents approved the Project, approximately four weeks

after the superintendents' letters were mailed. Other principal letters were mailed as superintendent approvals were received. The letter provided information on the Needs Assessment Project purpose and procedures (similar to that included in the superintendent letter), indicated superintendent's approval, and requested a list of all elementary teachers and foodservice personnel on staff at the school. The enclosed reply form also asked for the number of fifth graders, number of fifth grade classes, and information on type of foodservice (satellite or on-premise preparation). If food for the lunch program was prepared at another site, information on the place of preparation was requested along with the names of foodservice personnel at that site or the name of a person who could provide the names.

7. Telephone calls were made, as needed, to solicit reply of nonrespondents and to request information lacking from a school. Two replacement schools were selected according to the back-up plan because of school principals' refusals, even though the superintendent had granted approval for the USD to participate. A third refusal was received only one week before the Data Collection Phase was initiated. The school was not replaced because time did not permit planning for an additional school at this point in the Project. A total of 97 schools was included in the final sample of schools.

8. Acknowledgment letters were sent to principals which thanked them for their cooperation and for providing data requested.

9. Letters were sent to fifth grade teachers in schools from which principal replies had been received, approximately four weeks after the initial principal letters were mailed. Others were mailed as soon thereafter as principal replies were received. The letter described the Needs Assessment purpose and procedures, outlined the on-site visit, specified the type of data collection techniques for collecting data from fifth grade students (test of nutrition knowledge and attitudes and dietary practices; anthropometric measurements; and 24-hour dietary recall interviews) and indicated the type of assistance needed from the teacher. The letter also indicated district superintendent and school principal approvals, mentioned the survey form that would be sent to all elementary teachers at a later date, and requested that a roster of students be provided. A reply form for preparing the class roster and a stamped, addressed return envelope were enclosed.

   A sample copy of the letter sent to teachers was mailed to district superintendents and school principals.

10. Telephone calls were made, as needed, to school principals requesting rosters from nonresponding teachers.

11. Prior to on-site visits to collect data from fifth grade students, literature was reviewed and procedures were tentatively developed and revised through several stages. A consultant who was

experienced in nutritional assessment assisted the research team in selecting equipment for anthropometric measurements. He made recommendations for procedures to be used for measurements and also, for dietary recalls, and conducted a training session with the team.

Appropriate forms were developed for recording data from measurements and recalls. Several practice sessions were held to develop skill among the research team members in dietary recall and anthropometric measurement techniques. Children similar in age to those to be in the study sample volunteered to assist in the trials of procedures.

Literature on test instruments and numerous tests were reviewed prior to selection of tests to measure nutrition knowledge, attitudes, and dietary practices of fifth grade students, teachers, and foodservice personnel. The test tentatively selected for the students was pretested in fifth grade classes at two elementary schools prior to final selection. Instructions and response sheets for test administration were developed, then reviewed after each pretest.

Three pilot studies with a fifth grade class at three different elementary schools not in the sample were conducted after all procedures were developed to give the team experience in the methodology and to assist in revision of procedures. The protocol for the on-site visit was reviewed and revised after each pilot study. The revisions involved additional specification and detail of procedures primarily.

The adult version of the test which tentatively was selected for the teacher and foodservice surveys of nutrition knowledge and attitudes and dietary behavior was administered as a pretest to two groups of junior-senior level university students to establish construct validity. One group was knowledgable about nutrition and the other was not. Data indicated the test distinguished between the two groups. After these pretests, the tests were selected for use in the project. Response sheets were developed for teachers and foodservice personnel to respond to the test. The first two pages of each response sheet was for recording answers to items in the test booklets. Pages 3 and 4 were designed to provide biographical data and information on nutrition training and related issues.

12. Prior to the on-site visits, packets of tests and response sheets to collect data from all elementary teachers and foodservice personnel in the participating schools were distributed. The packets for all personnel at a school were sent to the school principal for distribution.

    A transmittal letter to the principal explained the survey objective and asked that he/she distribute the packets to the school staff. The packet included a cover letter which explained the study and gave instructions for response, a test booklet (foodservice personnel or teacher edition), a response sheet, and an addressed, stamped envelope for return of the completed response sheet. Yellow and blue response sheets were used for foodservice personnel and

teachers, respectively. The response sheets were prenumbered with a code number for purposes of follow-up of nonresponses.

Forms were developed for recording code numbers of response sheets, distribution dates of test packets, receipt of response sheets, and follow-up mailings (a yellow form for foodservice personnel records and blue for teacher records). One yellow form and one blue form were prepared for each school.

In schools in which food was not prepared on site, packets were distributed to foodservice personnel at the school as described. Packets also were distributed to personnel at the base or central kitchen where food for the sample school was prepared. The district foodservice director or another appropriate person was identified in these school districts and contacted by phone to solicit assistance in distributing packets. The packets were sent to the contact person for distribution, along with a cover letter describing the project and giving instructions for distribution. The packet for foodservice employees in these kitchens included a slightly different letter, explaining the rationale for including them in the project. A yellow form was prepared for each base or central kitchen for recording distribution of test packets.

13. When the response sheets were returned by the teachers and foodservice personnel to the Project Coordinator, they were removed from the envelopes, separated according to the type of respondent (teacher or foodservice employee), arranged sequentially according to ID number, reviewed for completeness, and recorded on the teacher or foodservice distribution form. In the event that any section(s) of the response sheet was incomplete, a follow-up letter and the unanswered section of the response sheet were mailed to the respondent for completion. A response sheet from which the ID number had been removed was treated as a non-response. Between three and four weeks following the initial mailing, a follow-up letter was sent to all nonresponding teachers and foodservice personnel encouraging reply. An additional response sheet and a stamped, addressed envelope were enclosed to facilitate response. The letter requested that the individual notify the researchers if another test booklet were needed.

14. A tentative schedule of on-site visits to participating schools was planned, taking into consideration the following:

    a. geographic location of schools;
    b. size of schools--especially, number of fifth graders, and number of fifth grade classes;
    c. length of school day;
    d. minimum time for data collection;
    e. estimated travel time between schools; and
    f. day of week.

Visits were planned to begin January 29 and end, May 14. The schedule was planned to visit schools in the eastern part of Kansas in the early part of Phase 2 of the Project, the Data Collection

Phase, because distances from the University were shorter. Possible travel difficulties because of inclement weather were anticipated. Visits to the western part of the state were planned for the latter part of Phase 2. These visits require greater distances for travel. Also, as recommended in the literature, data collection was not planned on Mondays because 24-hour dietary recalls are often atypical on weekend days.

Based on pilot study, it was determined that a minimum of 2½ hours would be required in most schools to administer the test to all fifth grade students, take anthropometric measurements of all fifth graders, and conduct dietary recall interviews with a selected sample of students. A maximum of two schools, therefore, could be scheduled on one day, because of the minimum time requirement, length of school day, and need for travel time between schools. In schools with three or more fifth grade classes and 70 or more students, an entire day was planned. Also, an entire day was required for visits to a few schools in isolated areas because of travel time required between locations. It was determined an entire day was needed at 21 of the 97 participating schools. A total of 59 to 60 data collection days was projected.

15. Based on the tentative schedule, telephone calls were made to principals of participating schools to establish dates of the on-site visits. Revisions in the schedule were made as needed. Information provided by the principals, which necessitated adjustments in the schedule, included the following:

    a. dates of district spring breaks and holidays;
    b. dates of parent conference and staff in-service education days;
    c. special aspects of the school schedule (e.g., time of lunch periods, music, physical education, and/or recess);
    d. dates of statewide teachers meetings.

16. Within one to four weeks following the telephone calls establishing the date of the on-site visit, the principal was mailed a letter of confirmation of the date. The letter also identified the research team, explained the additional steps preceding the on-site visit, reviewed the general procedures, and identified the special requirements of the on-site visit (space and chairs needed, time requirement, etc.).

    A copy of the principal letter and a transmittal memorandum were sent to the district superintendents to inform them of the scheduled date.

    Weekly schedules were prepared.

17. Approximately three to four weeks prior to the scheduled on-site visits,[1] a packet was sent to each school principal which included parent consent letters. The packet included: (a) a transmittal letter to the principal, (b) a letter to each fifth grade teacher in the school, (c) a roster for each fifth grade class in the school with names of all students in the class listed for the teacher to use in recording receipt of parent consent forms, and (d) a parent letter and consent form for each student in each teacher's class with the students' names indicated on letters.

    The principal letter reviewed the purpose of the parent consent procedure, asked principals to encourage student participation and parental approval, and requested that the principal give the materials to appropriate teachers in the school and ask teachers to distribute the parental letters to students to take home for signatures.

    The teacher letter reviewed the purpose of the parent consent procedure, requested that the teacher distribute forms to students to take home to parents, then hold the forms to give to the research team at the time of the on-site visit.

    The parental consent letter briefly described the Needs Assessment Project, included a statement of informed consent, and encouraged the parents or guardians to permit their children to take part. A consent form to be signed and returned to the teacher was attached.

    Sample copies of the principal, teacher, and parent letters were sent to the district superintendents with a transmittal memorandum.

18. A final mailing was (or will be) sent to each school one week to ten days prior to the on-site visit to provide final instructions to the principals and fifth grade teachers. The letter to the principals repeats the established date of the on-site visit, reviews the general procedures and requirements of the visit, and asks that the principals distribute letters to the fifth grade teachers at their schools and encourage the teachers to follow the instructions carefully.

    The teacher letter repeats the date of the visit, identifies the research team, reminds the teachers about the parental consent procedure and forms, reviews the project procedures, asks that the teachers encourage student participation, and includes a standard statement to be used in introducing the study to students in their classes.

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[1] Because of time constraints, the packets were mailed one to two weeks in advance of visits to schools scheduled for on-site visits during the first three weeks of the Data Collection Phase.

A sample copy of the teacher letter and a copy of the principal letter were (or will be) sent to the district superintendents with a transmittal memorandum.

19. Within one week after the on-site visit to each school, "thank you" letters were (or will be) mailed to the district superintendent, school principal, and each fifth grade teacher.

APPENDIX B

Sampling Plan Information

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

Sampling Plan

	Kansas Board of Education Districts (BED)									
	1	2	3	4	5	6	7	8	9	10
Kansas Education District Data[1]										
Number of USD's[2] in each BED	4	6	23	42	70	48	41	20	37	16
Number of elementary schools in each BED	54	75	74	147	154	143	126	59	115	111
Per cent of total Kansas elementary schools	5.1	7.1	7.0	13.9	14.6	13.5	11.9	5.6	10.9	10.5
Total number of elementary students in each BED	17,534	26,845	17,546	32,571	25,856	25,252	21,623	14,800	23,383	32,484
Total number of 5th graders in each BED	2,922	4,474	2,924	5,428	4,309	4,208	3,603	2,466	3,897	5,414
Per cent of total 5th graders in Kansas	7.4	11.3	7.4	13.7	10.9	10.6	9.1	6.2	9.8	13.7
NETP Needs Assessment Sampling Data										
Total number of schools sampled in each BED	5	7	7	14	15	14	12	6	11	10
Total number of USD's sampled	2	3	6	11	11	11	10	5	10	4
Total number of 5th graders sampled in each BED	353	506	280	615	563	580	678	246	245	764
$\frac{\text{5th graders sampled in BED}}{\text{Total 5th graders in BED}} = \%$	12.0	11.3	9.6	11.3	13.1	13.8	18.8	10.0	13.9	14.1
$\frac{\text{5th graders sampled in BED}}{\text{Total 5th graders in state}} = \%$	6.9	9.9	5.5	11.9	10.9	11.3	13.2	4.7	10.6	14.9

[1]Based on information extracted from the Kansas Educational Directory, 1978-79.

[2]Unified School District.

Sampling Plan (cont.)

	Kansas Board of Education Districts (BED)									
	1	2	3	4	5	6	7	8	9	10
Kansas Education District Data[1]										
Total number of kindergarten teachers in each BED	58	80	26	56	32	47	37	17	26	101
Total number of elementary teachers in each BED	767	1,777	310	658	445	659	412	257	349	1,477
NETP Needs Assessment Sampling Data										
Number kindergarten teachers in sampled schools	5	10	6	17	16	17	10	6	10	18
Number elementary teachers in sample in each BED	102	148	89	186	230	208	131	93	174	271
$\frac{\text{Number kindergarten teachers sampled in BED}}{\text{Total number kindergarten teachers in BED}} = \%$	8.6	12.5	23.0	30.4	50.0	36.2	27.0	35.3	38.5	17.8
$\frac{\text{Number elementary teachers sampled in BED}}{\text{Total number elementary teachers in BED}} = \%$	13.3	8.3	28.7	28.3	51.7	31.6	31.8	36.2	49.9	18.4

[1]Based on information extracted from the Kansas Educational Directory, 1978-1979.

APPENDIX C

Changes in the Sampling Plan

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
January 15, 1980

CHANGES IN THE SAMPLING PLAN

School in original sample	USD	Replacement school	USD	Reason
Lakeview Elementary (Hutchinson)	308	Lincoln Elementary (Hutchinson)	308	Lakeview Elementary closed at end of 1978-79 school year
Halstead Elementary (Halstead)	440	Haviland Elementary (Haviland)	474	Halstead refused to participate
Kennedy Elementary (Hays)	489	Lincoln Elementary (Hays)	489	Kennedy refused to participate
Gardner Elementary (Gardner)	231	Edgerton Elementary (Edgerton)	231	Gardner did not include fifth graders
Hillsboro Elementary (Hillsboro)	410	Durham Elementary (Durham)	410	Hillsboro did not include fifth graders
Countryside Elementary (Inman)	448	Inman Elementary (Inman)	448	Countryside did not include fifth graders
Jefferson County North (Winchester)	339	Jefferson County North Middle (Winchester)	339	Jefferson County North did not include fifth graders
Kansas City	500	NOT REPLACED		Refused to participate. No comparable replacement available
Roosevelt Elementary (Newton)	373	Santa Fe Middle School (Newton)	373	Roosevelt did not include fifth graders
Sunset Elementary (Newton)	373	Chisholm Middle School (Newton)	373	Sunset did not include fifth graders
Burlington Lower Elementary (Burlington)	244	Burlington Upper Elementary (Burlington)	244	Burlington Lower Elementary did not include fifth graders
Andale School (Andale)	267	Conway Springs Elementary (Conway Springs)	356	Andale refused to participate

School in original sample	USD	Replacement school	USD	Reason
Simpson Elementary (Russell)	407	Bickerdyke Elementary (Russell)	407	Simpson did not include fifth graders
Trailwood Elementary (Shawnee Mission)	512	NOT REPLACED		Refused to participate; school with special health project; no comparable school available
Stockton Elementary (Stockton)	271	Tescott Elementary (Twin Valley)	240	Stockton refused because they are involved in Iowa field test project
Highland Park Elementary (Topeka)	501	McCarter Elementary (Topeka)	501	Highland Park refused to participate
Winfield Elementary (Winfield)	465	Clearwater Grade School Annex (Clearwater)	264	Winfield refused to participate

APPENDIX D

Procedures and Forms for Anthropometric Measurements

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

METHODS FOR ANTHROPOMETRIC MEASUREMENTS[1]

I. HEIGHT: (Record in centimeters)

A. Instrument:

Height measuring apparatus (specially constructed portable, height measuring apparatus)

B. Accuracy check:

Use a 100 centimeter metric rule to check the accuracy of the height board after it is set up for measurement.

C. Procedure:

1. The subject should stand on the outline of feet attached to the horizontal platform against the measuring board. The individual stands with heels and back in contact with the board, without shoes, looking directly forward and head held straight.

2. A right angle board (or leveler) is slid down the height board until the bottom surface touches the subject's head. The subject is told to look straight ahead and stretch to maximum height, leaving heels together firmly on the platform and the toes at a slight angle.

3. Reading taken to the nearest tenth of a centimeter, while holding the right angle board which touches the subject's head firmly against the measuring board.

II. WEIGHT: (Record in pounds and ounces to be converted to kilograms by computer)

A. Instrument:

Accu-Weigh bench scale

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[1]For all measurements, the research assistant taking measurements should report the reading loudly enough to be heard by the recorder. The recorder should repeat the measurement outloud as the reading is recorded, as an accuracy check. Also, both should check subject name to be sure data are being recorded on the correct data form.

B. Accuracy check:

After transporting, check scales using standard weights. Unlock and position scale for weighing. Weigh three, 25 pound weights adding them one at a time. Record weights. Adjust scale if needed.

C. Procedure:

Weigh subjects in indoor clothing, less jackets, sweaters, and footwear. CHECK POCKETS FOR ARTICLES. Reading taken to the nearest ounce.

III. UPPER ARM CIRCUMFERENCE: (Record in millimeters)

A. Instrument:

Lufkin steel measuring tape

B. Procedure:

1. Subject stands with left arm flexed 90^{o}. Measurement is taken at the midpoint between the left shoulder (tip of the acromion process) and the elbow (tip of the olecranon process).

2. With the left arm flexed at 90^{o}, determine the midpoint of the upper arm using a string with a knot at one end. Place the knot on the tip of the acromion process and measure to the tip of the olecranon process. Fold the length of string in half, insert a felt point pin in loop, mark midway point on upper arm.

3. Measure with the tape in a horizontal plane in light contact with the skin. The arm should hang relaxed and just away from the side. Shirts must be taken off or sleeves rolled up.

4. Reading is taken to the nearest tenth of a centimeter. If shirt or blouse cannot be pushed up to shoulder, measure length of upper arm over clothing; then, if possible, push sleeve up to measure circumference and skinfold. If sleeve cannot be pushed up or rolled above midpoint, measure over clothing.

IV. TRICEPS SKINFOLD: (Record in millimeters)

A. Instrument:

Lange skinfold caliper

B. Standardization of caliper:

Before any measurements are taken at each school, check each caliper with the metal block. Record readings for each caliper.

C. Standardization of procedure:

At least monthly, the procedures of each member of the research team will be observed and checked by a specialist in anthropometric measurement.

D. Procedure:

1. The triceps skinfold is measured midway between the shoulder (tip of the acromion process) and the elbow (tip of the olecranon process) of the left arm, the crest of the skinfold being parallel to the long axis of the arm. It is critical that the midpoint be located because of the gradation of subcutaneous fat thickness from elbow to shoulder.

2. The arm of the subject should hang freely and relaxed when the skinfold measurement is taken. The skinfold (long axis vertical) is picked up between thumb and forefinger about 1 cm above the level marked on the skin and directly in line with the point of the elbow or olecranon process. Care is necessary to avoid lifting muscle tissue with the skinfold on some subjects. To be sure the muscle is not being grasped in the skin "pinch," the researcher should ask the subject to push his/her hand against the researcher's hand, then to relax the muscle for the measurement with the caliper.

3. The caliper jaws are applied at exactly the level marked. The long axis of the caliper must be vertical. The measurement is read at approximately one or two seconds after the full pressure of the caliper jaws is applied to the skinfold. If a longer interval is allowed, the jaws may "creep" and the reading will be inaccurate.

4. Reading taken to the nearest half (5/10) of a millimeter. Two readings should be taken on each subject; if the two readings are not the same, a third reading is taken. Measure and record thickness of fabric if measurement must be taken over clothing.

SET-UP AND OPERATING INSTRUCTIONS[1,2]

1. Unpacking of Scale

Place scale upside down and remove the two rubber shipping wedges inserted on each side of the fulcrum lever to prevent damages during transit. Turn scale right side up and remove all shipping wires which are used to secure the main sliding weight and beam locking device. Release beam locking device by pushing lever (A) towards the back of the scale.

2. Zero Adjustment

Prior to checking the zero adjustment, make sure that all sliding weights have been moved to the extreme left-hand side position on their respective rods. Normally, all *Accu-Weigh Bench Beam scales are equipped with three sliding weights (B), (C) and (D). Some models are equipped with an extra graduated beam (L) with an additional sliding weight (M). Once all sliding weights have been moved to their extreme left-hand side position, the beam tip indicator (E) should line up with the fixed indicator (F). A slanted mirror device (G) facilitates viewing of the relative position of the beam tip indicator and the fixed indicator while eliminating the need to stoop down.

If the beam tip indicator is not exactly lined up with the fixed indicator, a zero adjustment is necessary.

The zero adjustment device (H) is located on the left-hand side of the beam assembly. This device, which looks like a small tube, contains a small weight which can be moved from the left to right by use of a screwdriver. Access to this adjustable weight is on the left-hand side opening of the zero adjustment device (J). Keep in mind that zero adjustment should be made a little at a time until the beam tip indicator and the fixed indicator are in exact alignment.

3. Weighing of Unknown Quantities

Place product to be weighed on platform. Move main sliding weight (B) to the right until the beam assembly drops down. Then move the main sliding weight back by one notch. If, at this point, the beam tip indicator (E) and the fixed indicator (F) are lined up, read the weight from the number located immediately under the notch where the main sliding weight is sitting. It is not necessary to move the other sliding weights. If the indicators (E) and (F) are not in alignment at this point, slide the secondary weight (C) to the right, a little bit at a time, until the indicators (E) and (F) are lined up. The total weight is the addition of the weight values indicated by the main and secondary sliding weights.

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[1] Bench beam scale, Accu-Weigh Model 300T, Metro Equipment Corporation, Sunnyvale, California.

[2] A diagram of the scale is included following these instructions. Parts of the scale are labeled with alphabetic codes used in these instructions.

4. Verification of Pre-Determined Weight

Slide the main and secondary weight to the pre-determined weight of the product. Then place the product on the platform and check if the indicators (E) and (F) are lined up or not. If the beam tip indicator (E) is higher than the fixed indicator (F), the product is heavier than its pre-determined weight. Conversely, if the beam tip indicator (E) is lower than the fixed indicator (F), the product is lighter than its pre-determined weight.

5. Use of Tare

When goods are weighed within a container, and NET weight needs to be determined, the weight of the empty container needs to be compensated PRIOR to weighing of the product.

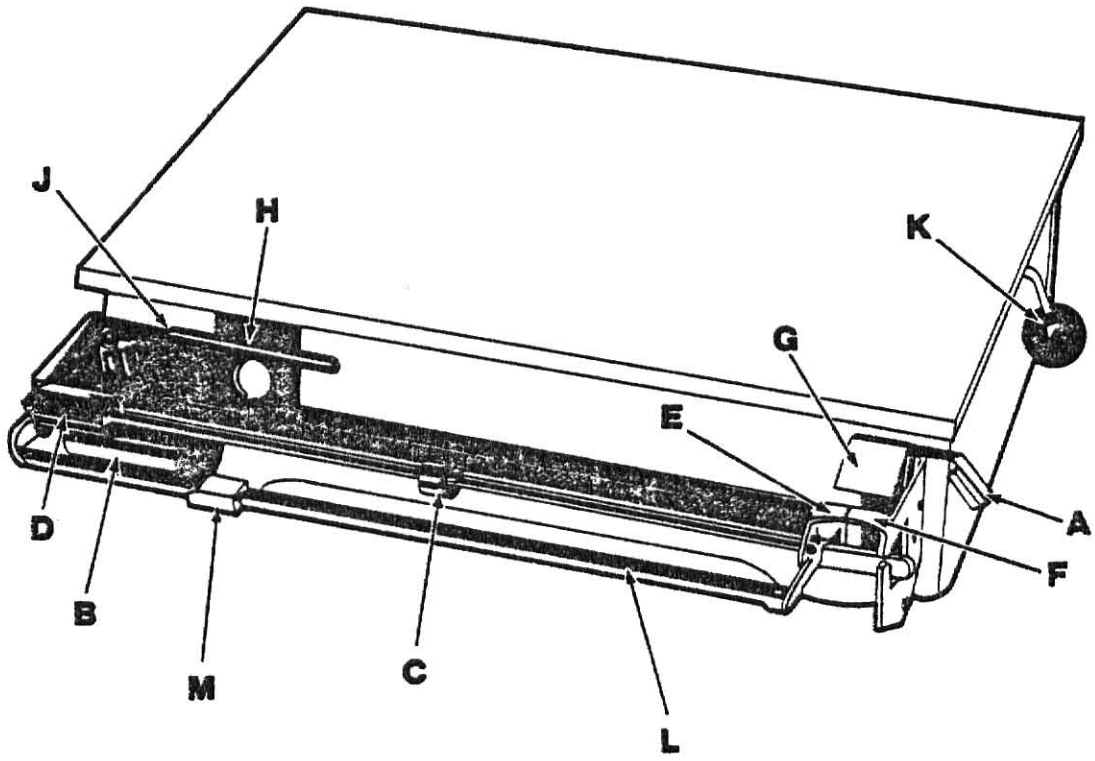
Place the empty container on the platform. Slide the tare weight (D) toward the right, a little bit at a time, until the indicators (E) and (F) are lined up. After the product has been placed inside the container, proceed to determine its weight as explained above under paragraph 4. The weight indicated by the addition of the weight values shown by the main and secondary weights will be the NET weight of the product.

6. Maintenance

*Accu-Weigh Bench Beam scales are relatively simple weighing devices which require virtually no maintenance. However, care should be exercised to avoid over-loading, shock-loading and any other conditions that might tend to damage the internal weighing mechanism. Periodically, check under the scale to make sure that no foreign object might have slipped under the weighing mechanism and interfere with the free movement of the lever system.

7. Lever and Platform Locking Device

Some models are equipped with a lever and platform locking device. The locking handle is located on the right-hand side of the platform. If the scale needs to be moved from one location to another, be sure to lock both the beam locking device (A) and lever and platform locking device (K).



Bench beam scale, Accu-Weigh Model 300T, Metro Equipment Corporation, Sunnyvale, California.

SCHOOL _____

ANTHROPOMETRIC MEASUREMENTS

NAME _____ NUMBER _____

ETHNIC GROUP _____

HEIGHT _____ cms.

WEIGHT _____ lbs. _____ oz.

TRICEPS SKINFOLD:

READING #1 _____ mm.

READING #2 _____ mm.

READING #3 _____ mm.

UPPER ARM CIRCUMFERENCE _____

February 22, 1980

Dear

For our nutrition education project in progress in selected Kansas elementary schools, our research assistants need to have their skinfold measurement techniques checked for accuracy. We need a group of children, who are near the same age as the children in our study, to help us check their measuring techniques.

Would you be willing to be one of our subjects for this accuracy check? If so, would you let the research assistants take your arm circumference and skinfold measurements in Laboratory 5 in the Natatorium on the KSU campus on the following dates:

Monday, March 3, 1980 4:30 p.m.
Friday, April 11, 1980 1:30 p.m. (Teachers meeting: no school)

We would appreciate it if you would wear a short sleeve T-shirt for the measurements.

If you need transportation to and from the Natatorium on those days could you let us know and we will pick you up at school or at your home on Monday, March 3, and at your home on Friday, April 11.

We would greatly appreciate your help.

Sincerely,

Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and Nutrition

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics, Restaurant and Institutional Management

ns

April 1, 1980

Dear

It will soon be time for the research assistants on our nutrition education project to check their arm circumference and skinfold measurement techniques for accuracy again. We hope you are willing to be one of our subjects for the second accuracy check.

We will plan to meet in Laboratory 5 in the Natatorium on the KSU campus on

Friday, April 11, 1980, 1:30 p.m. (Teachers meeting: no school)

We would appreciate it if you would wear a short sleeve T-shirt for the measurements. In addition would you wear, or bring with you, a sweater or a sweat shirt. We need to take some measurements over clothing in order to determine how much should be added when clothing cannot be removed.

If you need transportation to and from the natatorium on April 11th please let us know and we will pick you up at your home. Our telephone number is 532-6966.

We appreciate your help.

Sincerely,

G. Kathleen Newell

G. Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and Nutrition

Allene G. Vaden

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics, Restaurant and Institutional Management

ns

APPENDIX E

Procedures and Forms for Dietary Recall Interviews

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

GUIDELINES FOR DIETARY RECALL INTERVIEWS

1. Some Do's and Don'ts for Interviewers

   a. Do be friendly, but gently firm, when you ask your questions.

   b. Do try to obtain the desired information as quickly as possible, but do not hurry the child at any time.

   c. Do express confidence at all times in the information being supplied by the child. Do not show surprise verbally or by facial expressions concerning anything said or done by the child.

   d. Do avoid expressing approval or disapproval of any food/beverage reported by the child.

   e. Do ask general questions to help the child remember what he/she has eaten but do not ask questions that suggest specific foods eaten.

2. Guidelines for Interviewing Children

   a. Introduction. Put the child "at ease." Talk about non-food items until he or she is comfortable with you. You might ask about a recent vacation, or his/her day or favorite T.V. show. A few minutes will probably be long enough to establish this relationship. Begin by asking the general questions on the first page of the recall form. Then explain that you want to record all the foods the child has eaten for the last 24 hours. Follow Procedure for the Interview for format of interview.

   b. Sequence of Interview.

      (1) If the interview takes place in the morning, first ask the child about foods eaten that morning, then the foods eaten on the previous day. Progress backward timewise to approximately the same time of day the interview is being conducted. Include those foods and drinks consumed within 24 hours. This should usually include a morning, noon and evening meal plus snacks. Enter meal code in appropriate column if student identifies meal.

      (2) Sample question: Did you eat or drink anything since you came to school? Write down each food as the child mentions it, do not refer to any specific meal unless the child identifies the foods as having been eaten at a certain meal. Do not worry about amounts until all foods are recorded.

(3) If the interview takes place in the afternoon, ask first about foods eaten within the past few hours, then during the morning and at home before coming to school. Proceed to the previous day, progressing backward. Include those foods and drinks consumed within the last 24 hours.

c. General Pointers for Interviews.

(1) Record the foods and drinks on Recall Form as the child mentions them in column titled, "Food/Type/Preparation." Obtain specific descriptions concerning the food or drink. Do not worry about amounts until all foods are recorded. Record where meal was eaten, using appropriate code in "Where?" column.

(2) Use the Probing Questions to get complete and specific information about types of foods eaten; e.g., if the student says he/she had a sandwich find out what kind of sandwich, if it had butter or mayonnaise or salad spread in addition to the filling, or what kind of bread, and approximately how many slices of tomatoes.

(3) Call attention to the posters with food models to assist students in identifying types of foods eaten.

(4) Then proceed to get information on quantities consumed. Use measuring cups, spoons, and graded sizes of glasses from interview equipment kit to assist student in identifying quantities. Enter in amount column on form.

(5) Also, use posters with food models to assist in determining portions; e.g., if child has eaten the same size serving as the model then record as 1 x mdl; if child says he has eaten less or more than the model, record as a fraction or multiple of the model (3/4 x mdl).

3. Completion of Recall Data

As soon as possible after the on-site visit, review forms and complete or clarify as needed. If "model," or a portion thereof, were entered as quantity, refer to List of Food Models and enter exact quantity. Using code sheet, enter Meal Code and Where Code for each food in appropriate columns on recall form. Also, determine food code and quantity code from listing of foods in data base and enter appropriate codes.

PROCEDURE FOR THE INTERVIEW

1. Sign your name in the space after: recall taken by.
2. Fill in blanks regarding day and date of recall.
3. Circle the time of the interview.
4. Ask the child his or her name.

   What is your name?
5. Put the child "at ease."

   How's school going today? Or

   Have you ever been in an interview before?
6. Begin the interview questions. Fill in blanks as soon as the answer is given.
   1. What is your father's occupation?
   2. What is your mother's occupation?
   3. How many persons are there living in your home?
   4. Do you live on a farm or in town?
   5. Who usually prepares your meals?
   6. How many times a week do you eat out?
   7. Do you take vitamin or mineral supplements?

      If yes, How many per day? per week?
   8. If yes, Do you know the brand name?
   9. Are you on a special diet now?

   9b. If yes, Why are you on a diet?

   9b. If no, Have you been on a special diet within the past year?

      If yes, For what reason?
7. Read the following statement and proceed with the recall. Use Probes where necessary.

I would like you to tell me about everything you ate from right now to about this time yesterday. Let's start from your last snack or meal and be sure to include everything you ate at home, at friends, at school, or bought from vending machines. O.K. let's start with the last thing you ate.

8. Thank the student and dismiss him or her. Check your data.

   Thank you very much for cooperating with us. Have a good day.

PROBING QUESTIONS

1. Was the milk; whole, two per cent, skim, or chocolate?
2. Did you have sugar on your cereal? Was it cooked, dry? Presweetened?
3. Was your toast white, whole wheat, rye, raisin, or other? What did you put on it?
4. Were your mashed potatoes real or instant? Did you put anything on them?
5. Did you have lettuce, tomato, mayonnaise, ketchup, mustard, butter, pickles, cheese, or onions on your sandwich?
6. Did you have dressing on your salad?
7. Did you have butter or sauce on your vegetables?
8. How were the vegetables cooked? Did they have butter on them?
9. Did you put sugar or anything else in your tea or coffee?
10. What kind of juice did you have at breakfast? Did it come from a can or bottle, or powder? Was it pure juice, i.e., Minute Maid, Scotch Treat, Dewey Fresh, etc.? Was it artificial, i.e., Awake, Tang, Bright Day, etc.?
11. What kind of cookies did you eat? Were they homemade or store-bought? Do you know the Brand name? Did they have chocolate chips, peanut butter, oatmeal, or anything else?
12. What kind of pie or cake did you have? Did it have any kind of topping on it?
13. Did you have any fruit on your cake or in your jello? Was it canned or fresh?
14. Did the pop you drank come in a can or a regular or giant size bottle? Was it diet?

KANSAS STATE UNIVERSITY

Needs Assessment Project

Kansas Nutrition Education and Training Program
Departments of Dietetics, Restaurant and Institutional Management
and Foods and Nutrition
Justin Hall
Manhattan, Kansas 66506
913-532-6966

FOOD INTAKE: 24 HOUR DIETARY RECALL

Recall taken by _____

Name of subject _____ ID no. _____

Date of Recall _____

Time of interview

____ (1) Morning
____ (2) Afternoon

Day of the week of Recall

____ (1) M
____ (2) T
____ (3) W
____ (4) Th
____ (5) F

1. Father's occupation

_____

2. Mother's occupation

_____

3. How many persons are there living in your home?

____ (1) 2
____ (2) 3
____ (3) 4
____ (4) 5
____ (5) 6
____ (6) Other _____

4. Who usually prepares your meals?

____ (1) Mother
____ (2) Father
____ (3) Older sister
____ (4) Older brother
____ (5) Self
____ (6) Other _____

5. How many times a week do you eat out?

____ (1) 1
____ (2) 2
____ (3) 3
____ (4) 4
____ (5) 5
____ (6) Other _____

6. Do you take vitamin and/or mineral supplements?

____ (1) Yes
____ (2) No

(If answer is Yes)

How many per day? _____
per week? _____

7. What kind? (Insert brand name if known.)

Multivitamins _____
Ascorbic acid _____
Vitamins A and D _____
Iron _____
Other _____

8. Are you on a special diet now?

____ (1) Yes
____ (2) No

8a. If Yes, why are you on a diet?

____ (1) For weight reduction
____ (2) For weight reduction (doctor's prescription)
____ (3) For gaining weight
____ (4) For allergy, specify _____
____ (5) For other reason, specify _____

8b. If No, have you been on a special diet within the past year?

____ (1) Yes
____ (2) No

If Yes, for what reason?

_____

Cooperating with the Kansas State Department of Education

Meal Code
B = breakfast
am = am snack
L = lunch
pm = afternoon snack
D = dinner
eve = evening snack

Source and Where Eaten Codes
SL = School Lunch
CL = Carried Lunch from Home
H = Home
O = Other Home (Friend or Relative)
V = Vending Machine
G = Grocery
FF = Fast Food (State Name)
R = Restaurant (not fast food)
Other (specify)

Abbreviations
hmd = homemade
com = commercial
cnd = canned
jc = juice
FF = french fries
pot = potatoes
wh brd = white bread
ww brd = whole wheat bread
crm = cream
sug = sugar
frt = fruit
c = with
s = without
fr = fried
veg = vegetable
crax = crackers
tst = toast
marg = margarine
bu = butter
chix = chicken
rst = roast
br = broiled
cof = coffee

Amount Codes
tsp = teaspoon
Tbsp = tablespoon
c = cup
oz = ounce
lb = pound
mdl = model
in. = inch

FOOD CODE	AMT. CODE	MEAL CODE	WHERE CODE	MEAL	WHERE?	FOOD/TYPE/PREPARATION	AMOUNT
						-->	

Is this the way you usually eat? Yes _____ No _____

FOOD CODE	AMT. CODE	MEAL CODE	WHERE CODE	MEAL	WHERE?	FOOD/TYPE/PREPARATION	AMOUNT

LIST OF FOOD MODELS

Milk

Cheese, American, 1 oz
Cheese, Cheddar, 1 oz
Cheese, Cheddar, 1¼ oz
Cheese, Cottage, ½ cup
Cheese, Swiss, 1 oz
Cocoa, 3/4 cup
Ice cream, Vanilla, ½ cup, ¼ pint
Milk, 1 cup (4 models)
Milk, Chocolate, 1 cup
Milkshake, Chocolate, 1½ cups
Pudding, Chocolate, ½ cup
Yogurt, Strawberry, 1 cup

Meat and other protein-rich foods

Bacon, ½ oz
Beans, Refried, ½ cup
Beef, Roast, 3 oz edible portion
Beef Liver, 3 oz
Bologna, 1 oz
Chicken, Fried, 3 oz edible portion
Egg, Fried, large
Egg, Scrambled, large
Frankfurter, 2 oz
Ham, Baked, 3 oz edible portion
Meat Loaf, 3 oz
Meat Patty, 3 oz
Peanut Butter, 2 tbsp
Peanuts, Salted, ¼ cup
Peas, Blackeye, ½ cup
Perch, Fried, 3 oz
Pork Chop, 3 oz edible portion
Sausage, 1 oz
T-Bone Steak, 3 1/3 oz edible portion

Vegetables--Fruit

Apple, medium
Applesauce, ½ cup
Apricots, Dried, 4 halves
Asparagus, 4 spears, ½ cup
Banana, medium
Beans, Green, ½ cup
Beans, Lima, ½ cup
Beets, ½ cup
Broccoli, stalk, ½ cup
Cabbage, 1/6 head, ½ cup
Cantaloupe, ¼ medium
Carrots, ½ cup
Carrot Sticks
Cauliflower, ½ cup
Celery Sticks
Coleslaw, ½ cup
Corn, ½ cup
Corn, ear
Fruit Salad, ½ cup fruit
Grapefruit, ½ medium
Grapes, ½ cup
Greens, ½ cup
Lettuce, 1/6 head, ½ cup
Lettuce Leaves, 2 large
Onions, ½ cup
Orange, medium
Orange Juice, ½ cup
Peaches, ½ cup
Pear, medium
Peas, Green, ½ cup
Pineapple, large slice
Potato, Baked, large
Potatoes, Boiled, 2 small
Potatoes, French-Fried, 20 pieces
Potatoes, Mashed, ½ cup
Potato, Sweet, ½ medium
Prunes, Stewed, 4 medium, 2 tbsp juice
Raisins, 4½ tbsp
Squash, Summer, ½ cup
Squash, Winter, ½ medium, ½ cup
Strawberries, ½ cup
Tomato, ½ medium
Tomato Juice, ½ cup
Tossed Salad, 3/4 cup
Watermelon, 1 cup

Bread--Cereal

Biscuit, Baking Powder
Bread, White (2 models)
Bread, Whole Wheat (2 models)
Cornbread
Corn Flakes, 3/4 cup
Crackers, Graham, 2
Crackers, Saltine, 5
Hominy Grits, ½ cup
Noodles, Egg, ½ cup
Oatmeal, ½ cup
Pancake
Rice, ½ cup
Roll, Frankfurter
Roll, Hamburger
Roll, Hard
Toast, White
Tortilla, Corn
Waffles, 2

Combinations

Beans, Baked, Pork and Tomato Sauce, ½ cup
Beef and Vegetable Stew, 1 cup
Chili Con Carne with Beans, 1 cup
Custard, Baked, ½ cup
Macaroni and Cheese, ½ cup
Pizza, Cheese, ¼ of 14" pizza
Soup, Chicken Noodle, 1 cup
Soup, Cream of Tomato, 1 cup
Spaghetti, Meat Balls and Tomato Sauce, 1 cup
Taco, Beef

Others

Bar, Milk Chocolate, 1 oz
Beer, 1½ cups
Butter, 1 tsp (4 models)
Cake, Devil's-Food, 1/16 of 9" cake
Cake, Sponge, 1/12 of 10"
Chocolate Syrup, 2 tbsp
Coffee, 3/4 cup
Cookie, Sugar, 3" diameter
Cream, Sour, 1 tbsp
Cream, Whipped, 1 tbsp
Doughnut, Cake Type
French Dressing, 1 tbsp
Gelatin Dessert, ½ cup
Half-and-Half, 1 tbsp
Jelly, 1 tbsp
Mayonnaise, 1 tbsp
Pie, Apple, 1/6 of 9" pie
Popcorn, 1 cup
Potato Chips, 10 chips
Roll, Danish Pastry
Sherbet, Orange, ½ cup,
Soft Drink, 1 cup
Sugar, 1 tsp

Type of Milk Served: _____ 2% _____ chocolate
_____ whole _____ other:

Breakfast menu		Lunch menu (today)		Lunch menu (prior day)	
menu item	portion size	menu item	portion size	menu item	portion size

Type of Milk Served: _____ 2% _____ chocolate
_____ whole _____ other:

Breakfast menu		Lunch menu (today)		Lunch menu (prior day)	
menu item	portion size	menu item	portion size	menu item	portion size

APPENDIX F

Project Approval Correspondence

(Kansas State Department of Education Letterhead)

(Initial Letter to Superintendent in Selected Schools)

October 16, 1979

Dear

The Child Nutrition Amendment, P.L. 95-166, enacted by the United States Congress in 1977, provided funds to the Kansas State Department of Education for a Nutrition Education and Training Program. As a part of this legislation, a continuing needs assessment is required. Kansas State University in cooperation with the Kansas State Department of Education will conduct a needs assessment during the 1979-80 school year. The purposes of the needs assessment are to measure dietary behavior and nutrition attitudes and knowledge of children, elementary teachers, and foodservice personnel.

An approximate 10 per cent representative sample of elementary schools throughout the state will be asked to participate in the needs assessment project. The following school(s) in your district is among the 103 Kansas elementary schools randomly selected to be included in the project:

We are requesting your approval for data collection in the school(s) identified above, which would involve fifth grade children, teachers, and school foodservice personnel.

According to the data collection plan, all fifth graders at selected schools would be interviewed to determine their dietary intake using a dietary recall method. Each interview would require only about 15 minutes. Also, each child's height, weight, and skinfold thickness would be measured. Questionnaires concerning nutrition attitudes and knowledge would be administered to each class of fifth graders. Signed consents from parents and children would be obtained prior to data collection. Data would be collected during an on-site visit on a preconfirmed date to each school by a team of two to five trained interviewers from Kansas State University. On-site visits would be conducted between January 14 and April 18, 1980. The date and schedule would be planned in cooperation with the principal at each school, with as little disruption of school operations as possible.

Data from teachers will be obtained by questionnaires which will be mailed in mid-January to all elementary teachers in each school. Questionnaires also will be used to collect information from foodservice personnel at each school. If food is not prepared at the selected school, foodservice personnel at the school from where the food is transported also will be asked to complete the questionnaire. The teachers and foodservice personnel questionnaires will measure nutrition knowledge and attitudes and dietary behavior.

We will keep you fully informed concerning data collection procedures and both you and your superintendent will be provided with a summary of findings. Results of this needs assessment will provide baseline data for planning the Nutrition Education and Training Program for the State of Kansas.

Please complete the enclosed form and return to us by the end of the week. If you have not already done so, we would like you to provide names and home addresses of elementary teachers and foodservice personnel, which can be included on, or attached to, the form. An envelope is provided for returning the form and attached lists.

Thank you for your cooperation. We look forward to meeting and working with you on this project.

Sincerely,

Cynthia S. Foley
Coordinator
Needs Assessment Project

Approved:

Rita A. Hamman, Director
School Food Service Section

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics,
Restaurant and Institutional
Management

Percy Sillin, Ph.D.
Assistant Commissioner, Agency
Services
Kansas State Department of
Education

G. Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and
Nutrition
Kansas State University

ns

Reply Form for Needs Assessment Project

_____ Approval is granted for the school or schools selected from the district to participate in the Nutrition Education Training Program Needs Assessment Project.

_____ Approval not granted.

Signed: _____
(Superintendent/s Name--Typed)

Superintendent, U.S.D. _____

If you agree to participate, please list the names of principals at the selected schools below.

School	Principal

(Letterhead)

(Acknowledgment to Initial Letter Sent to Superintendent)

Dear

We have received the completed reply form indicating your agreement to participate in the Needs Assessment Project and appreciate both your promptness in responding and your willingness to take part in this project. Thank you for taking time from your busy schedule to read the letter, consider the project's importance and our request, and complete the form, including the principal's(s') name(s).

As we mentioned in the initial letter, we will keep you fully informed concerning data collection procedures and will provide you with a summary of findings at the end of the study. We will be conducting on-site visits January 14 through April 18, 1980, and we will be contacting both you and the principal(s) soon concerning other details of the project and scheduling of the visit(s) to your school(s).

Thank you for your assistance.

Sincerely,

Cynthia S. Foley
Coordinator
Needs Assessment Project

CSF:ns

c: Rita Hamman
Joyce Dierking
School Food Service Section
Kansas State Department of
Education

(Letterhead)

(Initial Letter to Principal of Selected Schools)

The Child Nutrition Amendment, P.L. 95-166, enacted by the United States Congress in 1977, provided funds to the Kansas State Department of Education for a Nutrition Education and Training Program. As a part of this legislation, a continuing needs assessment is required. Kansas State University in cooperation with the Kansas State Department of Education will conduct a needs assessment during the 1979-80 school year. The purposes of the needs assessment are to measure dietary behavior and nutrition attitudes and knowledge of children, elementary teachers, and foodservice personnel.

The superintendent of your school district has granted permission for your school to be one of 103 Kansas elementary schools randomly selected for this project. Approximately 10 per cent of the Kansas elementary schools have been asked to participate in the needs assessment.

According to the data collection plan, all fifth graders at selected schools will be interviewed to determine their dietary intake using a dietary recall method. Each interview will require only about 15 minutes. Also, each child's height, weight, and skinfold thickness will be measured. Questionnaires concerning nutrition attitudes and knowledge will be administered to each class of fifth graders as a group. Completion of the questionnaire will require about 20 to 30 minutes.

Signed consents from parents and children will be obtained prior to data collection. Data will be collected during an on-site visit on a preconfirmed date to each school by a team of two to five trained interviewers from Kansas State University. On-site visits will be conducted between January 14 and April 18, 1980.

You will be contacted soon regarding the tentative date of the on-site visit and other details. We will plan the visit in cooperation with both you and the fifth grade teachers so interference with school operations will be minimal.

Data from teachers will be obtained by questionnaires which will be mailed in mid-January to all elementary teachers in each school. Questionnaires also will be used to collect information from foodservice personnel at each school. If food is not prepared at the selected school, foodservice personnel at the school from where the food is transported also will be asked to complete the questionnaire. The teachers and foodservice personnel questionnaires will measure nutrition knowledge and attitudes and dietary behavior.

We will keep you fully informed concerning data collection procedures and both you and your superintendent will be provided with a summary of findings. Results of this needs assessment will provide baseline data for planning the Nutrition Education and Training Program for the State of Kansas.

Please complete the enclosed form and return to us by the end of the week. If you have not already done so, we would like you to provide names and home addresses of elementary teachers and foodservice personnel, which can be included on, or attached to, the form. An envelope is provided for returning the form and attached lists.

Thank you for your cooperation. We look forward to meeting and working with you on this project.

Sincerely,

Cynthia S. Foley
Coordinator
Needs Assessment Project

Approved:

Rita A. Hamman, Director
School Food Service Section

Percy Sillin, Ph.D.
Assistant Commissioner, Agency Services
Kansas State Department of Education

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics, Restaurant and Institutional Management

G. Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and Nutrition
Kansas State University

ns

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

Survey Form for Needs Assessment Project

Total number of fifth grade students _____

Number of fifth grade classes _____

Type of foodservice:

_____ Food prepared at this school
_____ Food prepared at another site and transported

_____
(Name of school where food is prepared)

Please list names and home addresses of foodservice personnel at this school below or attach roster. In addition, if food is prepared at another site please provide names of foodservice personnel or indicate where the names can be obtained.

Names of Foodservice Personnel	Home Address

-over-

Please list names, grade level, and home address of all teachers at this school, grades K-6. If this school is a middle school, list all teachers assigned to levels up to grade 6.

Names of Elementary Teachers	Grade Level Taught	Home Address

Please return in attached envelope to: Dr. Allene G. Vaden, Kansas State University.

(Letterhead)

(Acknowledgment to Initial Letter Sent to Principal)

Dear

We have received the completed survey form for the Needs Assessment Project and appreciate your promptness in supplying the information we requested.

As we mentioned in the previous letter, we will keep you fully informed concerning data collection procedures and will provide you with a summary of findings at the end of the study. The on-site visits will be conducted January 14 through April 18, 1980. We will be contacting both you and the fifth grade teacher(s) soon concerning other details of the project and scheduling of the visit to your school.

Thank you for your assistance.

Sincerely,

Cynthia S. Foley
Coordinator
Needs Assessment Project

CSF:ns

c: Rita Hamman
Joyce Dierking
School Food Service Section
Kansas State Department of
Education

(Letterhead)

(Initial Letter to Fifth Grade Teachers in Selected Schools)

The Child Nutrition Amendment, P.L. 95-166, enacted by the United States Congress in 1977, provided funds to the Kansas State Department of Education for a Nutrition Education and Training Program. As a part of this legislation, a continuing needs assessment is required. Kansas State University in cooperation with the Kansas State Department of Education will conduct a needs assessment during the 1979-80 school year. The purposes of the needs assessment are to measure dietary behavior and nutrition attitudes and knowledge of children, elementary teachers, and foodservice personnel.

The superintendent of your school district has granted permission for your school to be one of 103 Kansas elementary schools randomly selected for this project. Approximately 10 per cent of the Kansas elementary schools have been asked to participate in the needs assessment. Also, we have been in contact with your principal regarding the project and data collection procedures.

According to the data collection plan for each school, questionnaires concerning nutrition attitudes and knowledge will be administered to each class of fifth graders as a group. Completion of the questionnaire will require about 20 to 30 minutes. As each child completes the questionnaire, his or her height, weight, skinfold thickness, and arm circumference will be measured. The total time required for administration of the test and these physical measurements should be not more than one and one-half hours. Then, a random sample of fifth graders at selected schools will be individually interviewed to determine their dietary intake using a dietary recall method.

Data will be collected during an on-site visit on a preconfirmed date to teach school by a team of two to five trained interviewers from Kansas State University. On-site visits will be conducted between January 14 and April 18, 1980.

Your school will be contacted soon regarding the tentative date of the on-site visit. We will plan the visit in cooperation with both you and your principal so interference with school operations will be minimal.

Signed consents from parents and children will be obtained prior to data collection. We would like for you to distribute parent consent forms to students in your class to take home for their parents' signatures. These forms will be mailed to you three to four weeks before the scheduled visit.

In addition, you will be asked to complete a nutrition questionnaire. This questionnaire will be mailed to all elementary teachers at your school in January.

A summary of the findings will be provided to your district. Results of this needs assessment will provide baseline data for planning the Nutrition Education and Training Program for the State of Kansas.

Please list the number of students in your class and their names on the enclosed form. An envelope is provided for returning the form to us.

Thank you for your cooperation. We look forward to meeting and working with you on this project.

Sincerely,

Cynthia S. Foley
Coordinator
Needs Assessment Project

Approved:

Rita A. Hamman, Director
School Food Service Section

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics, Restaurant and Institutional Management

Percy Sillin, Ph.D.
Assistant Commissioner, Agency Services
Kansas State Department of Education

G. Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and Nutrition
Kansas State University

ns

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Kansas State University
in cooperation with the Kansas State
Department of Education

Schedule: Week of _____

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers

APPENDIX G

Schedules

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

WEEK 1 92

Schedule: Week of Jan. 28 to Feb. 1

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Jan. 29 8:00 am	USD 322 Onaga-Havensville- Wheaton	Onaga Elementary Onaga, KS 66521 James L. Weis, P 913-889-7101	Mikie Paulsen
Jan. 29 1:00 pm	USD 442 Nemaha Valley	Kelly Elementary Kelly, KS 66446 Louis E. Haladay, P 913-336-2459	Mrs. Jack Buzzard
Jan. 30 8:00 am	USD 383 Manhattan	Marlatt Elementary 2715 Hobbs Manhattan, KS 66502 Robert D. Anderson, P 913-539-4341	Earle Franca Elaine Laughlin Susan New Connie Walker
Jan. 31 8:00 am	USD 323 Westmoreland	St. George Elementary St. George, KS 66535 Lyle Berges, P 913-494-2472	Norma Lou Havenstein
Jan. 31 12:15 pm	USD 383 Manhattan	T. Roosevelt Elem. Houston and 14th Manhattan, KS 66502 Doyle Barnes, P 913-537-2290	Sue Carpenter Pamela Parsons
Feb. 1 8:00 am	USD 378 Riley County	Leonardville Elem. Leonardville, KS 66449 William R. Ross, P 913-293-5343	Wayne Haller Carol Shorman
Feb. 1 12:00 pm	USD 475 Junction City	Washington Elementary 15th and Washington Junction City 66441 Alvin Ferguson, P 913-238-8131	Mrs. Terry Korpi John Wataha

WEEK 2

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Kansas State University
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Department of Education

Schedule: Week of Feb. 4 to Feb. 8

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Feb. 5 8:00 am	USD 498 Valley Heights	Valley Heights Elem. Blue Rapids, KS 66411 Charles G. Steele, P 913-226-7693	Carol Musil
Feb. 5 12:30 pm	USD 380 Vermillion	Centralia Elementary Centralia, KS 66415 Louis C. Case, P 913-857-3324	Norma Riddle
Feb. 6 7:45 am	USD 425 Highland	Highland Elementary Highland, KS 66035 Conrad Clary, P 913-442-3663	Barbara Collins
Feb. 6 12:00 pm	USD 406 Wathena	Wathena Elementary Wathena, KS 66090 Charles B. Watkins, P 913-989-4425	Mrs. Jennifer Smith Mrs. Michelle Manville
Feb. 7 8:00 am	USD 335 North Jackson County	Jackson Heights Elem. Route 3 Holton, KS 66436 Paul Moser, P 913-364-2244	Miss Sheryl Harber Miss Jennifer Otto
Feb. 7 1:00 pm	USD 339 Jefferson County North	Jefferson Co. N. Middle Winchester, KS 66097 Bill Uhner, P 913-774-2500	Mrs. Betty Ruhlen Ms. Sue Kenney
Feb. 8 8:00 am	USD 501 Topeka Public Schools	Bishop Elementary 3601 West 31st Topeka, KS 66614 Dr. Forrest D. Fernkopf, P 913-272-8610	Gregg Duguid Sheryl Suddarth Marianna Nothern

WEEK 3

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Kansas State University
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Department of Education

Schedule: Week of Feb. 11 to Feb. 15

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Feb. 12 8:00 am	USD 501 Topeka Public Schools	McCarter Elementary 5512 West 16th Topeka, KS 66604 Dr. Frank E. Wilson, P 913-272-1971	Mrs. Da'Nella Anderson Mrs. Pam Higgs
Feb. 12 1:00 pm	USD 497 Lawrence	Wakarusa Valley Elem. Route 5 Lawrence, KS 66044 F. Virgil Patton, P 913-843-7776	Cynthia B. Clinton
Feb. 13 8:00 am	USD 348 Baldwin City	Baldwin Elementary 8th and Chapel Baldwin City, KS 66006 Tom A. Church, P 913-594-3393	Tony Houchin Mrs. Becky Solander
Feb. 13 12:30 pm	USD 497 Lawrence	Kennedy Elementary 1605 Davis Road Lawrence, KS 66044 Jerry Michael Cormack, P 913-842-1332	Linda Diehl Lin Meriage
Feb. 14 8:00 am	USD 204 Bonner Springs	Southwest Elementary 212 South Neconi Bonner Springs, KS 66012 William Patrick, P 913-441-1777	Miss Jacqueline Blystone Rex E. Vincent Mrs. Doloris Mills Miss Denise Underwood
Feb. 15 8:00 am	USD 202 Turner	Junction Elementary 2540 Junction Road Kansas City, KS 66106 Dr. John Stewart, P 913-262-6720	Alice Sooby Donna Ramsey Larry Channell

WEEK 4

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Schedule: Week of Feb. 19-Feb. 22

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Tues. Feb. 19 8:00 am	USD 223 Barnes	Linn Elementary Linn, KS 66953 Delbert Learned, P 913-348-2651	Mr. Delmer Wilgers
Tues. Feb. 19 12:30 p.m.	USD 455 Cuba	Cuba Elementary Cuba, KS 66940 Dr. John Shaw, P 913-729-3817	Judith E. Keller
Wed. Feb. 20 8:15 am	USD 273 Beloit	Beloit Elementary 12th and Bell Beloit, KS 67420 Gail R. Applebee, P 913-738-3581	Mr. Kenneth Fischer Mrs. Lynne Gates Miss Zelma Herrman
Thurs. Feb. 21 8:30 am	USD 305 Salina	Hageman Elementary 409 West Cloud Salina, KS 67401 Baten L. Young, P 913-825-0249	Mr. Paul Reinking Mrs. Mildred Polson
Thurs. Feb. 21 12:00 pm	USD 305 Salina	Lowell Elementary 1009 Highland Avenue Salina, KS 67401 August Zemke, P 913-827-1089	Charles Morgan
Fri. Feb. 22 8:00 am	USD 305 Salina	Sunset Elementary 1510 West Republic Salina, KS 67401 Jerry Dyck, P 913-827-8704	Robert Tripp Debra Williams Patrick McKenna
Fri. Feb. 22 12:30 pm	USD 307 Ell-Saline	Happy Corner Elem. Rural Route 2 Salina, KS 67401 Albert Newton, P 913-827-8891	Barbara Newton

WEEK 5

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Schedule: Week of Feb. 25-Feb. 29

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Tues. Feb. 26 8:00 am	USD 501 Topeka Public Schools	Quinton Heights Elem. 2331 Topeka Topeka, KS 66611 Merrill R. Ross, P 913-233-1760	Miss Madeline Sobczak Mrs. Mary Ann Rubottom
Tues. Feb. 26 1:00 pm	USD 420 Osage City	Osage City Elementary Osage City, KS 66523 Brian E. Davies, P 913-528-3171	Linda Dayhoff Wilene Cole
Wed. Feb. 27 8:30 am	USD 253 Emporia	Village Elementary 2302 West 15th Emporia, KS 66801 Ed Gerhardt, P 316-342-5922	Jean Shirk Claudia Worcester
Wed. Feb. 27 12:00 pm	USD 390 Hamilton	Hamilton Elementary Hamilton, KS 66853 Eugene Stanley, P 316-678-3410	Brenda Wichman
Thurs. Feb. 28 8:00 am	USD 244 Burlington	Burlington Upper Elem. 720 Cross Street Burlington, KS 66839 Joseph Logan, P 316-364-8770	Lois Brinkman Jerilyn Curtiss Theresa Taylor
Thurs. Feb. 28 12:00 p.m.	USD 287 West Franklin	Pomona Elementary Pomona, KS 66076 Rodney L. Bond, P 913-566-3512	Mrs. Kathy Brooks
Fri. Feb. 29 8:00 am	USD 290 Ottawa	Eugene Field Elem. 720 Tremont Ottawa, KS 66067 Jim Toburen, P 913-242-3784	Leonard Jacobs Ralph Loyd
Fri. Feb. 29 12:00 p.m.	USD 362 Prairie View	LaCygne Elementary LaCygne, KS 66040 Donald C. Edmonds, P 913-757-4417	John Eppich

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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WEEK 6
REVISED

Schedule: Week of Mar. 3-Mar. 7

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Tues. March 4 8:00 am	USD 277 Burr Oak	Burr Oak Elementary Burr Oak, KS 66936 Earl A. Loyd, P 913-587-3366	Andy Scheopner
Tues. March 4 1:00 pm	USD 240 Twin Valley	Tescott Elementary Tescott, KS 67484 Martin H. Helmer, P 913-283-4774	Jean Ade
Wed. March 5 8:00 am	USD 431 Hoisington	Lincoln Elementary 515 North Pine Hoisington, KS 67544 Randall Evans, P 316-653-4549	Dick Williams
Thurs. March 6 8:00 am	USD 512 Shawnee Mission	South Park Elementary 8715 West 49th Terrace Shawnee Mission, KS 66203 Carlton McNair, P 913-432-9686	Kenneth Fair Mrs. Linda Iliff Ms. Marilyn Tieszen
Thurs. March 6 12:30 pm	USD 233 Olathe	Meadow Lane Elementary Rural Route 4 Olathe, KS 66061 Gary Colburn, P 913-764-0754	Debbie McDonald Janet Nall Steve Potter
Fri. March 7 8:00 am	USD 231 Gardner	Edgerton Elementary Edgerton, KS 66021 Russell W. Chambers, P 913-882-6221	Cheryl Lenhart Dalena Brown Judy Patty Judy Rinehart Suzanne Walking Eagle

WEEK 7

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Schedule: Week of Mar. 10-14

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Tues. March 11 8:00 am	USD 410 Hillsboro-Durham- Lehigh	Durham Elementary Durham, KS 67438 Marilyn Jost, P 316-732-2242	Janet Terman Tillie Bartel
Tues. March 11 12:30 pm	USD 206 Remington- Whitewater	Whitewater Elementary Whitewater, KS 67154 Herman Merritt, P 316-799-2131	Velda Gaeddert
Wed. March 12 8:00 am	USD 373 Newton	Chisholm Middle 900 East 1st Newton, KS 67114 Ronald Walker, P 316-283-5660	Lorrayne Pankratz Reina Jasso Kathy Quinton Charlene Mills
Thurs. March 13 8:00 am	USD 373 Newton	Santa Fe Middle 130 West Broadway Newton, KS 67114 Dr. Norris Wika, P 316-283-3440	Carrie Bleam Susan Bird Jann Pendry Barbara Pownell Shirley Smith Susan Janzen
Fri. March 14 8:00 a.m.	USD 308 Hutchinson	Lincoln Elementary 315 East Bigger Hutchinson, KS 67501 Dennis Berndsen, P 316-665-7621	Paralee Morris Miss Catherine Naden
Fri. March 14 12:30 pm	USD 308 Hutchinson	Winans Elementary 805 East B Hutchinson, KS 67501 Mrs. June Bachus, P 316-665-7641	Judy Hamilton

WEEK 8
REVISED

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Schedule: Week of Mar. 17-Mar. 21

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Tues. March 18 8:00 am	USD 501 Topeka Public Schools	Bishop Elementary 3601 West 31st Topeka, KS 66614 Dr. Forrest D. Fernkopf, P 913-272-8610	Gregg Duguid Sheryl Suddarth Marianna Nothern
Wed. March 19 8:00 am	USD 259 Wichita	Woodman Elementary 2500 South Hiram Wichita, KS 67217 Dr. A. Lorraine Hardesty,P 316-943-7742	Jane Eakens Marjorie Knuth Melvin Eakens Jewell McLaurian
Thurs. March 20 8:00 am	USD 259 Wichita	Dodge Elementary 4801 West 2nd Wichita, Kansas 67212 Larry W. McCrary, P 316-943-4871	Evelyn Lewallen Shirley Carlson
Thurs. March 20 12:30 pm	USD 259 Wichita	Wells Elementary 3601 South Pattie Wichita, KS 67216 Harold S. Smith, P 316-522-3001	John W. Sandlin
Fri. March 21 8:00 am	USD 259 Wichita	Colvin Elementary 2820 S. Roosevelt Wichita, KS 67210 Dr. Benjamin A. Mevey, P 316-683-4654	Claudette Freeman Rubert Overmon Vera Molloy

WEEK 9
REVISED

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Schedule: Week of Mar. 24-Mar. 28

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Tues. March 25 8:00 am	USD 259 Wichita	Kensler Elementary 1030 Wilbur Lane Wichita, KS 67212 Larry Gwaltney, P 316-722-1291	Sandra Thorpe Barbara Van Steinberg Florence West
Wed. March 26 8:00 am	USD 259 Wichita	Seltzer Elementary 903 South 127th E. Wichita, KS 67207 Ezra G. Burt, P 316-683-1432	Richard Enns Sharon Sloan
Wed. March 26 12:30 pm	USD 259 Wichita	Bryant Elementary 4702 West 9th Wichita, KS 67212 Jerry A. Burns, P 316-943-8191	Martha Connor Elzy Hale
Thurs. March 27 8:00 am	USD 264 Clearwater	Clearwater Grade School Annex 112 S. Prospect Clearwater, KS 67026 E. E. Dumler, P 316-584-2288	Richard Barcus Mrs. Janice Whitaker Mrs. Carol Williamson
Fri. March 28 8:00 am	USD 262 Valley Center	Abilene Elementary 530 North Abilene Valley Center, KS 67147 James Donohue, P 316-755-2321	Barbara Gandy Joan House David Mouser

WEEK 10

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Department of Education

Schedule: Week of Mar. 31-Apr. 4

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Tues. April 1 8:00 am	USD 235 Uniontown	West Bourbon Elem. Uniontown, KS 66779 Leland E. Christy, P 316-756-4335	Mrs. Elizabeth Robertson Mrs. Regina Broyles
Tues. April 1 12:15 pm	USD 246 Northeast	Arma Elementary Arma, KS 66712 Billy Joe Billiard, P 316-347-8461	Becky S. Bualle Catherine E. Kunstel
Wed. April 2 8:00 am	USD 505 Chetopa	Chetopa Elementary Chetopa, KS 67336 Fred Borsdorf, P 316-236-7959	Sharon Treat Elizabeth Kline
Wed. April 2 12:30 pm	USD 285 Cedar Vale	Cedar Vale Elementary Cedar Vale, KS 67024 Vernon Weakley, P 316-758-2265	Mrs. Pat McKinley
Thurs. April 3 8:00 am	USD 506 Labette County	Meadow View Elementary Route 2 Parsons, KS 67342 Garry O. Eckert, P 316-421-1857	Dru Carnahan Georgia Mae Evitts
Thurs. April 3 12:30 pm	USD 247 Cherokee	Cherokee Elementary Cherokee, KS 66724 Charles Stout, Jr., P 316-457-8315	Mrs. Kay York
Fri. April 4 8:00 am	USD 512 Shawnee Mission	D. Moody Elementary 10101 England Overland Park, KS 66212 Yancy Whitworth, P 913-642-2646	Anabelle Bayne Sandy Leffingwell Mary Kay Amidei Betty Lambert

WEEK 11

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Schedule: Week of Apr. 7-Apr. 11

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Tues. April 8 8:00 am	USD 448 Inman	Inman Elementary Inman, KS 67546 Leo Heidebrecht, P 315-585-6555	Viola Neufeldt
Tues. April 8 12:30 pm	USD 401 Chase	Chase Elementary Chase, KS 67524 Michael Barricklow, P 316-938-2996	Richard Lattin
Wed. April 9 8:30 am	USD 445 Coffeyville	Dearing Elementary Dearing, KS 67340 Mrs. Dovea N. Davis 316-948-3460	Robert Cowan Mrs. Velma McKinney
Wed. April 9 12:30 pm	USD 445 Coffeyville	Garfield Elementary 5th and Grant Coffeyville, KS 67337 James Siegenthaler, P 316-251-4470	Carolyn McMichael Maurine Miller Edna Gillis
Thurs. Apr. 10 8:00 am	USD 512 Shawnee Mission	Roesland Elementary 5001 Clark Drive Shawnee Mission, KS 66205 Don Morris, P 913-262-2412	Jane Hursh Karen Pecis

WEEK 12

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Schedule: Week of Apr. 14-Apr. 18

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Tues. Apr. 15 8:00 am	USD 495 Ft. Larned	Northside Elementary 16th and State Larned, KS 67550 Robert Stone, P 316-285-2751	Jadene Colglazier Roberta Lane
Tues. Apr. 15 12:00 pm	USD 495 Ft. Larned	Garfield Elementary Garfield, KS 67529 Michael Dey, P 316-569-2262	Roberta Rogg
Wed. Apr. 16 8:00 am	USD 461 Neodesha	Heller Elementary 415 North 8th Neodesha, KS 66757 Bob Henson, P 316-325-2875	Jo Oliver Richard Smith
Wed. Apr. 16 12:30 pm	USD 484 Fredonia	Lincoln Elementary 9th and Jackson Fredonia, KS 66736 Arthur Anderson, P 316-378-4138	Mildred Duciaume Carolyn Pickell Cecilia Porter
Thurs. Apr. 17 8:00 am	USD 470 Arkansas City	Adams Elementary 1201 North 10th Arkansas City, KS 67005 Mike Wayne Wolfe, P 316-442-6560	Mary Dermid Dixie Miller
Thurs. Apr. 17 12:30 pm	USD 470 Arkansas City	Pershing Elementary 1100 North 2nd Arkansas City, KS 67005 Dwain Stewart, P 316-442-3760	Mrs. Barbara Moscript
Fri. Apr. 18 8:00 am	USD 311 Pretty Prairie	Pretty Prairie Elem. Pretty Prairie, KS 67570 Bill Ritcha, P 316-459-6621	Mrs. Emil Schrag
Fri. Apr. 18 12:00 pm	USD 268 Cheney	Cheney Elementary 5th and Marshall Cheney, KS 67025 Marvin Andrews, P 316-542-3125	Matt Archer Adella Harmon Meg Rice

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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WEEK 13
REVISED

Schedule: Week of Apr. 21-Apr. 25

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Tues. Apr. 22 8:00 am	USD 444 Little River	Geneseo Elementary Geneseo, KS 67444 Lloyd Rages, P 316-824-6415	Mr. Terry Donley
Tues. Apr. 22 12:00 pm	USD 349 Stafford	Stafford Community Elementary Stafford, KS 67578 Duer Schifferdecker, P 316-234-5521	Laurabel Simpson
Wed. Apr. 23 8:00 am	USD 407 Russell County	Bickerdyke Elementary 4th and Maple Russell, KS 67665 John Farrell, P 913-483-5111	Mr. Terry Foster Mrs. Judy Grabbe Miss Linda Marti Mr. Louis Pivonka
Thurs. Apr. 24 8:00 am	USD 489 Hays	Lincoln Elementary 1906 Ash Hays, KS 67601 John Reidel, P 913-625-7341	Miss Emma Kolb Mrs. Darlene Fall
Fri. Apr. 25 8:00 am	USD 489 Hays	Roosevelt Elementary 2000 MacArthur Hays, KS 67601 Mrs. Ione Buchheister, P 913-625-2565	Ms. Cletis Hammerschmidt Ms. Judith Fritschen Ms. Edna Giebler
Fri. Apr. 25 1:30 pm	USD 489 Hays	Schoenchen Elementary Schoenchen, KS 67667 Frank Stramel, P 913-625-5391	Mrs. Ruthette Hansen

WEEK 14

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Department of Education

Schedule: Week of Apr. 28-May 2

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Tues. Apr. 29 8:00 am	USD 324 Eastern Heights	Eastern Heights Elem. Kirwin, KS 67644 J. R. Hoss, Jr., P 913-646-2771	Mrs. Marie Stockman
Tues. Apr. 29 12:00 pm	USD 326 Logan	Logan Elementary Logan, KS 67646 Paul A. Jones, P 913-689-4631	Eugene Hamel
Wed. Apr. 30 8:00 am	USD 103 Cheylin	Bird City Elementary Bird City, KS 67731 Keith Sanders, P 913-734-2351	Winnifred Wamhoff
Thurs. May 1 8:00 am	USD 315 Colby	Colby Elementary 210 North Grant Colby, KS 67701 Kenneth F. Rogers, P 913-462-3379	Harold Buller Duane Eberly Mrs. Judy Sloan
Fri. May 2 8:00 am	USD 466 Scott County	Scott City Elementary 704 College Scott City, KS 67871 Kenneth Long, P 316-872-3500	Jon Crane Joyce Lauber Julie Mason Thelma Mitch

WEEK 15

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Department of Education

Schedule: Week of May 5-May 9

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Tues. May 6 8:00 am	USD 474 Haviland	Haviland Elementary Haviland, KS 67059 Mike McMullen, P 316-862-5278	Marjorie Townsend
Tues. May 6 12:00 pm	USD 300 Comanche County	Coldwater Elementary Coldwater, KS 67029 Ralph Vogel, P 316-582-2671	Mrs. Marilyn Huck
Wed. May 7 8:00 am	USD 374 Sublette	Sublette Elementary Sublette, KS 67877 Russell Branden, P 316-675-2286	Mrs. Gale Liebelt Jim Sim
Wed. May 7 12:30 pm	USD 457 Garden City	Pierceville-Plymell Elementary S Star Route Garden City, KS 67846 Ms. Elaine Ferris, P 316-276-6204	Bob Perry
Thurs. May 8 8:00 am	USD 457 Garden City	Buffalo Jones Elem. 708 Taylor Garden City, KS 67846 Daryl D. McVey, P 316-276-2502	Miss Carol Wade
Thurs. May 8 12:30 pm	USD 457 Garden City	Jennie Wilson Elem. 1401 East Harding Garden City, KS 67846 Dr. Ronald Lantaff, P 316-275-9161	Eileen DiGerolamo Lucinda Miller

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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WEEK 16
REVISED

Schedule: Week of May 12-May 16

Date Time	USD No./Name	School Address Principal Phone	Fifth Grade Classes/Teachers
Tues. May 13 8:00 am	USD 356 Conway Springs	Kyle Trublood Elem. Conway Springs, KS 67031 Dolores Mies, P 316-456-2966	Susan S. Currin Sharon Gilges
Tues. May 13 12:30 pm	USD 331 Kingman	Norwich Elementary Norwich, KS 67118 Larry Nelson, P 316-478-2315	Fairy Johnson Harold Schmidt
Wed. May 14 12:30 pm	USD 217 Rolla	Rolla Elementary Rolla, KS 67954 Walter Neill Hays, P 316-593-4731	Helen O'Hair
Thurs. May 15 8:00 am	USD 483 Kismet-Plains	Kismet Elementary Kismet, KS 67859 Harold H. Jantzen, P 316-563-7370	Mrs. Wanda Shores

APPENDIX H

Summary of Mailings Prior to On-Site Visits

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

NEEDS ASSESSMENT MAILINGS

Type	To Whom and Where	Subject	Special Instructions
Letter A	Principal Send as soon as possible to first schools; mail all others by Feb. 8.	Confirm date of on-site visit	1. Fill in date and time on letter. 2. Add date and address
Memo A	Superintendent Send as soon as possible after sending principal letters.	Inform of dates of visit at schools in district	1. Enclose principal letter 2. Stamp: Copy of letter to principal 3. Add principal's name and address 4. Fill in date and time of visit
Letter B	Principal Teacher Parent letters Send packets as soon as possible to first schools; send 3-4 weeks in advance of visit to schools to be visited weeks 4 on.	Parent Consent Parent Consent Parent Consent	1. Add name and address of principal on principal letter. 2. Add names and addresses to teacher letters 3. Add: child's name on parent letters 4. Prepare packets for each school as follows: a. Principal letter b. Packet(s) for each teacher in the school to include: (1) teacher letter (2) parent consent checklist (3) parent letter for each child in class NOTE: Secure a class packet with a rubber band

NEEDS ASSESSMENT MAILINGS (cont.)

Type	To Whom and Where	Subject	Special Instructions
			5. Mail packets to principal of school in large brown envelope
Memo B	Superintendent Mail as soon as possible after school packets are sent.	Inform of Parent Consent procedures	1. Enclose sample copy of principal, teacher, and parent letter and consent form. 2. Stamp COPY on principal and teacher letters 3. No need to add inside addresses to copies of teacher and principal letters.
Letter C	Principal Teacher Send as soon as possible to first schools. Send 7-10 days prior to on-site visits for schools to be visited weeks 3 forward.	Final instructions prior to on-site visit	1. Fill in date and time on principal letter. 2. Add inside address and date to principal and teacher letters. 3. Prepare packets for each school as follows: a. Principal letter b. Teacher letter(s)--for each teacher in the school. 4. Mail packets to principal of each school in regular #10 envelope.
Memo C	Superintendent Mail as soon as possible after school packets are sent.	Inform of final instructions and reconfirm dates of on-site visits to school(s) in district	1. Enclose principal and teacher letters 2. Add date of letter, principal's name and address, and date and time of on-site visit. Stamp COPY.

NEEDS ASSESSMENT MAILINGS (cont.)

Type	To Whom and Where	Subject	Special Instructions
			3. Send sample of teacher letter--no need for name or dates
Letter D	Principal Teachers Superintendent Send out Friday of the week following on-site visit	Thank you for cooperation	1. Enclose teacher's letters in the envelope with principal letters--to be mailed to each school.

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

SCHEDULE OF MAILINGS FOR ON-SITE VISITS
1/21/80 to 5/16/80

Date to mail	Type	To whom	For schools to be visited week no.:
Mon. 1/21	A	Principal	Week #1
Tues. 1/22	B	Principal, Teacher	Week #1
Wed. 1/23	C	Principal, Teacher	Week #1
	A	Principal	Week #2
	A	Superintendent	Week #1
Fri. 1/25	B	Principal, Teacher	Week #2
	B	Superintendent	Week #1
Mon. 1/28	A	Principal	Week #3
	A*	Superintendent	Week #2 (*or on Tues. 1/29)
	C	Principal, Teacher	Week #2
	C	Superintendent	Week #1
Tues. 1/29	A	Principal	Weeks #4 and #5
Wed. 1/30	B	Superintendent	Week #2
Fri. 2/1	C	Superintendent	Week #2
	B	Principal, Teacher	Week #3
	A*	Principal	Weeks #6 and #7 (*or out by 2/8 for sure)
Mon. 2/4	A*	Principal	Weeks #8 and #9 (*or out by 2/8 for sure)
	B	Principal, Teacher	Weeks #4, #5, and #6
	C	Principal, Teacher	Week #3
Tues. 2/5	A	Principal	Weeks #10 and #11
	A	Superintendent	Weeks #3, #4, and #5
Wed. 2/6	B	Superintendent	Weeks #3, #4, and #5
Fri. 2/8	A	Principal	Weeks #12 and #13
	D	Principal, Teacher, Superintendent	Week #1
	C	Superintendent	Week #3

SCHEDULE OF MAILINGS FOR ON-SITE VISITS (cont.)

Date to mail	Type	To whom	For schools to be visited week no.:
Mon. 2/11	B	Principal, Teacher	Week #7
	C	Principal, Teacher	Week #4
	B	Superintendent	Weeks #6 and #7
Tues. 2/12	A	Principal	Weeks #14, #15, and #16
	A	Superintendent	Weeks #6, #7, and #8
Fri. 2/15	D	Principal, Teacher Superintendent	Week #2
	C	Superintendent	Week #4
Mon. 2/18	B	Principal, Teacher	Week #8
	C	Principal, Teacher	Week #5
	B	Superintendent	Week #8
Tues. 2/19	A	Superintendent	Weeks #9, #10, #11, #12, #13, #14, #15, and #16 (can complete by Fri. 2/22)
Fri. 2/22	D	Principal, Teacher, Superintendent	Week #3
	C	Superintendent	Week #5
Mon. 2/25	B	Principal, Teacher	Week #9
	C	Principal, Teacher	Week #6
	B*	Superintendent	Week #9 (*or on 2/26)
Tues. 2/26	C	Superintendent	Week #6
Fri. 2/29	D	Principal, Teacher, Superintendent	Week #4
Mon. 3/3	B	Principal, Teacher	Week #10
	C	Principal, Teacher	Week #7
	B*	Superintendent	Week #10 (*or on 3/4)
Tues. 3/4	C	Superintendent	Week #7
Fri. 3/7	D	Principal, Teacher, Superintendent	Week #5
Mon. 3/10	B	Principal, Teacher	Week #11
	C	Principal, Teacher	Week #8
	B*	Superintendent	Week #11 (*or on 3/11)
Tues. 3/11	C	Superintendent	Week #8
Fri. 3/14	D	Principal, Teacher, Superintendent	Week #6

SCHEDULE OF MAILINGS FOR ON-SITE VISITS (cont.)

Date to mail	Type	To whom	For schools to be visited week no.:
Mon. 3/17	B	Principal, Teacher	Week #12
	C	Principal, Teacher	Week #9
	B*	Superintendent	Week #12 (*or on 3/18)
Tues. 3/18	C	Superintendent	Week #9
Fri. 3/21	D	Principal, Teacher, Superintendent	Week #7
Mon. 3/24	B	Principal, Teacher	Week #13
	C	Principal, Teacher	Week #10
	B*	Superintendent	Week #13 (*or on 3/25)
Tues. 3/25	C	Superintendent	Week #10
Fri. 3/28	D	Principal, Teacher Superintendent	Week #8
Mon. 3/31	B	Principal, Teacher	Week #14
	C	Principal, Teacher	Week #11
	B*	Superintendent	Week #14 (*or on 4/1)
Tues. 4/1	C	Superintendent	Week #11
Fri. 4/4	D	Principal, Teacher, Superintendent	Week #9
Mon. 4/7	B	Principal, Teacher	Week #15
	C	Principal, Teacher	Week #12
	B*	Superintendent	Week #15 (*or on 4/8)
Tues. 4/8	C	Superintendent	Week #12
Fri. 4/11	D	Principal, Teacher, Superintendent	Week #10
Mon. 4/14	B	Principal, Teacher	Week #16
	C	Principal, Teacher	Week #13
	B*	Superintendent	Week #16 (*or on 4/15)
Tues. 4/15	C	Superintendent	Week #13
Fri. 4/18	D	Principal, Teacher, Superintendent	Week #11

SCHEDULE OF MAILINGS FOR ON-SITE VISITS (cont.)

Date to mail	Type	To whom	For schools to be visited week no.:
Mon. 4/21	C	Principal, Teacher	Week #14
	C	Superintendent	Week #14
Fri. 4/25	D	Principal, Teacher, Superintendent	Week #12
Mon. 4/28	C	Principal, Teacher	Week #15
	C	Superintendent	Week #15
Fri. 5/2	D	Principal, Teacher, Superintendent	Week #13
Mon. 5/5	C	Principal, Teacher	Week #16
	C	Superintendent	Week #16
Fri. 5/9	D	Principal, Teacher, Superintendent	Week #14
Fri. 5/16	D	Principal, Teacher, Superintendent	Weeks #15 and #16

APPENDIX I

Contacts with Schools Related to On-Site Visits

(Letterhead)

(Letter to Principal Confirming Date of On-Site Visit)

This letter is to confirm our telephone conversation establishing the date and time of the on-site visit to your school for the Needs Assessment Project. As we agreed by phone, the team from Kansas State University will come to your school on _____, 1980 at _____. The team consists of five persons, the Project Coordinator, Cynthia Foley, and four graduate research assistants. The Project Co-Directors, Drs. Allene G. Vaden and Kathleen Newell, may accompany the team.

Also, we wanted to provide you some general information about the visit. Initially, during the on-site visit, we will administer the test to the fifth grade students as a class. If you have two classes of fifth graders, we will administer the test to both classes simultaneously. In schools with more than two classes, the test will be administered to two classes first, followed by administration in other classes as soon as possible thereafter. Test administration will require about 20 to 30 minutes per class.

As students complete the test, they will be asked to go to the area designated for physical measurements in groups of no more than five. We will need you to designate an area where these measurements can be taken in as close proximity as possible to the fifth grade classrooms. The height, weight, arm circumference, and upper arm skinfold measurement will be taken on each student. We will bring all equipment needed with us (scale, etc.); however, we will need two chairs for data recorders.

After the physical measurements are complete, a random sample of students will be interviewed. A minimum of 16 students (or fewer, if less than 16 fifth graders are enrolled) and a maximum of 32 students will be selected for these dietary recall interviews, dependent on the time available at the school and the number of fifth graders enrolled. We will need a second area or room with eight chairs designated for the interviews. Four interviews will be conducted simultaneously.

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Approximately 2 to 4 weeks before the visit we will send a packet to you with parent consent forms. Our project has been reviewed and approved by the KSU Committee on Research Involving Human Subjects. According to guidelines of the Committee, we must have parental and student consent before involving the fifth grade students in your school in the Project. We would like for your fifth grade teachers to distribute the forms to students to take home for signatures of parents or guardians. Student consent forms will be signed just before the test administration during the on-site visit.

Although participation in the project is voluntary, we would like for you and the teachers to encourage the students to take part. The type of data being collected does not involve risk nor invade students' privacy unduly. Identity of all persons involved in the study will be kept completely confidential. Data from all students will be grouped and summarized.

About one week before our visit, we will send a letter to you and letters to each of the fifth grade teachers with final instructions for the visit. For consistency of procedure across the state, standard procedures for use in all schools have been developed. It will be important that these procedures be followed carefully.

Thank you for your continued cooperation. We look forward to our visit to your school. Please contact us if you have questions.

Sincerely,

Cynthia S. Foley
Project Coordinator

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics,
Restaurant and Institutional
Management

G. Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and
Nutrition

ns

c: School Superintendent
State Department of Education

(Letterhead)

(Transmittal Memorandum to Superintendents Regarding
Date of On-Site Visits)

To: Superintendents of Districts Participating
in the Needs Assessment Project

From: Cynthia Foley, Project Coordinator
Allene Vaden, Ph.D., R.D., Project Co-Director
Kathleen Newell, Ph.D., R.D., Project Co-Director

Re: Mailing to Principals to Confirm Date(s) of
on-site visit(s) to school(s) in District

Enclosed for your files is a copy of the letter sent to the principal(s) in the school(s) in your district that is participating in the Needs Assessment Project. The date and time for our scheduled on-site visit to each school is noted on the principal letter.

We have appreciated the cooperation of the staff in your district. Thank you for your assistance in facilitation of the project.

ns

Enclosure:
Copy of Principal letter

c: Kansas Department of Education

(Letterhead)

(Transmittal Letter to Principals Regarding
Parent Consent Procedures)

As the time of our scheduled on-site visit is approaching, it is necessary to initiate the first steps in the study protocol for the Needs Assessment Project. As we indicated earlier, the KSU Committee on Research Involving Human Subjects has reviewed and approved the Project. According to the guidelines of the Committee, we must have parental and student consent before involving the fifth grade students in your school in the Project.

Enclosed are packets for each fifth grade teacher in your school. Would you please distribute the packets to your teachers?

The packet for each teacher includes an explanatory letter, a class roster to be used in recording return of parent consent forms, and parent consent forms for each student in each teacher's class. We are asking that each teacher distribute the forms to students to take home for signatures of parents or guardians. As indicated in the teacher letter, the forms should be held until the time of our on-site visit and given to us at that time. Please encourage your teachers to distribute the forms to their students as soon as possible and ask the teachers to remind students to return them. At the time of the on-site visit we will ask students to complete a consent form. The KSU Committee on Research Involving Human Subjects requires that we have these forms on file for each student.

Although participation in the project is voluntary, we would like for you and the teachers to encourage the students to take part in the Project. The type of data being collected does not involve risk nor invade the students' privacy unduly. Identity of all persons involved in the study will be kept completely confidential. Data from all students will be grouped and summarized.

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We look forward to the visit to your school. Thank you for your continued helpfulness and cooperation. Please contact us if you have questions.

Sincerely,

Cynthia S. Foley
Project Coordinator

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics,
Restaurant and Institutional
Management

G. Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and
Nutrition

ns

c: School Superintendent
Kansas Department of Education

(Letterhead)

(Letter to Fifth Grade Teachers Regarding
Parent Consent Procedures)

We have received your class roster. Thank you for your cooperation; we look forward to meeting you at the time of our on-site visits. We are now scheduling the on-site visits and your class is scheduled within the next month. We will be in contact with you about one week in advance of the visit with specific instructions about the procedures.

As indicated in our earlier letter, we must have parental permission for each child to take part in the Needs Assessment Project. In addition, we will ask the students to complete permission forms at the time of the visit.

Enclosed are the consent forms for each child in your class to be signed by the parent or guardian and returned to you. Please distribute forms to the children today or tomorrow to take home to their parents or guardian to be returned to you, preferably the following day. We will ask for them when we visit your school. It is very important that the forms be returned as quickly as possible. Please check to see that all forms are received.

During the on-site visit, part of our procedure will be to conduct interviews with a random sample of the students to obtain dietary recalls. This requires that students not be informed in advance that they will be asked what they have eaten. In some instances it may influence their eating habits. We realize you will have to provide some instruction in order to familiarize the children with the study. To insure consistency across the state we will send a suggested introduction for you to use just before the on-site visit.

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If you have further questions, please do not hesitate to contact us. We appreciate your assistance.

Sincerely,

Cynthia S. Foley
Project Coordinator

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics, Restaurant and Institutional Management

G. Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and Nutrition
Kansas State University

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KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

School: _____ Teacher _____

PARENTAL CONSENT CHECKLIST

Please distribute parental consent forms to students in your class as soon as possible. As students return forms check in the column opposite each student's name. Please remind those students who fail to return the forms to bring them to you as soon as possible. We must have all forms returned prior to the on-site visit. Please hold the forms for our arrival on the scheduled time

Student's name	Form return	Student's name	Form return

(Letterhead)

(Letter to Parents Regarding Parental Consent)

Dear Parent or Guardian of _____:

Your child's school has been selected to take part in a study of children's nutrition knowledge and attitudes and eating habits. All fifth graders in about 100 elementary schools across Kansas are being asked to cooperate. Information will be used to plan nutrition education programs for the state. In cooperation with the Kansas State Department of Education, Kansas State University will conduct the project. This project has been approved by the superintendent of your school district, the principal of your child's school, and his or her fifth grade teacher.

In each selected school the fifth grade classes will be asked to complete a questionnaire about nutrition knowledge and attitudes, and a randomly selected group of children will be interviewed concerning their eating habits. Time will not permit interviewing all children. In addition, we would like to obtain the height, weight, and upper arm circumference of each child and take a skinfold measurement, which consists of measuring a fold of skin on the back of the upper arm. Information will be collected during a visit to each school by a team from Kansas State University within the next month.

We hope that you will permit your child to take part in the project, however participation is voluntary. Your child's name will not be linked with his or her responses and all individual information will be kept confidential. Information will be summarized for the entire group of children.

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Please indicate your willingness for your child to take part in the project on the attached form and return the form to your child's teacher tomorrow or as soon as possible.

Thank you for your cooperation.

Sincerely,

Cynthia S. Foley
Project Coordinator

Approved:

Rita A. Hamman, Director
School Food Service Section

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics, Restaurant and Institutional Management

Percy Sillin, Ph.D.
Assistant Commissioner, Agency Services
Kansas State Department of Education

G. Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and Nutrition
Kansas State University

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KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

Parental Consent Form

Please
check

_____ I give permission for _____ to participate
(child's name)

in the nutrition education project described on attached sheet.

_____ I do not give permission for _____ to
(child's name)

participate.

_____
(signature of parent or guardian)

_____
(date)

PROYECTO DE VALORACIÓN DE NECESIDADES

Programa de Nutrición Educacional y Entrenamiénto
Estado Kansas
Departamento Diétetico, Restaurantes e Instrucciónal
Administracíon
Comidas y Nutrimento
Justin Hall
Manhattan, Kansas 66506
913-532-6966

Letter to Parents Regarding Parental Consent (Spanish Translation)

Estimado Padre o Guardian de _____:

La escuela de su niño hacido selecciónada para participar en una investigación acerca el conocimiento nutriciónal, su actitud y habitos de comer. Todos los estudiántes del quinto grado en casi 100 escuelas primarías por todo el Estado de Kansas se les pide su cooperacion. Esta información sera utilizada para las planes de los programas de educación en nutricion alrededor del estado. La Universidad del Estado Kansas administraran este proyecto en cooperación con el Departamento de Educación, Estado Kansas. Este proyecto hacido aprovado por el superintendente de su distrito de escuela, el director de la escuela de su niño, y su profesor/a del quinto grado.

En cada escuela que fue escojida les preguntaran a los del clase del quinto grado, que llenen un cuestionario acerca de su conocimiénto de nutrición y actitud, despues un grupo de niños escojidos inpensadamente seran intrevistados tocante sus habitos de comer. El tiempo no permitera entrevistar todos los niños. Ademas quisieramos obtener las medidas de estatura, peso y circunferencia del brazo (parte interior) de cada niño y tambien medida del plegar del cuero, esto consiste de medir el cuero doblado bajo el interior del brazo. informacion sera colectada durante las visitas a cada escuela por un grupo del Universidad del Estado Kansas dentre el proximo mes.

Esperamos que usted permita a su niño que tome parte en este proyecto, sin embargo su participacion es voluntaria. El nombre de su niño no sera asociado con sus respuestas y toda información individual sera confidencial. Habra un sumario de información para todo el grupo de niños.

Favor de indicar su voluntad en dejar que su niño sea participante en este proyecto por medio de llenar el formulario que le mandamos con esta carta, y favor de mandarla manana o lo mas pronto posible a el profesor/a de su su niño.

Muchas Gracias por su cooperacion!

Sinceramente,

Cynthia S. Foley
Coordinadora del Proyecto

Aprobado:

Allene G. Vaden, Ph. D.,R.D.
Co- Director de Proyecto y
Profesor Asociado de Dietéticas
Restaurante y Administración
Institucional

Rita A. Hamman, Directora
Servicios de Comida, Seccion de
Escuelas

G. Kathleen Newell, Ph. D., R.D.
Co- Directora del Proyecto
Asociada Profesora de Comida
y Nutrición
Universidad del Estado de Kansas

Percy Sillin, Ph. D.
Comisionado Asistente, Servicios
de Agencia

Departamento de Educación
Estado de Kansas

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PROGRAMA NUTRICIONAL EDUCACIONAL Y ENTRENAMIENTO EN KANSAS
PROYECTO VALORACION DE NECESIDADES
UNIVERSIDAD DEL ESTADO DE KANSAS
en cooperacion con el Estado de Kansas
Departamento de Educacion

FORMULARIO DEL PERMISO PARENTAL

Favor de marcar

_____Doy permiso para _____ que participe
Nombre del Niño/a

en el proyecto educacional de nutricion como se explica en la carta incluída.

_____No consiento mi permiso para_____que participe
Nombre del Niño/a

_____
(Firma del Padre o Guardian)

_____
FECHA

(Letterhead)

(Transmittal Memorandum to Superintendent Regarding
Parent Consent Procedures)

To: Superintendents of Districts Participating
in the Needs Assessment Project

From: Cynthia Foley, Project Director
Allene Vaden, Ph.D., R.D., Project Co-Director
Kathleen Newell, Ph.D., R.D., Project Co-Director

Re: Parental Consent Procedures

Enclosed for your files is a copy of letters sent to each school in your district that is participating in the Needs Assessment Project regarding parental consent procedures. The first letter was sent to the principal requesting that he/she distribute information to teachers at the school. The teacher letter gives instructions on distribution of forms to students to be sent home for signatures of parents or guardians. A copy of the parent letter is also enclosed along with the form for parental signature.

This mailing to you is to keep you fully informed about the Needs Assessment Project. If you have questions, please contact us.

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Enclosures:
Copy of Principal Letter
Copy of Teacher letter
Copy of Parent Consent Letter and Form

c: Kansas Department of Education

(Letterhead)

(Letter to Principals with Final Instructions
for On-Site Visit)

On _____, 1980, at _____ the research team from Kansas State University will be coming to your school for the on-site visit for the Needs Assessment Project. The team will consist of Cynthia Foley, Project Coordinator and four graduate research assistants. Drs. Allene Vaden and Kathleen Newell, Project Co-Directors, may accompany the team.

As you are aware from earlier letters and phone conversations, we will (a) administer a test to all fifth grade students; (b) take several physical measurements of these students (height, weight, arm circumference, and upper arm skinfold); and (c) conduct a dietary recall interview with a sample of these students.

As indicated in an earlier letter, we will need you to designate a place in the school for the physical measurements to be taken which is in as close proximity to the fifth grade classrooms as possible. Two chairs will be needed for data recorders. We will bring all other equipment with us (scale, etc.).

Also, we will need a room or area with eight chairs for conducting the interviews. As we indicated earlier, four interviews will be conducted simultaneously. A minimum of 16 (or fewer, if less than 16 fifth graders are enrolled in the school) and a maximum of 32 interviews will be conducted at each school, dependent on the time available and number of fifth grade students enrolled.

Enclosed are letters to each of the fifth grade teachers in your school with final information prior to our visit. Please distribute these letters to each of your teachers. In the letter, we are asking that the teachers use a standard statement for telling the students in their classes about the study. For consistency in procedure in all schools across the state that are involved in the study, it is important that instructions be followed carefully. Please encourage your

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teachers to read the letter carefully and follow the procedure outlined for introducing the study to the students.

We look forward to the visit to your school. If you have questions, please contact us.

Sincerely,

Cynthia S. Foley
Project Coordinator

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics,
Restaurant and Institutional
Management

G. Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and
Nutrition

ns

c: School Superintendent
Kansas Department of Education

(Letterhead)

(Letter to Fifth Grade Teachers with Final Instructions for On-Site Visit)

On _____, 1980 at _____, a team of researchers from Kansas State University, will be visiting your school to collect data for the Needs Assessment Project as part of the Kansas Nutrition Education and Training Program. The team will include the Project Coordinator, Cynthia Foley, and five graduate research assistants. The Project Co-Directors, Drs. Allene Vaden and Kathleen Newell, may accompany the team. You received a letter from us earlier describing the study.

The parent consent forms were sent to you in a previous letter. As you will recall we asked that you distribute the forms to the students to be signed by parents or guardians and returned to you. If you have not received all the forms, please remind those students without forms to bring them to you as soon as possible. We will collect these forms from you when we arrive at the school.

At the time of the on-site visit, we will ask the students in your class to complete a student consent form as well. These consent procedures are necessary to comply with the guidelines for studies involving human subjects. The procedures we will be using have been approved by the KSU Committee on Research Involving Human Subjects.

Although student participation is voluntary, we would like for you to encourage all students in your class to participate. None of the procedures for the Needs Assessment will involve risk or invade the privacy of the students unduly.

During the visit, the participating students will be given a written test that will require 20 to 30 minutes to complete. Please have an assignment ready for those who will not be participating and for those who complete the test early.

After the test, height, weight and skinfold measurements of each of the students will be obtained. In addition, dietary recall interviews will be conducted with a random sample of your class. Because

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of time limitations, all children will not be interviewed. The interview will take about fifteen minutes for each child. Four interviews will be conducted simultaneously.

To insure consistency of procedures in all participating schools across the state, it is important that all fifth graders involved be informed of this project and given instructions in as nearly the same manner as possible. We are asking that you use the explanation below in preparing the students for the on-site visit. Please read the statement either the afternoon before or the morning of our visit:

> "We have been asked to help a group of researchers from Kansas State University. They want to find out what you eat, and what you think and know about nutrition. They will give a short nutrition test, and measure your height, weight, and arm. You will not be graded, and all of the information about you will be kept secret. Data from all children in the schools will be grouped together and analyzed. This is an important project because the information will be used to plan nutrition programs for Kansas elementary schools. The group from Kansas State hopes you will take part in the project."

If you have questions please do not hesitate to contact us. We appreciate your assistance.

Sincerely,

Cynthia S. Foley
Project Coordinator

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics,
Restaurant and Institutional
Management

G. Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and
Nutrition

ns

c: School Superintendent
Kansas Department of Education

(Letterhead)

(Transmittal Memorandum to Superintendent Regarding Final Instructions for On-Site Visits)

To: Superintendents of Districts Participating in the Needs Assessment Project

From: Cynthia Foley, Project Coordinator
Allene Vaden, Ph.D., R.D., Project Co-Director
Kathleen Newell, Ph.D., R.D., Project Co-Director

Re: Final Instructions to schools participating in the Needs Assessment Project

Enclosed for your files are copies of letters sent to the principal and teachers in each school in your district that is participating in the Needs Assessment Project. The letters reconfirm the dates of the visits and provide final instructions for the on-site visit.

We appreciate the continued cooperation of the staff in your district and look forward to the on-site visit. If you have questions, please contact us.

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Enclosures:
Copy of Principal letter
Copy of Teacher letter

c: Kansas Department of Education

(Letterhead)

(Letter of Appreciation to Superintendent
Following On-Site Visit)

We completed the on-site visit at a school or schools in your district within the last two weeks. As you are aware from previous correspondence, this visit was part of the Needs Assessment Project of the Kansas Nutrition Education and Training Program being conducted by Kansas State University, in cooperation with the Kansas State Department of Education.

Thank you for granting approval for the school or schools selected from your district to participate in the project. We have appreciated the cooperation of the staff in your district in the on-site visits and in the survey of elementary teachers and foodservice personnel.

According to our estimates, we will be collecting data from approximately 3,700 fifth graders, 1,000 elementary teachers, and 600 foodservice personnel. As we indicated earlier, you will receive a summary of the findings at the completion of the project. Results of this Needs Assessment Project will provide baseline data for planning the Nutrition Education and Training Program for the State of Kansas.

Again, thank you for your cooperation.

Sincerely,

Cynthia S. Foley
Project Coordinator

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics,
Restaurant and Institutional
Management

G. Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and
Nutrition
Kansas State University

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(Letterhead)

(Letter of Appreciation to Principal Following On-Site Visit)

Thank you for your cooperation and helpfulness during the recent on-site visit to your school which was part of the Needs Assessment Project of the Kansas Nutrition Education and Training Program. As you are aware, the Project is being conducted by Kansas State University in cooperation with the Kansas State Department of Education.

We appreciate your assistance in enlisting the cooperation of your students and in securing parental consents. Also, we greatly appreciate the assistance you gave us while we were on-site during the data collection.

We realize the Project has required a commitment of time and effort from you and interrupted your class schedule during the day we were at your school. Your participation, as well as that of the students, has made the Project possible, however.

According to our estimates, we will be collecting data from approximately 3,700 fifth graders, 1,000 elementary teachers, and 600 foodservice personnel. As we indicated earlier, your district will receive a summary of the findings at the completion of the Project. Results of this Needs Assessment Project will provide baseline data for planning the Nutrition Education and Training Program for the state. In addition, we believe the results of the Project will provide meaningful information for planning nutrition education curricula for elementary schools in Kansas.

-over-

Also, we believe the results of the Project will provide meaningful information for planning nutrition education curricula for the State. Again, thank you for your helpfulness and assistance.

Sincerely,

Cynthia S. Foley
Project Coordinator

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics,
Restaurant and Institutional
Management

G. Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and
Nutrition
Kansas State University

ns

(Letterhead)

(Letter of Appreciation to Teacher Following
on-Site Visit)

Thank you for your cooperation during the recent on-site visit to your school which was part of the Needs Assessment Project of the Kansas Nutrition Education and Training Program. As you are aware, the Project is being conducted by Kansas State University in cooperation with the Kansas State Department of Education.

We appreciate your assistance in the planning of the visit, in enlisting the cooperation of your teachers and other school personnel in the Project, and in making arrangements for data collection on-site.

We realize the Project has required a commitment of time and effort from you and all of your staff. Your participation, as well as that of the teachers, students, parents, and other school personnel, has made the Project possible, however.

According to our estimates, we will be collecting data from approximately 3,700 fifth graders, 1,000 elementary teachers, and 600 foodservice personnel. As we indicated earlier, your district will receive a summary of the findings at the completion of the Project. Results of this Needs Assessment Project will provide baseline data for planning the Nutrition Education and Training Program for the State of Kansas.

-over-

Again, thank you for your helpfulness and assistance. Please express our thanks to the students in your class--they were great! Please tell them thanks from us and from Kansas State University. Also, please tell them they have been part of a very important project that will be used to plan programs for the entire State of Kansas!

Sincerely,

Cynthia S. Foley
Project Coordinator

Allene G. Vaden, Ph.D., R.D.
Project Co-Director and
Associate Professor of Dietetics,
Restaurant and Institutional
Management

G. Kathleen Newell, Ph.D., R.D.
Project Co-Director and
Associate Professor of Foods and
Nutrition
Kansas State University

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APPENDIX J

Protocol and Related Forms for On-Site Visits to Schools

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

PROTOCOL FOR ON-SITE VISITS TO ELEMENTARY SCHOOLS IN SAMPLE
(Schools with One Fifth Grade Class)

Primary Roles of Research Team:

Project Coordinator -- overall supervisor of visit
Research Assistant #1 -- test administrator
Research Assistant #2 -- responsible for Station #1 (height and weight) in measurement procedure
Research Assistant #3 -- responsible for Station #2 (arm, skinfold) in measurement procedure
Research Assistant #4 -- test administration assistant and recorder for measurement data
All research assistants will conduct dietary recall interviews.

1. Project Coordinator will:

   (a) contact principal immediately upon arrival to school to confirm on-site arrangements, schedule, and procedures; determine place to leave coats and purses of research team;

   (b) contact fifth grade teacher to confirm schedule and procedures;

   (c) determine place(s) to conduct anthropometric measurements and 24 hour dietary recall interviews; request ten chairs to use during data collection (2 for measurement area, 8 for interview area);

   (d) obtain copy of school breakfast and lunch menus from school foodservice personnel for current and/or previous day, as needed, dependent on time of visit; inquire about type of milk served (2%, whole, choice, etc.);

   (e) review class roster with teacher to determine absences and to get names of any new students;

   (f) collect parental consent forms and teacher's roster for return of forms; review and revise list of fifth graders;

   (g) make arrangements with teacher to give assignment to non-participating students.[1]

[1] In a letter confirming visit, to be mailed one week before on-site visit, teacher will be asked to plan an assignment for fifth grade students whose parents are not willing for them to participate or for those students who individually refuse.

(Revised 1/24/80)

(h) give recall number to any students added to class roster; determine students to be interviewed for 24-hour dietary recalls from the list of random numbers provided by statistician; determine order of student interviews and record on class roster;

(i) give class roster to Research Assistant #1 after recall sample is selected.

2. Research assistants will:

(a) unload equipment from station wagon;

(b) get Check List of Supplies and Equipment from Project Coordinator and determine if all supplies and equipment are on-site; report to Project Coordinator;

(c) prepare set-ups for anthropometric measurements and 24-hour dietary recall interviews;

(d) check accuracy of height board, scale, and skinfold calipers and record on form for "Standardization of Equipment for Anthropometric Measurements" (refer to Anthropometric Measurements Procedure).

3. Project Coordinator will:

(a) check with research assistants to see if all equipment and supplies are set up and in order;

(b) introduce research team to principal and teacher in accordance with schedule established at school.

4. Before test administration, Research Assistant #1 will:

(a) determine if all equipment and supplies are ready in the classroom where test is to be administered:

(1) class roster--get roster from Project Coordinator after dietary recall sample has been selected;

(2) student consent forms;

(3) portfolio with posters, extra pencils, and erasers;

(4) recall forms to be used in 9(b)(5) below;

(5) equipment to demonstrate arm circumference and skinfold measurement (string, red pen, tape, calipers);

(b) review procedure with teacher and ask that he/she assist with discipline if needed.

5. Research Assistant #1 will:

(a) introduce self and any other research assistants in room;

(b) give instructions on informed consent (Instructions 1a to h on "Instructions Before Administration of Test") and demonstrate arm circumference and skinfold measurement on Research Assistant #4; consent forms will be distributed and collected by Research Assistants #1 and #4;

(c) review student consent forms with teacher to determine students who will participate in project;

(d) ask teacher to give non-consenting students an assignment;

(e) determine number of test packets needed after absences and consent forms have been reviewed;

(f) get number of tests needed from Project Coodinator.

6. Project Coordinator will record inclusive ID numbers of tests used in the class on class roster and Report of Visit to School form.

7. During continuation of test administration:

(a) Research Assistant #1 will give instructions 2 through 4 related to general information and test administration (refer to Instructions Before Administration of Test), with assistance of another research assistant, as needed.

(b) Research Assistant #4 will distribute test packets to fifth graders (packet will include a yellow signature card, student response sheet, and test booklet).

(c) After distribution of packets, Research Assistant #1 will continue with instructions for completing answer form (Instructions 5 to 12).

8. After test instructions are complete, Research Assistant #4 will take calipers to measurement area and prepare to serve as recorder of measurements.

9. During test completion, Research Assistant #1 will:

(a) answer fifth graders' questions; answers will be limited to clarifying test directions and pronouncing unfamiliar terms; if necessary, remind students to be quiet until all students have completed the test (ask for teacher's assistance if needed);

(b) prepare forms, etc., as follows:

(1) alphabetize student consent forms and secure with a clip;

(2) enter student ID numbers on class rosters as response sheets and test booklets are turned in;

(3) alphabetize response sheets and secure with a clip;

(4) check test booklets and erase marks, etc., if time permits;

(5) prepare recall forms with students' names and ID numbers for students in random sample for interviews (use a pencil); indicate order of interviews on forms;

(6) at end of test administration, write names on board of students selected randomly for dietary recall interviews, in order of random number selection; list minimum number of students; names will be added if more interviews can be conducted in scheduled time.

10. At end of test administration, Research Assistant #1 will:

(a) collect portfolio with test posters;

(b) give all forms and data to Project Coordinator:

(1) alphabetized consent forms,

(2) alphabetized response sheets,

(3) test booklets,

(4) numbered recall forms,

(5) class roster;

(c) be sure all equipment and supplies are out of classroom.

11. Project Coordinator and research assistants not involved in test administration will proceed to the area designated for anthropometric measurements.

12. As fifth graders complete test, they will be directed to the area for anthropometric measurements by Project Coordinator. No more than five students should be in line for measurements at any one time. As a student returns to the classroom, another student will be directed to the area.

13. Project Coordinator will check to see that fifth graders have:

(a) removed shoes, jackets, sweaters, etc.;

(b) emptied pockets;

(c) remembered to bring yellow signature cards to measurement area.

14. Procedure for anthropometric measurement will proceed as follows:

(a) Project Coordinator and research assistants not involved in test administration will initiate collection of anthropometric measurement data (refer to Anthropometric Measurement Procedures).

(b) One research assistant (#2) will take height and weight (at Station #1) and a second research assistant (#3) will determine upper arm midpoint and take arm circumference and skinfold measurements (at Station #2). Project Coordinator will record all data until Research Assistant #4 has completed assisting Research Assistant #1 with test administration.

(c) Project Coordinator will invite students to measurement area as needed, to keep measurement procedures flowing smoothly.

(d) When test administration is complete, the team will proceed as follows:

(1) At Station #1, Research Assistant #2 will take signature card of each student and give to recorder; then height and weight of each fifth grader will be measured.

- Research assistant should explain procedures to students to put them at ease;

- Research assistant will observe to see that measurements proceed at a pace to permit recorder to enter data accurately.

(2) At Station #2, Research Assistant #3 will ask student's name, then determine upper arm midpoint, measure arm circumference and measure skinfold thickness.

- Research assistant should explain procedures to put students at ease.

(3) Research Assistant #4 will be recorder for all measurements. Recorder will:

- get yellow signature card from Research Assistant #2 as each student arrives for measurements.

- enter students' names and ID numbers on anthropometric data cards.

- enter height and weight as measurements are taken at Station #1.

- check student's name on data card at Station #2.

- enter arm circumference and skinfold measurements at Station #2.

- enter ethnic group of each student. If recorder is unsure, ethnic group will be checked with teacher by Project Coordinator before leaving school.

(4) Research Assistants #2, #3, and #4 may rotate between taking measurements and recording data, as needed to avoid fatigue.

15. At end of anthropometric measurements, Research Assistants #2 and #3 will: fold up height board and stool and lock scale; store equipment where appropriate in school until end of visit.

16. Research Assistant #4 (Data Recorder) will:

(a) alphabetize yellow signature cards and secure with a rubber band;

(b) alphabetize anthropometric data cards and secure with a rubber band;

(c) give signature cards and data cards to Project Coordinator;

(d) pack case with skinfold equipment, etc. and take case to recall area.

17. Following test administration and anthropometric measurements:

(a) Research assistants will conduct dietary recall interviews, following established procedure (refer to Procedure for the Interview), with fifth graders in the sub-sample drawn by the Project Coordinator.

(b) Each research assistant should conduct from four to eight dietary recall interviews at each school as time permits. (If fewer than 16 fifth graders are enrolled at the school, all fifth graders will be interviewed.)

(c) Research Assistant #1 will begin recalls as soon as test administration is complete.

18. During recall interviews, Project Coordinator will:

(a) direct fifth graders to recall area as needed, introduce fifth graders to research assistants, and give recall forms to research assistants as interviews are scheduled;

(b) review anthropometric data cards and check with teacher to determine ethnic group of students for whom recorder is unsure;

(c) check class roster to determine if all parent consent forms, student consent forms, test response forms, and anthropometric data forms are in order;

(d) file all data for school in appropriate folder;

(e) leave school form (Survey of School Food Programs) and memo with principal;

(f) collect recall forms from research assistants and file in school folder.

19. Research assistants will:

(a) repack equipment in station wagon;

(b) review Check List to determine if all equipment and supplies have been collected and report to Project Coordinator.

20. Project Coordinator will:

(a) have brief exit conferences with principal and teacher and express thanks for cooperation;

(b) check with research assistants to determine if all equipment and supplies are packed and in order.

21. As soon as possible after visit is complete, research assistants should:

    (a) review recall forms from interviews they conducted and complete or clarify information;

    (b) complete erasing test booklets.

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

PROTOCOL FOR ON-SITE VISITS TO ELEMENTARY SCHOOLS IN SAMPLE
(Schools with Two or More Fifth Grade Classes)

Primary Roles of Research Team:

Project Coordinator -- overall supervisor of visit
Research Assistant #1 -- test administrator
Research Assistant #2 -- test assistant and responsible for Station #1 (height and weight) in measurement procedure
Research Assistant #3 -- test assistant and responsible for Station #2 (arm, skinfold) in measurement procedure
Research Assistant #4 -- test administrator and recorder for measurement data
All Research Assistants will conduct dietary recall interviews.

1. Project Coordinator will:

(a) contact principal immediately upon arrival to school to confirm on-site arrangements, schedule, and procedures; determine place to leave coats and purses of research team;

(b) contact fifth grade teachers to confirm schedule and procedures;

(c) arrange to have test conducted in two classes simultaneously, if possible, and as soon thereafter in other classes if there are more than two classes, so that testing can be completed as quickly as possible in the early part of the visit;[1]

(d) determine place(s) to conduct anthropometric measurements and 24 hour dietary recall interviews; request ten chairs to use during data collection (2 for measurement area, 8 for interview area);

(e) review class rosters with teachers to determine absences and get names of any new students;

(f) collect parental consent forms and teachers' rosters for return of forms; review and revise lists of fifth graders;

---

[1]Scheduling must be kept flexible and must be established in cooperation with principal and fifth grade teachers. This protocol suggests the schedule to be followed, subject to adaptation to the schedule constraints at each site.

(Adapted 2/11/80 from
One Class Protocol)

(g) make arrangements with teachers to give assignment to non-participating students;[1]

(h) give recall number to any students added to class rosters; determine total number of students to be interviewed and divide by the number of classrooms to determine number of interviews from each class; determine specific students to be interviewed from the list of random numbers provided by statistician; determine order of student interviews and record on class rosters;[2]

(i) give class rosters to Research Assistants #1 and #4 after recall sample is selected for the classes for which each assistant is responsible;

(j) obtain copy of school breakfast and lunch menus from school foodservice personnel for current and/or previous day, as needed, dependent on time of visit; inquire about type of milk served (2%, whole, choice, etc.); prepare a menu chart for each Research Assistant to use in interviews on appropriate form.

2. Research Assistants will:

(a) unload equipment from station wagon;

(b) get Check List of Supplies and Equipment from Project Coordinator and determine if all supplies and equipment are on-site; report to Project Coordinator;

(c) prepare set-ups for anthropometric measurements and 24-hour dietary fecall interviews;

(d) check accuracy of height board, scale, and skinfold calipers and record on form for "Standardization of Equipment for Anthropometric Measurements" (refer to Anthropometric Measurements Procedure).

3. Project Coordinator will:

(a) check with Research Assistants to see if all equipment and supplies are set up and in order;

(b) introduce research team to principal and teachers in accordance with schedule established at school.

---

[1] In a letter confirming visit, to be mailed one week before on-site visit, teachers will be asked to plan an assignment for fifth grade students whose parents are not willing for them to participate or for those students who individually refuse.

[2] Rosters may be numbered and random sample from each class determined prior to arrival on site. Revisions will need to be made on site, after absences, new enrollments, and parental consent have been reviewed.

4. (a) If there are two classes of fifth graders Research Assistants #1 and #4 will each conduct a test simultaneously in the two classrooms, if possible, with assistance from Research Assistants #2 and #3.

   (b) If there are three classes, Research Assistants #1 and #4 will proceed to the third classroom to administer the test as soon as the testing is complete in the first class, if possible, dependent on the schedule established with the school principal and the fifth grade teachers.

   (c) If a school has four classes, Research Assistants #1 and #4 will proceed to the third and fourth classrooms after completion of testing in the first two classes, if the school schedule permits. Research Assistants #2 and #3 will assist with testing in these classrooms.

   (d) If there are more than four classes, the Project Coordinator will determine the schedule and assignment of Research Assistants for testing.

5. Before test administration, Research Assistants #1 and #4, with assistance of Research Assistants #2 and #3 will:

   (a) determine if all equipment and supplies are ready in the first two classrooms where tests are to be administered and will take all supplies and equipment to additional classrooms where test is to be administered at the appropriate time:

      (1) class roster--get roster from Project Coordinator and assist Project Coordinator with 1(h) above;

      (2) student consent forms;

      (3) portfolio with posters, extra pencils, and erasers;

      (4) recall forms to be used in 10(b)(5) below;

      (5) equipment to demonstrate arm circumference and skinfold measurement (string, red pen, tape, calipers);

   (b) review procedure with teachers and ask that they assist with discipline if needed.

6. Research Assistants #1 and #4 will conduct the testing as follows, in each of the classrooms for which each Assistant is responsible:

   (a) introduce self and any other Research Assistants in room;

   (b) give instructions on informed consent (Instructions 1a to h on "Instructions Before Administration of Test") and demonstrate arm circumference and skinfold measurement on Research Assistant assisting with test; distribute and collect consent forms.

   (c) review student consent forms with teacher to determine students who will participate in project;

   (d) ask teacher to give non-consenting students an assignment; if possible, ask teacher to relocate non-consenting students to another room or to one area of classroom;

(e) determine number of test packets needed after absences and consent forms have been reviewed;

(f) get number of tests needed from Project Coordinator.

7. *Project Coordinator will* record inclusive ID numbers of tests used in the class on class rosters and on Report of Visit to School form.

8. During continuation of test administration in each classroom, Research Assistants (#1 and #4) responsible for testing will:

(a) give instructions 2 through 4 related to general information and test administration (refer to Instructions Before Administration of Test), with assistance of another Research Assistant, as needed;

(b) distribute test packets to fifth graders (packet will include a yellow signature card and student response sheet with ID number stamped on them and a test booklet);

(c) after distribution of packets, continue with instructions for completing answer form (Instructions 5 to 12).

9. As soon as possible after testing had been initiated in the last classrooms, Research Assistants #2 and #3 will take calipers to measurement area and begin measurement procedures.

10. During test completion in each classroom, Research Assistants (#1 and #4) responsible for testing will:

(a) answer fifth graders' questions; answers will be limited to clarifying test directions and pronouncing unfamiliar terms; if necessary, remind students to be quiet until all students have completed the test (ask for teacher's assistance if needed);

(b) prepare forms, etc., as follows:

(1) alphabetize student consent forms, secure with a clip, and label with teacher's name;

(2) enter student ID numbers on class rosters as response sheets and test booklets are turned in;

(3) alphabetize response sheets and clip together with class rosters on top of response sheets;

(4) check test booklets and erase marks, etc., if time permits;

(5) prepare recall forms with students' names and ID numbers for students in random sample for interviews (use a pencil); indicate order of interviews and label with teacher's name in upper right hand corner of forms.

(6) at end of test administration, write names on board of students selected randomly for dietary recall interviews, in order of random number selection; list minimum number of students; names will be added if more interviews can be conducted in scheduled time.

11. At end of test administration in each classroom, Research Assistants (#1 and #4) responsible for testing will:

(a) collect portfolio with test posters;

(b) give all forms and data to Project Coordinator:

(1) alphabetized consent forms, labeled with teacher's name;

(2) alphabetized response sheets, labeled with teacher's name and clipped together with class roster;

(3) test booklets,

(4) numbered recall forms, labeled with teacher's name.

(c) be sure all equipment and supplies are out of classroom.

12. Project Coordinator and Research Assistants #2 and #3 will proceed to the area designated for anthropometric measurements as soon as schedule permits. Fifth graders will be directed to the area for anthropometric measurements by Project Coordinator. No more than five students should be in line for measurements at any one time. The Project Coordinator will determine the order for bringing students from various classes to the measurement area.

13. Project Coordinator will check to see that fifth graders have:

(a) removed shoes, jackets, sweaters, etc.;

(b) emptied pockets;

(c) remembered to bring yellow signature cards to measurement area.

14. Procedure for anthropometric measurement will proceed as follows:

(a) Project Coordinator and Research Assistants not involved in test administration will initiate collection of anthropometric measurement data (refer to Anthropometric Measurement Procedures).

(b) One Research Assistant (#2) will take height and weight (at Station #1) and a second Research Assistant (#3) will determine upper arm midpoint and take arm circumference and skinfold measurements (at Station #2). Project Coordinator will record all data until Research Assistant #4 has completed test administration. If one of the Project Co-Directors is able to be on-site, she will serve as recorder.

(c) Project Coordinator will invite students to measurement area as needed, to keep measurement procedures flowing smoothly.

(d) When test administration is complete, the team will proceed as follows:

(1) At Station #1, Research Assistant #2 will take signature card of each student and give to recorder; then height and weight of each fifth grader will be measured.

- Research Assistant should explain procedures to students to put them at ease;

- Research Assistant will observe to see that measurements proceed at a pace to permit recorder to enter data ccurately.

(2) At Station #2, Research Assistant #3 will ask student's name, then determine upper arm midpoint, measure arm circumference and measure skinfold thickness.

- Research Assistant should explain procedures to put students at ease.

(3) Research Assistant #4 will be recorder for all measurements.[1] Recorder will:

- get yellow signature card from Research Assistant #2 as each student arrives for measurements;

- enter students' names and ID numbers on anthropometric data cards;

- enter height and weight as measurements are taken at Station #1;

- check student's name on data card at Station #2;

- enter arm circumference and skinfold measurements at Station #2;

- enter ethnic group of each student. If recorder is unsure, ethnic group will be checked with teacher by Project Coordinator before leaving school.

(4) Research Assistants #2, #3, and #4 may rotate between taking measurements and recording data, as needed to avoid fatigue.

15. At end of anthropometric measurements, Research Assistants #2 and #3 will: fold up height board and stool and lock scale; store equipment where appropriate in school until end of visit.

16. Research Assistant #4 (Data Recorder) will:

(a) alphabetize yellow signature cards by class, secure with a rubber band, and label with teacher's name;

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[1] If one of the Project Co-Directors is on-site, she will serve as recorder and Research Assistant #4 will begin interviews.

(b) alphabetize anthropometric data cards by class, secure with a rubber band, and label with teacher's name;

(c) give signature cards and data cards to Project Coordinator;

(d) pack case with skinfold equipment, etc. and take case to recall area.

17. Following test administration and anthropometric measurements:

(a) Research Assistants will conduct dietary recall interviews, following established procedure (refer to Procedure for the Interview), with fifth graders in the sub-sample drawn by the Project Coordinator.

(b) Each Research Assistant should conduct from four to eight dietary recall interviews at each school as time permits. (If fewer than 16 fifth graders are enrolled at the school, all fifth graders will be interviewed.)

(c) Research Assistant #1 will begin recalls as soon as test administration is complete.

18. During recall interviews, Project Coordinator will:

(a) direct fifth graders to recall area as needed, introduce fifth graders to Research Assistants, and give recall forms to Research Assistants as interviews are scheduled;

(b) review anthropometric data cards and check with teachers to determine ethnic group of students for whom recorder is unsure; record birth dates of each student on data cards from yellow signature cards (month, day, year; e.g., 8/4/70);

(c) check class rosters to determine if all parent consent forms, student consent forms, test response forms, and anthropometric data forms are in order; clip test forms and consent forms from each classroom together and label with teacher's name; put rubber bands around signature cards and anthropometric data cards for each class and label with teacher's name;

(d) file all data for school in appropriate folder;

(e) leave school form (Survey of School Food Programs) and memo with principal;

(f) collect recall forms from Research Assistants as interviews are completed, clip forms for each class together, label with teacher's name, and file in school folder.

19. Research Assistants will:

(a) repack equipment in station wagon;

(b) review Check List to determine if all equipment and supplies have been collected and report to Project Coordinator.

20. Project Coordinator will:

    (a) have brief exit conferences with principal and teachers and express thanks for cooperation;

    (b) check with Research Assistants to determine if all equipment and supplies are packed and in order.

21. As soon as possible after visit is complete, Research Assistants should:

    (a) review recall forms from interviews they conducted and complete or clarify information;

    (b) complete erasing test booklets;

    (c) complete entering students' birth dates on yellow signature cards, if necessary.

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

School: _____
City: _____
Date: _____

CHECKLIST OF SUPPLIES AND EQUIPMENT FOR ON-SITE VISITS TO ELEMENTARY SCHOOLS IN SAMPLE

Beginning of visit	End of visit	
		1. Packet on Protocol (5 notebooks; 1 per team member)
		1.1 Protocol for on-site visit
		1.2 Instructions before administration of test
		1.3 Anthropometric Procedures
		1.4 Interview instructions:
		a. Procedures for Training the Interviewers
		b. Procedures for Interview
		c. Probing Questions
		d. List of Food Models
		1.5 Pencil packet
		1.6 Weekly Schedule
		2. School Forms (in brown folder; 1 folder per school to be visited)
		2.1 Checklist of Supplies and Equipment
		2.2 Class Roster (1 per class in school)
		2.3 Random number list to select recall sample (1 per class)
		2.4 Standardization of Equipment Form (1 per school)
		2.5 Memo to Principal and Survey of School Food Programs (1 per school)
		3. Student Data Collection Forms* (Adequate supply for schools to be visited)
		3.1 Student Consent Forms (1 per student)
		3.2 Test Packets (1 per student) (Packet to include: signature card, response sheet, test booklet)
		3.3 Anthropometric cards (1 per student)
		3.4 Recall forms (1 per student in sub-sample)

*NOTE: Completed forms to be added to school folder at end of school visit, grouped by class.

Beginning of visit	End of visit

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

REPORT OF VISIT TO SCHOOL

Week: _____

Date of Visit: _____

Time: _____

USD No./Name: _____

School: _____

Address: _____
Street

_____
City State Zip Code

Principal: _____

Foodservice Programs in School:

_____ Breakfast
_____ Lunch

Type of Foodservice System:

_____ On-site
_____ Satellite

Fifth grade teacher	Class no.	No. fifth grade students	Test ID numbers assigned to class

Schedule during visit:

Comments concerning visit:

Type of Milk Served: _____ 2% _____ whole _____ chocolate _____ other:

Breakfast menu		Lunch menu (today)		Lunch menu (prior day)	
menu item	portion size	menu item	portion size	menu item	portion size

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
NEEDS ASSESSMENT PROJECT
Kansas State University
in cooperation with the Kansas State
Department of Education

Standardization of Equipment for Anthropometric Measurements

Name of School _____ Date _____

Address of School _____ Hour _____

A. Height Board

(Use a 100 cm metric rule to check accuracy. Record date and reading.)

1. Reading _____

B. Accu-Weight Bench Scale

(After transporting scale, position scale for weighing. Use three, 25 pound weights to check accuracy. Record weights.)

	Scale #1	Scale #2
1. Weight #1		
2. Weight #1 and #2		
3. Weight #1, #2 and #3		

C. Lange Skinfold Calipers

(Before taking measurements at each school use the metal block to check accuracy. Record readings.)

	Caliper #1	Caliper #2
1. 10 mm		
2. 20 mm		
3. 30 mm		
4. 40 mm		
5. 50 mm		

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Kansas State University
in cooperation with the Kansas State
Department of Education

School: _____

City: _____

class	initial no. of students	new enroll-ments	moved from school	absences	no parent form	parent non-consent	student non-consent	adjusted no. of students
1.								
2.								
3.								
4.								
5.								
6.								
Totals								

School: Location: Date:

Teacher: Class:

recall no.	meas. no.	name of student	present/ absent	parent permis.	student permis.	dietary recall sample	ID no.	data check		
								test	measure-ments	recall data

APPENDIX K

Procedures and Forms for Test Administration to Fifth Grade Students

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Kansas State University
in cooperation with the Kansas State
Department of Education

INSTRUCTIONS BEFORE ADMINISTRATION OF TEST

Informed Consent Statement:

1. (a) Your school has been selected to take part in a study of students' nutrition knowledge, attitudes, and eating habits. All fifth graders in about 100 elementary schools across Kansas are being asked to participate. In cooperation with the Kansas State Department of Education, Kansas State University is conducting the project.

   (b) Today, you will be asked to complete a questionnaire about nutrition knowledge and attitudes and you may be asked about your eating habits.

   (c) Also, we would like to weigh you and measure your height and the circumference of the upper part of your arm, and take a skinfold measurement.

      (1) This means measuring the length of your arm like this (demonstrate), then we'll make a tiny mark on your arm with a red pen to be sure we're measuring at the right place.

      (2) Next, we will measure around your arm with a tape like this (demonstrate) and measure a fold of skin on the back of your upper arm (demonstrate).

      (3) It won't hurt you.

   (d) We hope you will take part in the project; however, this is your decision. Your name will not be matched with your answers and all information about you will be kept secret.

   (e) The information collected from you and all of the other fifth graders in the other schools will be put together and used to help plan nutrition education programs for Kansas elementary schools.

   (f) Please clear everything from your desk except for a pencil. (STOP: Ask if anyone needs pencils; distribute to those who do.)

   (g) Now, we need to have you sign your name and put today's date on the form we will distribute and indicate whether or not you are willing to take part. Sign both your first and last name. (STOP: Pass out forms.)

   (h) We will pick up these forms before we begin the test. (STOP: Research assistant will review forms and revise list of students. Also, she will ask teacher to give an assignment to nonparticipants.)

General Information:

2. (a) First, you will all complete the nutrition test, and then, you will go to the measurement area as you are called.

   (b) After you have been weighed and measured please return to your classroom (or desk if a separate room is not provided).

   (c) Next, some of you will be interviewed regarding your eating habits. Time will not permit us to interview all of you. So we gave each of you a number and used a table of random numbers to decide who to interview. This was like drawing numbers from a hat--you all had an equal chance to have your number drawn.

   (d) Those of you who will be interviewed will be called to the interview area when it is your turn.

Test Administration:

3. We will now begin the test. The items in this test have been designed to find out what you know and how you feel about nutrition. Even though there will be some questions for which you do not know the answers, try to answer all of the questions.

4. We are going to pass out the booklets and answer sheets now. Please do not begin until we tell you to; do not open the booklet yet. (STOP: Distribute test packets. If necessary, call out names of participating students.)

5. (a) First, sign your first and last name on the yellow card. Under your name, write your birth date--the month, day and year you were born. Lay the card aside to take with you when it is your turn to be measured.

   (b) Now, at the top of the green answer page, please sign your first and last name. Then, complete the four general questions at the top of the page. Mark an X beside the answer that applies to you.

   (c) When you have finished this part, unclip the answer sheet from the booklet--STOP until I tell you to go on. Please do not open the booklet yet. (STOP: Wait until all students have completed general questions. Ask if all students are ready before proceeding.)

6. Now, open the test booklet. Please do not mark on the test booklets. Use the answer sheets to record your answers. Please do not start until I tell you to. You will not be timed. (STOP: Put up posters for display.)

7. There are three parts to this test. (NOTE: Administrator points out each part on answer sheet, holding it up, as instructions are given.)

   (a) On the first part, for questions 1-35, circle the letter on the front side of the answer sheet for the answer you think is correct. (Show Poster #1) This poster shows an example.

   (b) On the second and third parts, questions 36-65, you will answer on the back side of the answer sheet. Circle the whole word for the answer that you have chosen. There are no right or wrong answers on

these questions, we want to know what you think. These two posters show you the way these questions should be answered.

(c) (Show Poster #2) For example, on this item, I agree that it is fun to eat out--this is similar to questions 36 to 46.

(d) (Show Poster #3) On this example, by circling sometimes, that means I don't always wash my hands before meals, but I do sometimes. This question is similar to those in numbers 47 to 65.

(e) I'll leave these posters for you to refer to while taking the test.

8. Remember, after you finish question 35, you must turn over the answer sheet to answer the remaining questions. Make sure that you read each question carefully before you choose your answer.

9. Read and answer all of the questions until you complete the booklet. When you are finished, quietly bring your booklet and answer sheet to me and go back to your seat. Please try not to disturb others who are still working on the test. We will tell you when it is your turn to be measured.

10. Remember, we want you to answer every item--even if you are not sure of all the answers.

11. If you do not understand the directions or do not recognize a word, please raise your hand and we will help you. However, we cannot answer the test question for you.

12. You may begin. Remember, do not mark on the test booklet.

(NOTE: (a) While students are completing the test, limit answers to students' questions to clarifying test directions and pronouncing unfamiliar terms.

(b) Refer to Protocol during test administration and complete assigned tasks as indicated.

(c) Be sure to clear classroom of all supplies and equipment before leaving. Give all consent forms, response sheets, test booklets, and roster to Project Coordinator.)

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Consent Form for Fifth Graders

I will take part in this project.

_____ _____
(your name) (date)

I will not take part in this project.

_____ _____
(your name) (date)

APPENDIX L

Changes in Sample

KANSAS NUTRITION EDUCATION AND TRAINING PROGRAM
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Kansas State University
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Changes in Sample Size

week no.	USD	school	initial no. of students	new enroll-ments	moved from school	absences	no parent form	parent non-consent	student non-consent	adjusted no. of students
1	322	Onaga Elementary	21	0	0	1	0	0	0	20
	442	Kelly Elementary	4	0	1	0	0	0	0	3
	383	Marlatt Elementary	114	1	0	8	6	3	1	97
	323	St. George Elementary	19	1	0	1	0	1	2	16
	383	T. Roosevelt Elementary	43	0	1	3	5	3	0	31
	378	Leonardville Elementary	40	1	2	8	0	1	0	30
	475	Washington Elementary	42	1	0	0	16	1	0	26
2	498	Valley Heights Elementary	15	0	0	1	0	0	0	14
	380	Centralia Elementary	13	0	0	0	0	0	0	13
	425	Highland Elementary	27	0	0	5	0	1	0	21
	406	Wathena Elementary	43	0	0	0	0	10	0	33
	335	Jackson Heights Elem.	50	0	0	2	0	1	1	46
	339	Jefferson Co. N. Middle	35	0	0	2	0	0	1	32

Changes in Sample Size (cont.)

week no.	USD	school	initial no. of students	new enroll-ments	moved from school	absences	no parent form	parent non-consent	student non-consent	adjusted no. of students
3	501	McCarter Elementary	46	0	1	4	2	3	0	36
	497	Wakarusa Valley Elem.	22	0	0	1	0	14	0	7
	348	Baldwin Elementary	40	1	0	5	0	3	0	33
	497	Kennedy Elementary	31	1	0	5	10	0	0	17
	204	Southwest Elementary	82	1	3	1	8	4	0	67
	202	Junction Elementary	70	2	0	8	1	3	0	60
4	223	Linn Elementary	12	0	0	0	3	1	0	8
	455	Cuba Elementary	16	0	0	1	0	0	0	15
	273	Beloit Elementary	55	1	0	9	0	4	0	43
	305	Hageman Elementary	41	2	0	1	0	2	0	40
	305	Lowell Elementary	21	2	0	0	0	1	0	22
	305	Sunset Elementary	67	0	0	6	1	7	5	48*
	307	Happy Corner Elementary	14	0	0	1	0	0	0	13
5	501	Quinton Heights Elem.	36	4	1	2	0	2	0	35
	420	Osage City Elementary	52	1	0	1	11	4	0	37
	253	Village Elementary	66	2	0	2	2	8	1	55
	390	Hamilton Elementary	9	0	0	0	0	1	1	7
	244	Burlington Upper Elem.	70	1	3	8	0	5	0	55

*One student could not take test due to language problems. He had permission, but no test given to him.

Changes in Sample Size (cont.)

week no.	USD	school	initial no. of students	new enroll-ments	moved from school	absences	no parent form	parent non-consent	student non-consent	adjusted no. of students
5	287	Pomona Elementary	30	1	0	2	4	0	2	23
	290	Eugene Field Elementary	31	1	0	2	0	3	0	27
	362	LaCygne Elementary	26	0	1	0	0	2	0	23
6	277	Burr Oak Elementary	14	0	2	0	0	0	0	12
	240	Tescott Elementary	15	0	0	1	1	0	0	13
	431	Lincoln Elem. (Hois.)	21	1	0	2	0	0	0	20
	512	South Park Elementary	49	1	2	1	6	12	0	29
	233	Meadow Lane Elementary	50	0	2	3	1	1	0	43
	231	Edgerton Elementary	119	2	0	12	13	5	0	91
7	410	Durham Elementary	49	0	2	3	0	6	0	38
	206	Whitewater Elementary	27	2	2	1	0	4	0	22
	373	Chisholm Middle	83	0	2	1	6	13	0	61
	373	Santa Fe Middle	144	3	2	2	16	8	1	118
	308	Lincoln Elem. (Hutch.)	34	1	3	2	2	1	0	27
	308	Winans Elementary	20	1	0	0	0	5	0	16
8	501	Bishop Elementary	70	1	0	2	1	1	1	66
	259	Woodman Elementary	100	2	3	10	2	15	0	72
	259	Dodge Elementary	41	5	4	2	1	4	0	35

Changes in Sample Size (cont.)

week no.	USD	school	initial no. of students	new enroll-ments	moved from school	absences	no parent form	parent non-consent	student non-consent	adjusted no. of students
8	259	Wells Elementary	22	2	3	1	2	2	0	16
	259	Colvin Elementary	64	11	6	6	12	5	0	46
9	259	Kensler Elementary	85	3	1	1	16	8	1	61
	259	Seltzer Elementary	52	1	1	0	2	5	0	45
	259	Bryant Elementary	55	3	0	2	22	3	0	31
	264	Clearwater Grade Annex	76	3	3	3	10	14	0	49
	262	Abilene Elementary	83	1	1	3	5	2	0	73
10	235	West Bourbon Elementary	41	0	0	2	4	4	1	30
	246	Arma Elementary	39	0	3	1	0	2	0	33
	505	Chetopa Elementary	44	1	0	3	19	4	0	19
	285	Cedar Vale Elementary	17	2	2	1	1	1	0	14
	506	Meadow View Elementary	38	1	1	3	0	3	0	32
	247	Cherokee Elementary	27	0	1	1	0	1	0	24
	512	D. Moody Elementary	108	0	4	6	9	0	0	89
11	448	Inman Elementary	24	1	0	1	1	1	0	22
	401	Chase Elementary	22	0	0	0	0	0	0	22
	445	Dearing Elementary	36	0	1	2	0	0	1	32
	445	Garfield Elementary	64	2	6	2	1	1	0	56

Changes in Sample Size (cont.)

week no.	USD	school	initial no. of students	new enroll-ments	moved from school	absences	no parent form	parent non-consent	student non-consent	adjusted no. of students
11	512	Roesland Elementary	55	1	0	1	0	4	0	51
12	495	Northside Elementary	50	0	2	2	1	2	0	43
	495	Garfield Elementary	8	0	0	1	0	0	0	7
	461	Heller Elementary	39	1	3	1	2	2	0	32
	484	Lincoln Elem. (Fredonia)	69	1	2	2	3	3	0	60
	470	Adams Elementary	49	2	0	2	3	2	0	44
	470	Pershing Elementary	20	1	0	0	0	1	0	20
	311	Pretty Prairie Elem.	21	0	0	1	4	3	0	13
	268	Cheney Elementary	36	0	0	0	6	3	1	26
13	444	Geneseo Elementary	8	1	0	0	0	0	0	9
	349	Stafford Community Elem.	20	0	0	0	0	1	2	17
	407	Bickerdyke Elementary	75	2	1	3	6	7	1	59
	489	Lincoln Elem. (Hays)	40	1	0	1	0	1	0	39
	489	Roosevelt Elementary	59	2	0	1	4	5	0	51
	489	Schoenchen Elementary	3	0	0	0	0	0	0	3
14	324	Eastern Heights Elem.	13	0	0	1	0	0	0	12
	326	Logan Elementary	17	0	1	2	0	0	0	14
	103	Bird City Elementary	16	0	0	1	0	5	0	10

Changes in Sample Size (cont.)

week no.	USD	school	initial no. of students	new enroll-ments	moved from school	absences	no parent form	parent non-consent	student non-consent	adjusted no. of students
14	315	Colby Elementary	67	1	1	0	5	6	1	55
	466	Scott City Elementary	80	2	2	3	0	7	0	70
15	474	Haviland Elementary	15	0	0	0	0	1	0	14
	300	Coldwater Elementary	21	2	1	1	0	0	0	21
	374	Sublette Elementary	36	1	0	0	10	2	0	25
	457	Pierceville-Plymell Elem.	10	0	0	0	0	0	2	8
	457	Buffalo Jones Elem.	26	2	0	1	7	0	0	20
	457	Jennie Wilson Elem.	51	0	0	1	3	4	2	41
16	356	Kyle Trublood Elem.	32	0	3	2	1	4	0	22
	331	Norwich Elementary	9	0	1	0	0	2	0	6
	483	Kismet Elementary	22	0	1	0	0	1	2	18
	217	Rolla Elementary	14	0	2	0	0	1	0	11
		TOTALS	4,017	94	90	197	277	286	30	3,231

APPENDIX M

Data Coding Information

CODING OF QUESTIONNAIRE DATA

Fifth Grade Student Response Sheet

BED number = 1-10
USD number = official Kansas State Department of Education Unified School District (USD) number
School number = 1-6; in cases of multiple schools in the same USD each school was assigned a number
Teacher number = 1-6; in cases of multiple fifth grade classes in the same school each fifth grade teacher was assigned a number
ID number = 1-3236
Questions 1-35 were keypunched as a, b, c, d; questions 36-46 were keypunched as a, b; questions 47-65 were keypunched as a, b, c.

General Information Section

1. Sex
   (1) = boy
   (2) = girl

2. Place of residence
   (1) = farm
   (2) = town

3. Transportation to school
   (1) = walk
   (2) = ride a bike
   (3) = ride in car
   (4) = ride in bus

4. Length of bus ride
   (1) = 15 minutes
   (2) = 30 minutes
   (3) = 45 minutes
   (4) = 1 hour

CODING OF FOOD INTAKE: 24 HOUR DIETARY RECALL

Page 1. Demographic Information

ID number = 1-3235

Time of interview
(1) = Morning
(2) = Afternoon

Day of Week of Recall
(1) = Monday
(2) = Tuesday
(3) = Wednesday
(4) = Thursday
(5) = Friday

Code position and basis of employment for father's and mother's occupation

1. and 2. Father's and mother's occupation[1]
Position:
(1) = Professional, Technical
(2) = Managerial Occupations
(3) = Clerical
(4) = Sales
(5) = Service
(6) = Agriculture
(7) = Skilled
(8) = Unskilled
(9) = Unemployed
(10) = Homemaker
(11) = Student
(13) = Military
(14) = Separated or not living at home
(15) = Retired
Basis of employment:
(A) = Full time
(B) = Part time

3. How many persons are there living in your home?
(1) = 2
(2) = 3
(3) = 4
(4) = 5
(5) = 6
(6) = 7 or more

---

[1] Space was allowed to record two jobs each for both father and mother.

4. Who usually prepares your meals?
   (1) = Mother
   (2) = Father
   (3) = Older sister
   (4) = Older brother
   (5) = Self
   (6) = Other
   (7) = Combination of above

5. How many times a week do you eat out?
   (0) = None or rarely
   (1) = 1
   (2) = 2
   (3) = 3
   (4) = 4
   (5) = 5
   (6) = 6 or more

6. Do you take vitamin and/or mineral supplements?
   (1) = Yes
   (2) = No
   (3) = Sometimes
   How many per day? enter no.
   per week? enter no.

7. What kind?[1]
   (901) = Multivitamins
   (902) = Vitamin C
   (903) = Vitamin A & D
   (904) = Iron
   (906) = One A Day plus Iron
   (907) = Vitamin E
   (908) = Calcium
   (909) = Niacin
   (910) = Vitamin B_6
   (911) = Protein supplement
   (912) = Megavitamins

8. Are you on a special diet now?
   (1) = Yes
   (2) = No

8a. If Yes, why are you on a diet?
   (1) = For weight reduction
   (2) = For weight reduction with doctor's prescription
   (3) = For gaining weight
   (4) = For allergy, specify
   (5) = For other reason, specify

---

[1] Supplements were coded as Meal 7. Codes refer to food item numbers assigned to supplements reported.

8b. If No, have you been on a special diet within the past year?
(1) = Yes
(2) = No

Pages 2 and 3.
Column:
1-4 ID code

5 Meal code (1-7) Punch 1 card for each meal for each student. If two cards are needed for a meal, repeat columns 1-7 on card 2 for that meal and continue adding additional foods.
(1) B = breakfast
(2) am = am snack
(3) L = lunch
(4) pm = afternoon snack
(5) D = dinner
(6) eve = evening snack
(7) vitamin supplement

6-7 Where eaten code
Enter no. from code form (1-10)
(1) SL = school lunch
(2) CL = carried lunch from home
(3) H = home
(4) O = other home (friend or relative)
(5) V = vending machine
(6) G = grocery
(7) FF = fast food (state name)
(8) R = restaurant (not fast food)
(9) other (specify)
(10) multiple places

8-79 Enter foods eaten in the following format, 6 col./food:

3 Col. Food Code: Enter a three digit number from the FOOD LISTING IN DIETCHECK for each item. If food was not included in data base, assign a new food code and quantity code number.

3 Col. Amount Code: Enter the quantity of food consumed as a three digit number with two decimal places in the following format: 9.99. This number should be right-justified. DO NOT LEAVE A SPACE FOR THE DECIMAL.

For example: Col. 8-11: enter food code for first food eaten at that meal

12-14: enter amount code for first food eaten at that meal

15-79: continue to enter food and amount code for each item in the meal.

Space is allowed for 12 foods to be entered in Col. 8-79. If additional space is needed for a meal, as noted above, duplicate col. 1-7 and continue adding foods for the meal.

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Week _____

Date of Visit _____

School _____

Food Code	Menu Item	Portion	Portion Code

Card 1

Coding Form for New Foods
(form for names and portion sizes)

Col. 1-3 food item no.	Col. 4-23 (20 col.) name of food item	Col. 24-29 (6 col.) portion size

Card 2. Nutrient Information

food item Col:	item no. 1-3	calories 13-16	protein, g 17-19	fat total, g 20-22	sat. fat acids, g 23-25	oleic, unsat., g 26-28	linoleic, unsat. 29-30	carbohydrate, g 31-33	calcium, mg 34-37	iron, mg 38-40	vitamin A, IU 41-44	thiamine, mg 45-47	riboflavin, mg 48-50	niacin, mg 51-53	vitamin C, mg 54-56	pantothenic, mg 61-63	B_6, mg 64-66	B_{12}, ug 67-68	folic acid, ug 69-70	phosphorus, mg 71-73	magnesium, mg 74-76	vitamin E, IU 77-79

Guide for Coding Dietary Recalls

	food item no.	quantity
DAIRY PRODUCTS		
Choc. milk = Cocoa Milk	30	
Choc. milk = Choc. Milk Skim lowfat, 2%, or skim	31	
HIGH PROTEIN FOODS		
1 fish cake = 2 fish sticks	101	
1 oz. sausage = 1 link	93	4 oz.
VEGETABLES		
1 boiled, peeled potato = 3/4 cup potatoes	186	
1 ear corn = 5" long ear	158	
1 4" stick celery = ½ stalk	155	
1 stalk celery = 3 cups diced celery		
1 head lettuce = 4 cups chopped lettuce	166	
"Buttered" vegetables - add ½ pat margarine	144	
FRUITS		
1 pineapple ring = ¼ cup crushed	302	1 cup
2 halves peaches = 1/3 cup	287	1 cup
All oranges are California	270	one
BREADS AND CEREALS		
Cooked Farina = Cream of Wheat	684	½ cup
Brownie = 2" sq.	745	one
Super Sugar Smacks = Sugar Smacks	732	one
Cheerios = Pep cereal	731	
50 g. Bran flakes/1 cup (28 g. = 1 oz.)	729	
Oreo = Sandwich cookie	747	one
Pizza: one slice = 1/8 of 14" diam. circle	410	one
SUGARS, CANDY, JAMS AND JELLIES		
For glazes, use 470, Syrup, table blends	470	Tbsp.
MISC.		
2 slices dill pickle = 1/8 one dill pickle	491	
NOTES		
Catsup = Tomato Catsup (Vegetables)	210	Tbsp.
Pork and Beans (Miscellaneous)	116	cup
Turkey pot pie = Poultry pot pie	90	

CEREALS[1]

729 - ½ Cup	730 - ½ Cup	731 - 1 Cup	732 - 1 Cup
ALL BRAN	RAISIN BRAN	PEP CEREAL	SUGAR SMACKS
Bran Buds Cracklin Bran Corn Chex Wheat Chex Corn Bran Most Life Tasteoos Bran Chex	Special K Concentrate	40% Bran Flakes Wheaties Team Cheerios Golden Grahams Kik Total Product 19 Rice Krispies Body Buddies Rice Chex	Frosted Mini Wheats

733 - 3/4 Cup	373 - 3/4 Cup	682 - ½ Cup
SUGAR FROSTED FLAKES	FROSTED CORN FLAKES	SHREDDED WHEAT
Alpha Bits Fruity Pebbles Honey Comb Cocoa Puffs Ct. Chocula Lucky Charms Trix Apple Jacks Cocoa Crisps Cookie Crisps Cap'n Crunch Quisp Flintstones Honey Nut Franken Berries	Frosted Rice King Vitamin	Team Flakes Puffed Rice Puffed Wheat 100% Natural Cereal

CANDY BARS[1]

708 - 35 gm.	713	854	856
BAR CHOCOLATE	MR. GOODBAR	REECE'S	BABY RUTH
Choco Lite Kit Kat Krackel Crunch $100,000 Summit Almond Bark Twixt	Whats a ma callit Rally	Skrunch	Heath Bar Butterfinger

[1]Cereals or candy grouped together have similar nutrient content; use food code no. for cereal or candy in capital letters for all cereals or candy in the group.

APPENDIX N

Means, Standard Deviations, Selected Percentiles, and Coefficients of Variation for Height, Weight, Arm Circumference, Triceps Skinfold, and Muscle Circumference of Fifth Grade Girls in Fourteen Age Groups

Table 58: Means, standard deviations, selected percentiles, and coefficients of variation for height of Kansas fifth grade girls by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		cm.	cm.							
≤126	≤10.50	86	143.63 ± 6.77	132.0	135.7	138.3	143.4	148.6	153.1	156.4	4.71
127	10.58	121	142.72 ± 7.35	131.9	133.0	137.5	142.0	147.7	152.2	155.0	5.15
128	10.67	113	142.98 ± 6.33	132.0	133.4	138.4	143.2	148.2	151.0	153.0	4.43
129	10.75	103	141.04 ± 6.62	131.4	133.0	136.0	140.5	145.1	149.5	152.4	4.70
130	10.83	113	145.32 ± 6.50	135.4	137.1	139.7	145.7	149.8	153.6	156.6	4.48
131	10.92	111	144.54 ± 6.86	134.8	135.9	139.6	143.9	147.9	154.9	158.0	4.75
132	11.00	122	145.69 ± 7.40	132.9	136.2	140.9	144.8	151.0	155.1	159.1	5.08
133	11.08	120	146.52 ± 7.37	134.3	136.5	141.8	146.0	150.6	155.5	159.8	5.03
134	11.17	110	145.63 ± 7.26	134.3	136.2	140.7	144.8	149.8	156.4	159.8	4.99
135	11.25	125	147.03 ± 7.10	134.3	136.1	142.5	146.9	152.5	156.3	158.1	4.83
136	11.33	109	147.59 ± 7.13	136.2	138.1	142.0	147.5	152.8	156.6	159.7	4.83
137	11.42	137	148.11 ± 7.88	135.0	139.0	142.2	147.7	153.8	158.3	160.6	5.32
138	11.50	110	147.34 ± 7.81	134.9	138.5	142.0	146.2	152.4	158.0	162.1	5.30
≥139	≥11.58	140	146.55 ± 7.14	135.5	136.6	141.9	146.4	151.3	156.2	158.1	4.87

Table 59: Means, standard deviations, selected percentiles, and coefficients of variation for weight of Kansas fifth grade girls by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		kg.	kg.							
≤126	≤10.50	86	37.19 ± 7.33	27.1	28.1	32.0	35.7	41.8	48.4	52.4	19.71
127	10.58	121	37.62 ± 8.53	27.0	28.8	31.8	35.9	41.3	48.6	53.4	22.68
128	10.67	113	38.03 ± 7.07	27.8	29.4	32.5	37.2	42.8	48.5	50.3	18.60
129	10.75	103	35.48 ± 7.35	25.5	27.6	30.4	33.6	38.9	47.5	50.0	20.72
130	10.83	113	38.35 ± 7.87	28.8	29.9	32.5	36.8	43.1	47.8	52.1	20.53
131	10.92	111	38.21 ± 8.02	27.8	29.3	31.6	36.8	41.8	50.8	54.4	21.00
132	11.00	122	39.03 ± 8.28	28.5	30.5	33.7	36.7	44.4	49.5	52.3	22.23
133	11.08	120	39.82 ± 8.46	28.8	30.9	33.6	38.7	44.1	51.7	54.4	21.24
134	11.17	110	38.18 ± 8.69	26.9	28.6	32.2	35.8	43.0	48.3	55.0	22.75
135	11.25	125	40.46 ± 8.28	27.6	28.4	34.4	39.3	46.6	52.0	55.2	20.47
136	11.33	109	40.16 ± 9.48	27.5	29.3	33.0	39.5	45.9	54.0	56.4	23.60
137	11.42	137	40.95 ± 8.40	29.6	31.8	35.1	39.8	46.1	52.5	55.8	20.52
138	11.50	110	39.79 ± 8.60	27.8	29.7	33.9	37.8	45.5	52.5	55.2	21.60
≥139	≥11.58	140	41.69 ±10.41	27.9	30.3	33.9	39.7	48.0	54.8	61.1	24.97

Table 60: Means, standard deviations, selected percentiles, and coefficients of variation for arm circumference of Kansas fifth grade girls by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		mm.	mm.							
≤126	≤10.50	85	219.0 ± 25.6	181.5	185.6	200.0	215.0	235.0	255.8	265.0	11.69
127	10.58	121	221.0 ± 28.0	185.0	190.0	200.0	215.0	235.0	256.6	269.8	12.68
128	10.67	112	223.1 ± 27.6	184.3	190.0	200.0	220.0	245.0	260.0	270.0	12.36
129	10.75	103	217.2 ± 40.6	179.2	185.0	195.0	206.0	232.0	250.0	277.4	18.70
130	10.83	113	220.0 ± 27.4	185.0	190.0	198.7	215.0	234.0	256.0	261.6	12.48
131	10.92	111	221.0 ± 27.9	184.6	190.2	200.0	214.0	240.0	190.2	263.2	12.63
132	11.00	122	221.5 ± 26.4	190.0	194.2	202.0	215.7	237.5	260.0	266.7	11.91
133	11.08	120	224.4 ± 27.9	185.2	193.2	204.2	220.0	242.8	262.8	269.8	12.43
134	11.17	110	217.7 ± 27.5	181.1	188.2	196.0	211.9	230.0	251.8	280.0	12.64
135	11.25	125	224.7 ± 28.1	185.0	191.6	202.5	220.0	244.8	266.0	274.4	12.49
136	11.33	109	221.5 ± 30.2	179.9	188.2	198.5	219.0	244.8	265.0	275.0	13.62
137	11.42	137	226.1 ± 26.7	184.7	195.0	210.0	224.0	237.5	260.0	275.7	11.80
138	11.50	110	222.2 ± 27.6	184.1	190.0	200.0	220.5	238.5	259.8	280.0	12.45
≥139	≥11.58	140	228.5 ± 33.6	184.0	190.0	202.2	225.5	247.6	270.0	293.4	14.73

Table 61: Means, standard deviations, selected percentiles, and coefficients of variation for triceps skinfold of Kansas fifth grade girls by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		mm.	mm.							
≤126	≤10.50	86	14.16 ± 4.77	7.1	8.3	10.3	13.5	17.8	20.8	23.0	33.68
127	10.58	121	15.31 ± 4.72	9.4	10.2	12.1	14.7	17.6	21.6	23.0	30.81
128	10.67	113	15.45 ± 5.18	8.0	9.0	12.6	14.5	18.1	22.2	25.1	33.50
129	10.75	103	14.89 ± 5.74	9.0	9.2	11.2	14.0	17.3	20.7	24.0	38.51
130	10.83	113	14.75 ± 5.11	9.0	10.1	11.9	13.8	16.3	21.3	23.4	34.61
131	10.92	111	15.52 ± 5.33	8.4	9.9	12.0	14.0	17.5	25.6	27.3	34.32
132	11.00	122	15.04 ± 4.93	9.0	10.0	11.8	14.2	16.9	22.0	24.0	32.74
133	11.08	120	15.47 ± 4.95	9.3	10.0	12.0	14.1	18.0	22.6	25.0	32.01
134	11.17	110	14.43 ± 4.62	8.7	10.0	11.5	13.3	16.1	20.4	24.9	32.02
135	11.25	125	14.69 ± 5.22	8.2	9.0	11.0	13.7	17.1	22.1	25.1	35.53
136	11.33	109	14.46 ± 4.15	8.5	9.5	11.7	14.0	16.9	20.3	21.5	28.71
137	11.42	137	15.77 ± 5.25	9.0	10.0	12.4	14.5	18.4	23.2	26.5	33.29
138	11.50	110	14.62 ± 4.55	8.0	9.5	11.7	13.9	17.0	20.5	22.7	31.13
≥139	≥11.58	140	15.68 ± 5.75	7.4	9.0	11.3	14.5	19.0	24.3	27.3	36.69

Table 62: Means, standard deviations, selected percentiles, and coefficients of variation for muscle circumference of Kansas fifth grade girls by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		mm.	mm.							
≤126	≤10.50	85	174.2 ± 18.5	149.1	152.2	161.4	171.2	185.0	200.7	213.3	10.64
127	10.58	121	172.9 ± 19.3	146.8	151.1	159.8	169.8	183.6	194.0	211.3	11.14
128	10.67	112	174.4 ± 17.2	148.9	153.7	160.2	174.3	187.4	197.4	204.8	9.88
129	10.75	103	170.4 ± 28.7	139.6	144.6	154.3	166.1	182.8	191.8	216.4	16.84
130	10.83	113	173.7 ± 19.3	148.1	150.7	158.0	171.5	187.8	203.2	208.9	11.11
131	10.92	111	172.2 ± 18.6	146.0	151.4	158.3	171.1	182.9	197.6	205.1	10.78
132	11.00	122	174.2 ± 18.5	151.8	152.9	161.2	170.0	186.4	199.9	208.6	10.61
133	11.08	120	175.8 ± 19.8	144.8	151.3	161.3	171.2	190.7	202.1	209.2	11.27
134	11.17	110	172.4 ± 20.5	143.2	147.4	157.9	169.5	185.4	200.2	209.9	11.89
135	11.25	125	178.6 ± 18.9	146.6	152.5	165.2	180.6	190.4	200.0	209.1	10.59
136	11.33	109	176.1 ± 23.6	145.8	148.1	157.3	173.9	191.7	210.0	219.0	13.38
137	11.42	137	176.6 ± 17.8	150.6	154.2	161.4	178.7	187.9	196.4	204.4	10.07
138	11.50	110	176.3 ± 21.7	143.8	151.2	160.4	173.4	190.3	204.8	220.8	12.30
≥139	≥11.58	140	179.2 ± 21.5	150.6	154.6	164.6	178.0	190.7	210.0	216.9	12.01

APPENDIX O

Means, Standard Deviations, Selected Percentiles, and Coefficients of Variation for Height, Weight, Arm Circumference, Triceps Skinfold, and Muscle Circumference of Fifth Grade Boys in Fourteen Age Groups

Table 63: Means, standard deviations, selected percentiles, and coefficients of variation for height of Kansas fifth grade boys by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		cm.	cm.							
≤126	≤10.50	78	143.43 ± 7.29	131.5	134.0	138.5	143.6	147.6	152.2	156.1	5.08
127	10.58	97	141.59 ± 6.24	131.1	133.8	137.4	141.5	145.0	150.6	152.8	4.41
128	10.67	120	142.46 ± 6.26	133.0	134.9	138.0	142.0	146.0	150.3	154.1	4.40
129	10.75	112	143.19 ± 5.99	134.4	135.9	138.8	143.0	147.0	151.5	154.2	4.18
130	10.83	102	144.00 ± 5.66	134.8	136.5	139.5	143.8	148.4	151.5	153.4	3.93
131	10.92	119	144.47 ± 6.12	134.3	137.0	140.8	144.4	148.5	151.3	154.5	4.24
132	11.00	107	144.46 ± 6.43	134.8	136.5	139.8	144.4	149.0	152.5	156.7	4.45
133	11.08	110	144.08 ± 6.70	133.8	135.5	138.7	144.2	148.4	153.4	156.3	4.65
134	11.17	117	145.34 ± 6.29	133.5	137.8	141.2	145.4	149.0	154.1	157.2	4.33
135	11.25	121	147.11 ± 5.85	138.5	139.9	142.6	147.0	151.0	154.6	157.0	3.98
136	11.33	99	146.50 ± 6.53	136.0	138.2	142.1	146.1	149.3	156.4	157.8	4.46
137	11.42	121	146.47 ± 6.74	135.2	137.3	141.8	146.5	150.8	156.2	158.6	4.60
138	11.50	96	147.67 ± 6.81	137.5	140.2	142.8	147.2	152.2	156.2	156.9	4.61
≥139	≥11.58	214	146.54 ± 7.04	134.8	137.5	142.1	146.2	151.4	157.0	158.9	4.80

Table 64: Means, standard deviations, selected percentiles, and coefficients of variation for weight of Kansas fifth grade boys by age

age		N	std. mean and dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		kg.	kg.							
≤126	≤10.50	78	38.52 ± 9.70	28.2	29.4	32.8	35.9	42.0	51.6	58.7	25.17
127	10.58	98	35.93 ± 6.51	27.5	28.9	31.1	35.3	38.7	44.7	53.0	18.12
128	10.67	120	37.28 ± 7.04	28.4	29.8	33.3	36.5	39.6	46.4	51.4	18.89
129	10.75	112	37.76 ± 8.41	27.5	29.1	32.1	36.0	40.7	51.5	57.4	22.26
130	10.83	102	36.66 ± 6.17	28.7	30.0	32.3	35.6	39.4	45.0	48.0	16.84
131	10.92	119	38.76 ± 3.06	29.6	31.3	34.1	37.2	41.3	48.5	53.6	20.79
132	11.00	107	38.03 ± 7.03	28.6	30.8	33.4	36.4	42.3	46.3	49.6	18.49
133	11.08	110	38.64 ± 8.65	28.8	30.4	32.4	36.1	43.9	51.2	58.2	22.38
134	11.17	117	39.14 ± 7.12	30.2	31.0	33.9	38.0	43.5	48.1	52.3	18.20
135	11.25	121	40.32 ± 8.73	29.5	32.1	33.7	38.9	43.6	51.4	60.3	21.66
136	11.33	99	41.20 ± 9.84	29.6	32.0	34.2	38.8	45.3	54.5	63.2	23.89
137	11.42	121	39.73 ± 7.16	30.0	32.0	34.8	37.8	43.6	49.8	54.6	18.02
138	11.50	96	41.68 ± 8.26	31.1	32.1	35.2	39.1	46.9	54.3	57.0	19.82
≥139	≥11.58	214	40.68 ± 9.08	29.2	31.9	34.7	38.5	44.6	53.1	57.3	22.33

Table 65: Means, standard deviations, selected percentiles, and coefficients of variation for arm circumference of Kansas fifth grade boys by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		mm.	mm.							
≤126	≤10.50	78	221.1 ± 32.0	184.0	185.9	200.0	215.0	232.8	256.0	283.6	14.50
127	10.58	98	214.6 ± 25.4	180.0	187.4	198.8	210.0	227.7	248.0	275.4	11.82
128	10.67	120	217.5 ± 25.5	181.1	190.1	200.2	215.0	229.8	251.3	264.9	11.79
129	10.75	112	220.1 ± 30.4	180.0	185.3	200.0	210.5	234.8	268.5	282.7	13.82
130	10.83	102	214.8 ± 25.7	180.0	185.0	198.8	210.0	227.0	252.0	267.0	11.98
131	10.92	119	221.4 ± 27.4	187.0	190.0	200.0	216.0	235.0	257.0	270.0	12.38
132	11.00	107	219.4 ± 27.5	180.8	190.0	200.0	215.0	233.0	255.0	275.0	12.52
133	11.08	110	219.6 ± 30.6	183.1	190.0	200.0	210.0	232.2	262.9	285.4	13.96
134	11.17	117	223.9 ± 26.5	189.6	195.0	204.0	220.0	240.0	263.0	274.1	11.83
135	11.25	121	224.0 ± 31.1	190.0	193.0	200.5	219.0	237.5	267.2	289.6	13.89
136	11.33	99	226.4 ± 33.6	185.0	190.0	200.0	220.0	243.0	280.0	298.0	14.86
137	11.42	121	222.4 ± 23.2	192.0	195.2	204.0	219.0	240.0	255.8	264.8	10.44
138	11.50	96	230.4 ± 30.4	186.7	192.5	210.0	224.5	250.0	281.5	289.1	13.20
≥139	≥11.58	214	224.2 ± 30.1	184.5	190.0	203.0	220.0	240.0	264.0	286.2	13.45

Table 66: Means, standard deviations, selected percentiles, and coefficients of variation for triceps skinfold of Kansas fifth grade boys by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		mm.	mm.							
≤126	≤10.50	78	14.02 ± 4.88	7.6	8.2	10.8	13.2	16.6	20.5	23.5	34.81
127	10.58	98	12.97 ± 4.83	6.3	7.0	9.3	12.5	15.0	19.3	23.0	37.24
128	10.67	120	13.39 ± 4.78	6.8	8.2	10.4	12.9	15.5	19.3	22.3	35.71
129	10.75	112	13.55 ± 5.71	7.0	7.8	9.1	12.6	17.0	21.8	24.3	42.13
130	10.83	102	13.03 ± 5.43	6.9	7.4	9.5	12.7	14.5	18.7	22.6	41.68
131	10.92	119	13.86 ± 5.17	7.7	8.7	10.7	13.0	15.5	20.0	22.3	37.33
132	11.00	107	13.85 ± 7.06	7.0	7.5	10.0	12.3	16.0	21.1	24.2	51.02
133	11.08	110	13.26 ± 5.37	6.7	7.4	9.5	12.0	15.8	21.3	24.2	40.50
134	11.17	117	13.46 ± 4.88	6.0	8.0	10.0	12.8	15.9	21.3	23.4	36.22
135	11.25	121	13.88 ± 5.52	7.5	8.2	9.8	12.2	17.1	22.0	26.5	39.80
136	11.33	99	14.58 ± 6.64	6.5	8.0	10.0	13.5	17.3	25.0	29.2	45.55
137	11.42	121	13.61 ± 4.49	7.8	8.3	10.3	13.0	16.0	19.1	21.9	32.97
138	11.50	96	14.33 ± 5.23	7.3	8.3	10.7	13.4	16.9	22.7	25.7	36.53
≥139	≥11.58	214	14.03 ± 6.33	6.5	7.8	10.0	12.8	16.0	22.9	26.0	45.15

Table 67: Means, standard deviations, selected percentiles, and coefficients of variation for muscle circumference measurements of Kansas fifth grade boys by age

age		N	mean and std. dev.	percentiles							coefficient of variation
				5th	10th	25th	50th	75th	90th	95th	
mos.	yrs.		mm.	mm.							
≤126	≤10.50	78	177.1 ± 22.8	146.0	150.3	159.4	175.9	188.3	203.0	224.8	12.91
127	10.58	98	173.8 ± 15.7	151.0	154.8	163.8	170.4	183.8	197.7	205.6	9.03
128	10.67	120	175.5 ± 19.0	148.8	156.5	164.3	173.6	186.6	195.4	212.6	10.84
129	10.75	112	177.6 ± 17.9	151.2	155.2	164.0	176.7	189.2	205.5	213.0	10.08
130	10.83	102	173.9 ± 21.0	141.4	153.7	165.8	173.5	184.3	197.6	207.9	12.06
131	10.92	119	177.8 ± 18.0	150.1	153.4	165.4	177.4	187.4	202.2	210.9	10.15
132	11.00	107	175.9 ± 25.1	145.3	155.5	167.0	176.8	187.3	199.5	210.0	14.28
133	11.08	110	177.9 ± 20.8	148.8	154.1	163.5	174.4	190.2	210.5	212.5	11.69
134	11.17	117	181.6 ± 18.5	155.1	161.2	169.5	180.1	192.3	206.2	219.8	10.21
135	11.25	121	180.4 ± 19.7	154.7	159.8	166.3	177.9	190.9	207.7	218.2	10.91
136	11.33	99	180.6 ± 20.6	155.3	159.2	168.7	178.0	187.6	205.9	218.9	11.41
137	11.42	121	179.6 ± 16.6	154.5	158.7	167.6	179.4	190.4	200.5	212.4	9.22
138	11.50	96	185.3 ± 21.6	149.3	158.8	170.1	184.6	199.0	216.1	226.6	11.68
≥139	≥11.58	214	180.1 ± 22.1	150.9	157.0	168.4	179.1	191.4	205.7	216.4	12.29

APPENDIX P

Weight in Kilograms and Pounds for Kansas Fifth Grade Girls and Boys by Age and Height

Table 68: Weight in kilograms for Kansas fifth grade girls by age and height

groups by age and height	N	weight				
		mean and std. dev.	min. value	max. value	coefficient of variation
		kg.			
girls, 10.5-10.9 yrs.					
lower[1]	9	26.11 ± 2.24	24.09	31.63	8.60
low	91	30.67 ± 3.86	23.36	46.65	12.60
middle	286	35.58 ± 5.33	25.48	53.51	14.97
upper	145	44.22 ± 6.81	30.19	74.80	16.14
high	53	48.83 ± 7.69	34.04	73.32	15.75
girls, 11.0-11.4 yrs.					
lower	22	28.00 ± 3.20	21.17	35.85	11.44
low	98	32.08 ± 4.71	24.46	52.41	14.68
middle	344	37.70 ± 6.14	25.48	59.46	16.28
upper	180	44.54 ± 6.57	28.23	77.72	14.76
high	79	51.16 ± 8.60	39.06	82.76	16.81
girls, 11.5-12.0 yrs.					
lower	18	30.28 ± 3.84	25.68	42.00	12.67
low	61	35.24 ± 5.50	25.11	52.35	15.61
middle	89	41.89 ± 8.17	29.45	66.92	19.51
upper	29	48.47 ± 9.41	35.91	82.82	19.41
high	10	53.16 ± 7.96	42.20	71.85	14.98

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.
Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

Table 69: Weight in pounds for Kansas fifth grade girls by age and height

groups by age and height	N	weight				
		mean and std. dev.		min. value	max. value	coefficient of variation
		lbs.				
girls, 10.5-10.9 yrs.						
lower[1]	9	57.57	± 4.95	53.12	69.75	8.60
low	91	67.63	± 8.52	51.50	102.88	12.60
middle	286	78.45	± 11.75	56.19	118.00	14.97
upper	145	93.11	± 15.02	66.56	164.94	16.14
high	53	107.67	± 16.96	75.06	161.69	15.75
girls, 11.0-11.4 yrs.						
lower	22	61.74	± 7.06	46.69	79.06	11.44
low	98	70.73	± 10.39	53.94	115.56	14.69
middle	344	83.12	± 13.53	56.19	131.12	16.28
upper	180	98.21	± 14.50	62.25	171.38	14.76
high	79	112.81	± 18.96	86.12	182.50	16.81
girls, 11.5-12.0 yrs.						
lower	18	66.76	± 8.46	56.62	92.62	12.67
low	61	77.71	± 12.13	55.38	115.44	15.61
middle	89	92.37	± 18.02	64.94	147.56	19.51
upper	29	106.89	± 20.75	79.19	182.62	19.41
high	10	117.23	± 17.56	93.06	158.44	14.98

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

Table 70: Weight in kilograms for Kansas fifth grade boys by age and height

groups by age and height	N	weight			
		mean and std. dev.	min. value	max. value	coefficient of variation
		kg.			
boys, 10.5-10.9 yrs.					
lower[1]	6	29.02 ± 4.22	23.98	36.79	14.53
low	64	30.10 ± 3.17	22.90	39.00	10.54
middle	287	35.23 ± 4.21	24.18	53.20	11.96
upper	176	41.15 ± 7.80	30.27	82.65	18.95
high	52	46.92 ± 8.72	29.90	69.56	18.59
boys, 11.0-11.4 yrs.					
lower	10	27.39 ± 2.29	22.84	30.58	8.36
low	83	32.38 ± 3.70	24.38	43.31	11.44
middle	207	36.47 ± 5.41	26.27	62.13	14.84
upper	315	41.58 ± 7.07	29.28	81.63	17.02
high	60	50.93 ± 9.28	36.90	74.94	18.23
boys, 11.5-12.0 yrs.					
lower	10	31.45 ± 4.64	25.96	38.52	14.75
low	46	33.71 ± 3.87	26.73	43.36	11.48
middle	128	39.52 ± 5.91	30.36	64.03	14.95
upper	50	48.54 ± 7.22	35.00	63.83	14.88
high	7	60.01 ±13.07	47.62	86.87	21.78

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - > 5th to < 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - > 75th to $\leq$ 95th percentile
High - > 95th percentile

Table 71: Weight in pounds for Kansas fifth grade boys by age and height

groups by age and height	N	weight mean and std. dev.	min. value	max. value	coefficient of variation
		lbs.			
boys, 10.5-10.9 yrs.					
lower[1]	6	64.00 ± 9.30	52.88	81.12	14.53
low	64	66.38 ± 6.99	50.50	86.00	10.54
middle	287	77.69 ± 9.29	53.31	117.31	11.96
upper	176	90.74 ± 17.20	66.75	182.25	18.95
high	52	103.47 ± 19.24	65.94	153.38	18.59
boys, 11.0-11.4 yrs.					
lower	10	60.39 ± 5.05	50.38	67.44	8.36
low	83	71.39 ± 8.16	53.75	95.50	11.44
middle	207	80.43 ± 11.93	57.94	137.00	14.84
upper	315	91.68 ± 15.60	64.56	180.00	17.02
high	60	112.31 ± 20.47	81.38	165.25	18.23
boys, 11.5-12.0 yrs.					
lower	10	69.36 ± 10.23	57.25	84.94	14.75
low	46	74.34 ± 8.53	58.94	95.62	11.48
middle	128	87.14 ± 13.03	66.94	141.19	14.95
upper	50	107.04 ± 15.92	77.19	140.75	14.88
high	7	132.32 ± 28.82	105.00	191.56	21.78

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

APPENDIX Q

Height in Centimeters and Inches for Kansas Fifth Grade Girls and Boys by Age and Weight

Table 72: Height in centimeters for Kansas fifth grade girls by age and weight

groups by age and weight	N	height			
		mean and std. dev.	min. value	max. value	coefficient of variation
		cm.			
girls, 10.5-10.9 yrs.					
lower[1]	11	131.31 ± 3.96	124.90	137.50	3.01
low	95	136.31 ± 3.76	127.00	146.50	2.76
middle	296	142.48 ± 4.96	129.10	160.70	3.48
upper	147	148.21 ± 5.71	130.40	165.40	3.85
high	35	152.59 ± 5.42	142.80	166.20	3.55
girls, 11.0-11.4 yrs.					
lower	19	135.06 ± 4.66	127.10	143.20	3.45
low	122	138.90 ± 4.54	129.50	153.70	3.27
middle	351	146.02 ± 4.90	132.80	162.00	3.36
upper	188	152.50 ± 6.10	137.30	170.00	4.00
high	43	155.77 ± 5.78	143.50	169.00	3.71
girls, 11.5-12.0 yrs.					
lower	14	134.72 ± 4.98	123.70	141.40	3.70
low	46	141.38 ± 4.18	134.50	151.30	2.95
middle	88	146.55 ± 5.45	133.40	162.90	3.72
upper	48	152.97 ± 6.08	142.60	167.40	3.97
high	11	154.15 ± 5.68	148.00	165.40	3.68

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

Table 73: Height in inches for Kansas fifth grade girls by age and weight

groups by age and weight	N	height			
		mean and std. dev.	min. value	max. value	coefficient of variation
		in.			
girls, 10.5-10.9 yrs.					
lower[1]	11	51.70 ± 1.56	49.17	54.13	3.01
low	95	53.67 ± 1.48	50.00	57.68	2.76
middle	296	56.09 ± 1.95	50.83	63.27	3.48
upper	147	58.35 ± 2.25	51.34	65.12	3.85
high	35	60.08 ± 2.13	56.22	65.43	3.55
girls, 11.0-11.4 yrs.					
lower	19	53.17 ± 1.83	50.04	56.38	3.45
low	122	54.68 ± 1.79	50.98	60.51	3.27
middle	351	57.49 ± 1.93	52.28	63.78	3.36
upper	188	60.04 ± 2.40	54.06	66.93	4.00
high	43	61.33 ± 2.28	56.50	66.53	3.71
girls, 11.5-12.0 yrs.					
lower	14	53.04 ± 1.96	48.70	55.67	3.70
low	46	55.66 ± 1.64	52.95	59.57	2.95
middle	88	57.70 ± 2.14	52.52	64.13	3.72
upper	48	60.22 ± 2.39	56.14	65.90	3.97
high	11	60.69 ± 2.23	58.27	65.12	3.68

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

Table 74: Height in centimeters for Kansas fifth grade boys by age and weight

groups by age and weight	N	height: mean and std. dev.	height: min. value	height: max. value	height: coefficient of variation
		cm.			
boys, 10.5-10.9 yrs.					
lower[1]	4	132.48 ± 5.52	125.50	138.90	4.17
low	47	134.63 ± 3.65	125.50	142.40	2.71
middle	309	141.64 ± 4.51	130.90	163.10	3.18
upper	153	146.08 ± 4.67	135.90	156.50	3.20
high	71	150.67 ± 5.56	137.00	164.20	3.69
boys, 11.0-11.4 yrs.					
lower	3	132.23 ± 1.62	130.50	133.70	1.22
low	61	137.06 ± 4.19	125.90	146.90	3.06
middle	361	144.01 ± 4.76	132.80	158.00	3.31
upper	168	149.30 ± 5.36	135.60	162.80	3.59
high	82	152.56 ± 5.28	142.00	165.90	3.46
boys, 11.5-12.0 yrs.					
lower	2	132.65 ± 6.86	127.80	137.50	5.17
low	35	139.12 ± 4.13	125.50	151.10	2.97
middle	135	145.22 ± 4.84	132.00	155.10	3.34
upper	35	150.26 ± 5.10	138.80	164.20	3.39
high	34	154.35 ± 6.53	141.50	173.40	4.23

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $\geq$ 5th to < 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $\geq$ 75th to $\leq$ 95th percentile
High - > 95th percentile

Table 75: Height in inches for Kansas fifth grade boys by age and weight

groups by age and weight	N	height			
		mean and std. dev.	min. value	max. value	coefficient of variation
		in.			
boys, 10.5-10.9 yrs.					
lower[1]	4	52.16 ± 2.17	49.41	54.68	4.17
low	47	53.00 ± 1.44	49.41	56.06	2.71
middle	309	55.76 ± 1.78	51.54	64.21	3.18
upper	153	57.51 ± 1.84	53.50	61.61	3.20
high	71	59.32 ± 2.19	53.94	64.64	3.69
boys, 11.0-11.4 yrs.					
lower	3	52.06 ± 0.64	51.38	52.64	1.22
low	61	53.96 ± 1.65	49.57	57.83	3.06
middle	361	56.70 ± 1.88	52.28	62.20	3.31
upper	168	58.78 ± 2.11	53.38	64.09	3.59
high	82	60.06 ± 2.08	55.90	65.31	3.46
boys, 11.5-12.0 yrs.					
lower	2	52.22 ± 2.70	50.31	54.13	5.17
low	35	54.77 ± 1.63	49.41	59.49	2.97
middle	135	57.17 ± 1.91	51.97	61.06	3.34
upper	35	59.16 ± 2.01	54.64	64.64	3.39
high	34	60.77 ± 2.57	55.71	68.27	4.23

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.
Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

APPENDIX R

Triceps Skinfold Measurements in Millimeters for Kansas Fifth Grade Girls and Boys by Age and Height and Age and Weight Groups Based on National Percentiles

Table 76: Triceps skinfold in millimeters for Kansas fifth grade girls by age and height

groups by age and height	N	triceps skinfold mean and std. dev.	min. value	max. value	coefficient of variation
		mm.			
girls, 10.5-10.9 yrs.					
lower[1]	11	9.85 ± 2.57	5.83	13.83	26.09
low	95	11.79 ± 2.47	6.50	19.00	20.91
middle	296	13.87 ± 3.32	3.00	23.50	23.96
upper	147	18.19 ± 5.91	6.67	49.00	32.49
high	35	23.12 ± 6.44	15.33	45.33	27.85
girls, 11.0-11.4 yrs.					
lower	19	9.79 ± 2.46	3.00	14.17	25.18
low	122	12.25 ± 2.64	6.00	20.83	21.55
middle	351	14.09 ± 3.68	5.50	25.67	26.13
upper	188	17.09 ± 4.75	8.67	33.33	27.77
high	43	23.56 ± 6.43	13.83	41.33	27.31
girls, 11.5-12.0 yrs.					
lower	14	11.31 ± 2.88	7.00	16.50	25.49
low	46	12.02 ± 3.50	6.17	21.50	29.13
middle	88	14.75 ± 4.61	7.00	27.67	31.26
upper	48	18.11 ± 4.73	9.83	31.00	26.14
high	11	23.85 ± 6.29	13.50	35.00	26.38

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

Table 77: Triceps skinfold in millimeters for Kansas fifth grade girls by age and weight

groups by age and weight	N	triceps skinfold			
		mean and std. dev.	min. value	max. value	coefficient of variation
		mm.			
girls, 10.5-10.9 yrs.					
lower[1]	9	12.74 ± 2.55	9.00	17.83	19.99
low	91	12.87 ± 3.43	5.83	24.33	26.67
middle	286	14.71 ± 4.49	3.00	30.00	30.52
upper	145	16.32 ± 5.34	6.33	38.00	32.75
high	53	18.04 ± 8.38	6.67	49.00	46.44
girls, 11.0-11.4 yrs.					
lower	22	13.23 ± 4.10	8.00	25.00	31.02
low	98	13.30 ± 3.56	3.00	24.00	26.80
middle	344	14.88 ± 5.07	5.50	36.83	34.07
upper	180	15.56 ± 4.48	7.50	36.33	28.78
high	79	16.93 ± 5.84	8.67	41.33	34.47
girls, 11.5-12.0 yrs.					
lower	18	13.81 ± 4.08	7.33	22.33	29.57
low	61	13.86 ± 4.42	6.17	24.50	31.91
middle	89	15.68 ± 5.77	7.00	32.33	36.81
upper	29	16.56 ± 6.07	7.00	35.00	36.68
high	10	17.05 ± 4.81	9.83	23.00	28.22

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.
Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

Table 78: Triceps skinfold for Kansas fifth grade boys by age and height

groups by age and height	N	triceps skinfold			
		mean and std. dev.	min. value	max. value	coefficient of variation
		mm.			
boys, 10.5-10.9 yrs.					
lower	4	7.79 ± 2.08	5.83	10.67	26.74
low	47	10.32 ± 6.01	5.00	45.00	58.23
middle	310	11.59 ± 3.10	4.83	22.67	26.71
upper	153	14.68 ± 3.76	5.00	25.00	25.62
high	71	21.04 ± 6.25	8.00	38.33	29.70
boys, 11.0-11.4 yrs.					
lower	3	9.61 ± 4.10	7.00	14.33	42.63
low	61	11.50 ± 3.72	6.00	24.33	32.35
middle	361	11.62 ± 3.22	4.50	22.00	27.75
upper	168	15.64 ± 3.95	8.17	26.33	25.29
high	82	21.87 ± 6.61	8.33	39.50	30.23
boys, 11.5-12.0 yrs.					
lower	2	10.67 ± 3.77	8.00	13.33	35.36
low	35	10.04 ± 1.94	5.83	13.67	19.27
middle	135	12.59 ± 3.68	4.00	22.70	29.21
upper	35	16.46 ± 5.16	8.00	30.00	31.36
high	34	21.50 ± 5.24	10.83	32.00	24.38

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

Table 79: Triceps skinfold for Kansas fifth grade boys by age and weight

groups by age and weight	N	triceps skinfold mean and std. dev.	min. value	max. value	coefficient of variation
		mm.			
boys, 10.5-10.9 yrs.					
lower	6	10.80 ± 2.20	7.83	14.00	20.36
low	64	11.80 ± 5.78	5.50	45.00	48.98
middle	287	12.61 ± 4.07	4.83	27.83	32.27
upper	176	14.72 ± 5.74	5.00	38.33	39.00
high	52	15.76 ± 6.07	5.67	34.67	38.50
boys, 11.0-11.4 yrs.					
lower	10	10.67 ± 5.19	5.00	14.33	48.64
low	83	11.51 ± 3.70	6.00	24.33	32.11
middle	207	13.09 ± 4.84	4.50	34.83	37.01
upper	315	14.18 ± 5.24	4.50	35.33	36.94
high	60	16.53 ± 7.44	7.00	39.50	45.02
boys, 11.5-12.0 yrs.					
lower	10	11.88 ± 3.73	7.50	19.00	31.40
low	46	11.92 ± 3.56	5.83	20.83	29.89
middle	128	13.73 ± 4.94	4.00	32.00	35.98
upper	50	16.50 ± 6.20	6.00	29.00	37.54
high	7	18.43 ± 7.63	10.83	30.17	41.41

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.

Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

APPENDIX S

Triceps Skinfold for Fifth Grade Girls and Boys in Height-Weight Groups Based on National Percentiles

Table 80: Triceps skinfold for Kansas fifth grade girls in height-weight groups based on national percentiles

height-weight groups based on national percentiles	N	triceps skinfold			
		mean and std. dev.	min. value	max. value	coefficient of variation
ht.-wt.		mm.			
lower-lower	22	11.65 ± 2.38	8.00	16.50	20.44
lower-low	23	13.91 ± 3.51	7.33	21.50	25.20
lower-middle	4	19.54 ± 5.27	13.00	25.00	26.97
lower-upper	--	--	--	--	--
lower-high	--	--	--	--	--
low-lower	17	8.90 ± 2.37	3.00	14.17	26.64
low-low	129	12.07 ± 2.49	6.17	18.00	20.66
low-middle	94	15.16 ± 3.78	6.50	24.50	24.95
low-upper	10	18.58 ± 4.16	12.67	2.45	22.40
low-high	--	--	--	--	--
middle-lower	5	9.00 ± 1.87	7.00	12.00	20.79
middle-low	109	11.57 ± 2.71	6.00	19.00	23.43
middle-middle	469	14.09 ± 3.70	3.00	27.67	26.30
middle-upper	118	20.09 ± 5.19	9.17	3.33	25.83
middle-high	18	24.34 ± 6.46	13.50	36.83	26.53

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.
Groups defined using percentiles from National Center for Health Statistics:

Lower - $\leq$ 5th percentile
Low - $>$ 5th to $<$ 25th percentile
Middle - $\geq$ 25th to $\leq$ 75th percentile
Upper - $>$ 75th to $\leq$ 95th percentile
High - $>$ 95th percentile

Table 80: (cont.)

height-weight groups based on national percentiles	N	triceps skinfold			
		mean and std. dev.	min. value	max. value	coefficient of variation
ht.-wt.		mm.			
upper-lower	--	--	--	--	--
upper-low	2	14.42 ± 0.82	13.83	15.00	5.72
upper-middle	153	13.36 ± 3.18	6.33	23.00	23.78
upper-upper	168	17.06 ± 4.53	9.00	31.83	26.54
upper-high	31	22.85 ± 6.12	14.00	38.00	26.79
high-lower	--	--	--	--	--
high-low	--	--	--	--	--
high-middle	15	12.76 ± 3.70	7.00	19.83	28.97
high-upper	87	15.34 ± 5.41	6.67	49.00	35.25
high-high	40	23.45 ± 6.59	13.83	45.33	28.08

Table 81: Triceps skinfold for Kansas fifth grade boys in height-weight groups based on national percentiles

height-weight groups based on national percentiles	N	triceps skinfold			
		mean and std. dev.	min. value	max. value	coefficient of variation
ht.-wt.		mm.			
lower-lower	4	11.45 ± 3.06	7.50	14.33	26.70
lower-low	16	13.78 ± 14.01	5.00	††	††
lower-middle	6	13.25 ± 4.03	7.50	19.00	30.45
lower-upper	--	--	--	--	--
lower-high	--	--	--	--	--
low-lower	4	6.92 ± 0.89	5.83	8.00	12.83
low-low	83	10.38 ± 4.71	5.50	45.00	45.36
low-middle	101	12.73 ± 3.77	6.00	22.67	29.62
low-upper	5	16.87 ± 4.57	12.00	24.33	27.12
low-high	--	--	--	--	--
middle-lower	1	7.83 ± --	7.83	7.83	
middle-low	40	8.98 ± 2.19	5.00	13.33	24.43
middle-middle	455	11.91 ± 3.23	4.00	22.70	27.12
middle-upper	103	16.92 ± 3.89	8.33	30.00	23.00

[1]Source: Hamill, P.V.V. et al.: Physical growth: National Center for Health Statistics Percentiles. Am. J. Clin. Nutr. 32:607, 1979.
Groups defined using percentiles from National Center for Health Statistics:

Lower - ≤ 5th percentile
Low - > 5th to < 25th percentile
Middle - ≥ 25th to ≤ 75th percentile
Upper - > 75th to ≤ 95th percentile
High - > 95th percentile

††Figure does not meet standards of reliability or precision.

Table 81: (cont.)

height-weight groups based on national percentiles	N	triceps skinfold			
		mean and std. dev.	min. value	max. value	coefficient of variation
ht.-wt.		mm.			
middle-high	23	24.22 ± 5.32	15.50	34.83	21.95
upper-lower	--	--	--	--	--
upper-low	4	90.08 ± 2.37	6.50	12.00	26.14
upper-middle	234	11.15 ± 2.96	4.50	22.00	26.56
upper-upper	201	14.87 ± 3.97	5.00	27.50	26.71
upper-high	102	22.03 ± 5.02	11.50	38.33	23.60
high-lower	--	--	--	--	--
high-low	--	--	--	--	--
high-middle	10	9.42 ± 3.00	5.67	16.00	31.77
high-upper	47	13.47 ± 3.39	6.00	21.00	25.20
high-high	62	19.57 ± 7.49	8.00	39.50	38.27

APPENDIX T

Analysis of Variance and Variance Component Estimates of Total Day's and by Meal for Energy and Nutrient Intake of Kansas Fifth Grade Students Who Reported Eating on the Day of 24-hour Dietary Recall Interviews

Table 82: Analysis of variance of total day's energy and nutrient intake with and without supplements of Kansas fifth grade students (N = 1302) from 24-hour dietary recall interviews

	source of variation[1]			
mean squares	BED	USD/BED	school/USD/BED	error[2]
total day's meals (excluding supplements)				
energy, kcal	0.13	0.97	0.94	0.71
protein, gm.	976.89	1235.48	1550.32	0.11
fat, gm.	2524.30	0.33	2892.74	0.21
carbohydrate, gm.	0.21	0.16	0.17	0.12
vitamin A, I.U.	0.75	0.36	0.68	0.31
ascorbic acid, mg.	0.24	0.90	0.70	0.10
thiamin, mg.	1.19	1.43	0.78	0.81
riboflavin, mg.	3.71	3.15	3.37	2.61
niacin, mg.	63.45	85.00	72.58	70.05
vitamin B_6, mg.	1.08	1.37	0.84	0.84
calcium, mg.	0.75	0.67	0.46	0.39
phosphorus, mg.	0.28	0.54	0.48	0.31
magnesium, mg.	11011.33	0.14	0.66	0.93
iron, mg.	89.73	64.03	67.07	50.86

[1]

source	df	expected mean squares
BED	9	$\sigma^2+16.40\sigma_s^2+31.60\sigma_{USD}^2+128.16\sigma_{BED}^2$
USD/BED	65	$\sigma^2+12.21\sigma_s^2+15.13\sigma_{USD}^2$
school/USD/BED	24	$\sigma^2+14.33\sigma_s^2$
error	1203	σ^2

[2]Between individual students.

Table 82: (cont.)

	source of variation			
mean squares	BED	USD/BED	school/USD/BED	error
total day's meals (including supplements)				
energy, kcal	0.13	0.97	0.94	0.71
protein, gm.	982.20	1235.47	1550.32	0.11
fat, gm.	2524.30	0.33	2892.74	0.21
carbohydrate, gm.	0.21	0.16	0.17	0.12
vitamin A, I.U.	0.73	0.42	0.69	0.36
ascorbic acid, mg.	0.22	0.34	0.48	0.31
thiamin, mg.	1.45	1.73	1.26	1.06
riboflavin, mg.	4.48	3.23	3.96	2.83
niacin, mg.	113.97	126.46	126.22	0.11
vitamin B_6, mg.	1.12	1.98	1.08	1.19
calcium, mg.	0.77	0.68	0.49	0.40
phosphorus, mg.	0.28	0.54	0.48	0.31
magnesium, mg.	0.11	1.14	0.66	0.93
iron, mg.	184.02	111.28	94.26	0.11

Table 83: Analysis of variance of energy and nutrient intake from breakfast of Kansas fifth grade students (N = 1193) from 24-hour dietary recall interviews[1]

	source of variation[2]			
mean squares	BED	USD/BED	school/USD/BED	error[3]
energy, kcal	0.87	0.11	0.12	0.82
protein, gm.	144.08	159.88	78.88	0.11
fat, gm.	205.03	271.82	294.46	0.25
carbohydrate, gm.	2725.38	0.25	3000.07	0.17
vitamin A, I.U.	0.11	0.35	0.34	0.28
ascorbic acid, mg.	4047.26	0.36	0.63	0.35
thiamin, mg.	0.30	0.28	0.18	0.21
riboflavin, mg.	0.48	0.29	0.40	0.28
niacin, mg.	44.11	17.85	14.12	14.90
vitamin B_6, mg.	0.95	0.33	0.48	0.30
calcium, mg.	0.61	0.94	0.96	0.69
phosphorus, mg.	0.65	0.97	0.60	0.68
magnesium, mg.	5757.73	0.31	2658.48	0.27
iron, mg.	69.56	22.52	33.27	27.86

[1] Includes only those students who reported eating breakfast on day of recall interview.

[2]

source	df	expected mean squares
BED	9	$\sigma^2+15.15\sigma_s^2+29.23\sigma_{USD}^2+117.37\sigma_{BED}^2$
USD/BED	65	$\sigma^2+11.61\sigma_s^2+13.82\sigma_{USD}^2$
school/USD/BED	24	$\sigma^2+13.17\sigma_s^2$
error	1094	σ^2

[3] Between individual students.

Table 84: Analysis of variance for energy and nutrient intake from lunch of Kansas fifth grade students (N = 1283) from 24-hour dietary recall interviews[1]

	source of variation[2]			
mean squares	BED	USD/BED	school/USD/BED	error[3]
energy, kcal	0.62	0.36	0.17	0.11
protein, gm.	392.22	489.47	324.33	0.19
fat, gm.	1117.58	0.16	409.03	0.52
carbohydrate, gm.	0.13	0.54	3760.31	0.13
vitamin A, I.U.	0.27	0.15	0.26	0.60
ascorbic acid, mg.	5424.76	0.35	3988.93	0.98
thiamin, mg.	0.88	0.44	0.16	0.09
riboflavin, mg.	0.45	0.22	0.46	0.30
niacin, mg.	19.24	47.79	32.48	16.27
vitamin B_6, mg.	0.20	0.58	0.25	0.08
calcium, mg.	0.99	0.16	0.55	0.45
phosphorus, mg.	0.68	0.14	0.55	0.34
magnesium, mg.	3435.91	0.44	3107.97	0.88
iron, mg.	18.10	22.26	9.29	3.96

[1] Includes only those students who reported eating lunch on day of recall interview.

[2]

source	df	expected mean squares
BED	9	$\sigma^2+16.25\sigma_s^2+31.13\sigma_{USD}^2+126.27\sigma_{BED}^2$
USD/BED	65	$\sigma^2+12.02\sigma_s^2+14.91\sigma_{USD}^2$
school/USD/BED	24	$\sigma^2+14.15\sigma_s^2$
error	1203	σ^2

[3] Between individual students.

Table 85: Analysis of variance for energy and nutrient intake from dinner of Kansas fifth grade students (N = 1265) from 24-hour dietary recall interviews[1]

	source of variation[2]			
mean squares	BED	USD/BED	school/USD/BED	error[3]
energy, kcal	0.28	0.19	0.21	0.18
protein, gm.	508.32	345.51	580.12	0.38
fat, gm.	913.25	560.94	975.19	0.59
carbohydrate, gm.	3495.98	0.29	1800.17	0.28
vitamin A, I.U.	0.15	0.13	0.32	0.21
ascorbic acid, mg.	2928.44	1382.33	2374.66	0.21
thiamin, mg.	0.22	0.19	0.32	0.33
riboflavin, mg.	0.86	0.73	0.63	0.73
niacin, mg.	23.64	19.26	14.65	20.79
vitamin B_6, mg.	0.13	0.16	0.16	0.17
calcium, mg.	0.93	0.13	0.12	0.10
phosphorus, mg.	0.51	0.10	0.13	0.73
magnesium, mg.	3418.74	0.24	1760.31	0.27
iron, mg.	8.97	9.44	9.59	8.42

[1] Includes only those students who reported eating dinner on day of recall interview.

[2]

source	df	expected mean squares
BED	9	$\sigma^2+16.04\sigma_s^2+30.69\sigma_{USD}^2+124.57\sigma_{BED}^2$
USD/BED	65	$\sigma^2+11.86\sigma_s^2+14.70\sigma_{USD}^2$
school/USD/BED	24	$\sigma^2+13.93\sigma_s^2$
error	1203	σ^2

[3] Between individual students.

Table 86: Analysis of variance for energy and nutrient intake from snacks of Kansas fifth grade students (N = 1165) from 24-hour dietary recall interviews[1]

	source of variation[2]			
mean squares	BED	BED/USD	school/USD/BED	error[3]
energy, kcal	0.19	0.24	0.26	0.18
protein, gm.	188.50	233.25	326.92	0.20
fat, gm.	271.30	714.86	770.74	0.52
carbohydrate, gm.	4421.47	0.40	3225.83	0.34
vitamin A, I.U.	0.23	0.13	0.24	0.17
ascorbic acid, mg.	2455.29	0.16	1720.24	0.21
thiamin, mg.	0.20	0.22	0.09	0.15
riboflavin, mg.	1.50	1.86	1.41	1.03
niacin, mg.	14.97	14.94	22.87	13.70
vitamin B_6, mg.	0.14	0.19	0.14	0.16
calcium, mg.	0.22	0.13	0.86	0.89
phosphorus, mg.	0.90	0.71	0.86	0.68
magnesium, mg.	1400.06	0.17	2350.07	0.15
iron, mg.	7.48	5.73	6.64	6.92

[1]Includes only those students who reported eating between meal snacks on day of recall interview.

[2]

source	df	expected mean squares
BED	9	$\sigma^2+14.63\sigma^2_s+27.99\sigma^2_{USD}+114.49\sigma^2_{BED}$
USD/BED	65	$\sigma^2+10.99\sigma^2_s+13.58\sigma^2_{USD}$
school/USD/BED	24	$\sigma^2+12.68\sigma^2_s$
error	1203	σ^2

[3]Between individual students.

Table 87: Variance component estimates of total day's energy and nutrient intake with and without supplements of Kansas fifth grade students (N = 1302) from 24-hour dietary recall interviews

	variance component			
	BED	USD/BED	school/USD/BED	error
total day's meals (excluding supplements)				
energy, kcal				
variance component	0.12	0.46	0.16	0.71
per cent	0.16	0.63	2.22	96.99
protein, gm.				
variance component	0.00	0.00	33.08	0.11
per cent	0.00	0.00	2.98	97.02
fat, gm.				
variance component	0.00	0.37	54.78	0.21
per cent	0.00	1.68	2.49	95.83
carbohydrate, gm.				
variance component	0.34	0.00	0.36	0.12
per cent	0.28	0.00	2.97	96.75
vitamin A, I.U.				
variance component	0.44	0.00	0.25	0.31
per cent	1.30	0.00	7.47	91.24
ascorbic acid, mg.				
variance component	0.11	0.99	0.00	0.10
per cent	1.07	0.95	0.00	97.98
thiamin, mg.				
variance component	0.00	0.04	0.00	0.81
per cent	0.00	4.99	0.00	95.01
riboflavin, mg.				
variance component	0.00	0.00	0.05	2.61
per cent	0.13	0.00	1.97	97.90
niacin, mg.				
variance component	0.00	0.84	0.18	70.05
per cent	0.00	1.19	0.25	98.56
vitamin B_6, mg.				
variance component	0.00	0.04	0.00	0.84
per cent	0.00	4.03	0.00	95.97

Table 87: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
calcium, mg.				
variance component	0.00	0.14	0.50	0.39
per cent	0.00	3.47	1.22	95.31
phosphorus, mg.				
variance component	0.00	0.56	0.11	0.31
per cent	0.00	1.69	3.46	94.85
magnesium, mg.				
variance component	0.00	0.46	0.00	0.93
per cent	0.00	4.72	0.00	95.28
iron, mg.				
variance component	0.17	0.00	1.13	50.86
per cent	0.32	0.00	2.17	97.51
total day's meals (including supplement)				
energy, kcal				
variance component	0.12	0.46	0.16	0.71
per cent	0.16	0.63	2.22	96.99
protein, gm.				
variance component	0.00	0.00	33.06	0.11
per cent	0.00	0.00	2.98	97.02
fat, gm.				
variance component	0.00	0.37	54.78	0.21
per cent	0.00	1.68	2.49	95.83
carbohydrate, gm.				
variance component	0.34	0.00	0.36	0.12
per cent	0.28	0.00	2.97	97.75
vitamin A, I.U.				
variance component	0.35	0.00	0.23	0.36
per cent	0.90	0.00	5.92	93.18
ascorbic acid, mg.				
variance component	0.00	0.00	0.12	0.31
per cent	0.00	0.00	3.61	96.39

Table 87: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
thiamin, mg.				
variance component	0.00	0.03	0.01	1.06
per cent	0.00	2.98	1.24	95.78
riboflavin, mg.				
variance component	0.01	0.00	0.08	2.83
per cent	0.41	0.00	2.70	96.89
niacin, mg.				
variance component	0.00	0.16	1.02	0.11
per cent	0.00	0.14	0.90	98.96
vitamin B_6, mg.				
variance component	0.00	0.06	0.00	1.19
per cent	0.00	4.72	0.00	95.28
calcium, mg.				
variance component	0.00	0.13	0.68	0.40
per cent	0.00	3.11	1.63	95.26
phosphorus, mg.				
variance component	0.00	0.56	0.11	0.31
per cent	0.00	1.69	3.46	94.85
magnesium, mg.				
variance component	0.00	0.47	0.00	0.93
per cent	0.00	4.78	0.00	95.22
iron, mg.				
variance component	0.48	0.96	0.00	0.11
per cent	0.43	0.85	0.00	98.72

Table 88: Variance component estimates of energy and nutrient intake from breakfast of Kansas fifth grade students (N = 1193) from 24-hour dietary recall interviews

	variance component			
	BED	USD/BED	school/USD/BED	error
energy, kcal				
variance component	0.00	0.00	0.28	0.82
per cent	0.00	0.00	3.32	96.68
protein, gm.				
variance component	0.00	5.48	0.00	0.11
per cent	0.00	4.60	0.00	95.40
fat, gm.				
variance component	0.00	0.00	3.68	0.25
per cent	0.00	0.00	1.47	98.53
carbohydrate, gm.				
variance component	1.70	0.00	95.04	0.17
per cent	0.09	0.00	5.15	94.76
vitamin A, I.U.				
variance component	0.59	0.13	0.45	0.28
per cent	1.99	0.45	1.52	96.05
ascorbic acid, mg.				
variance component	18.90	0.00	0.21	0.35
per cent	0.50	0.00	5.58	93.91
thiamin, mg.				
variance component	0.00	0.01	0.00	0.21
per cent	0.00	3.37	0.00	96.63
riboflavin, mg.				
variance component	0.00	0.00	0.01	0.28
per cent	0.72	0.00	2.92	96.36
niacin, mg.				
variance component	0.19	0.26	0.00	14.90
per cent	1.25	1.70	0.00	97.05
vitamin B_6, mg.				
variance component	0.00	0.00	0.01	0.30
per cent	1.86	0.00	4.44	93.70

Table 88: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
calcium, mg.				
variance component	0.00	0.17	0.20	0.69
per cent	0.00	0.24	2.89	96.87
phosphorus, mg.				
variance component	0.00	0.26	0.00	0.68
per cent	0.00	3.71	0.00	96.29
magnesium, mg.				
variance component	18.59	0.32	0.00	0.27
per cent	0.68	1.15	0.00	98.17
iron, mg.				
variance component	0.48	0.00	0.41	27.86
per cent	1.67	0.00	1.43	96.90

Table 89: Variance component estimates of energy and nutrient intake from lunch of Kansas fifth grade students (N = 1283) from 24-hour dietary recall interviews

	variance component			
	BED	USD/BED	school/USD/BED	error
energy, kcal				
variance component	0.11	0.14	0.40	0.11
per cent	0.09	10.75	3.13	86.03
protein, gm.				
variance component	0.00	12.38	9.17	0.19
per cent	0.00	5.73	4.24	90.02
fat, gm.				
variance component	0.00	0.76	0.00	0.52
per cent	0.00	12.69	0.00	87.31
carbohydrate, gm.				
variance component	0.39	0.14	170.97	0.13
per cent	2.31	8.05	10.13	79.51
vitamin A, I.U.				
variance component	0.12	0.00	0.14	0.60
per cent	1.58	0.00	18.54	79.88
ascorbic acid, mg.				
variance component	7.61	0.88	212.98	0.98
per cent	0.64	0.07	17.79	81.50
thiamin, mg.				
variance component	0.00	0.02	0.00	0.09
per cent	0.76	16.27	4.47	78.50
riboflavin, mg.				
variance component	0.00	0.00	0.01	0.30
per cent	1.01	0.00	3.59	95.40
niacin, mg.				
variance component	0.00	1.19	1.14	16.27
per cent	0.00	6.40	6.15	87.45
vitamin B_6, mg.				
variance component	0.00	0.02	0.01	0.08
per cent	0.00	19.86	10.08	70.06

Table 89: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
calcium, mg.				
variance component	0.00	0.72	0.66	0.45
per cent	0.00	13.60	1.24	85.16
phosphorus, mg.				
variance component	0.00	0.61	0.15	0.34
per cent	0.00	14.52	3.54	81.94
magnesium, mg.				
variance component	0.00	0.11	157.50	0.88
per cent	0.00	9.50	13.74	76.75
iron, mg.				
variance component	0.00	0.92	0.38	3.96
per cent	0.00	17.57	7.17	75.26

Table 90: Variance component estimates of energy and nutrient intake from dinner of Kansas fifth grade students (N = 1265) from 24-hour dietary recall interviews

	variance component			
	BED	USD/BED	school/USD/BED	error
energy, kcal				
variance component	0.80	0.00	0.24	0.18
per cent	0.44	0.00	1.31	98.25
protein, gm.				
variance component	2.62	0.00	14.20	0.38
per cent	0.66	0.00	3.56	95.79
fat, gm.				
variance component	5.00	0.00	27.90	0.59
per cent	0.81	0.00	4.50	94.69
carbohydrate, gm.				
variance component	0.00	0.62	0.00	0.28
per cent	0.00	2.14	0.00	97.86
vitamin A, I.U.				
variance component	0.14	0.00	0.84	0.21
per cent	0.65	0.00	3.83	95.53
ascorbic acid, mg.				
variance component	20.19	0.00	17.10	0.21
per cent	0.93	0.00	0.79	98.28
thiamin, mg.				
variance component	0.00	0.00	0.00	0.33
per cent	0.40	0.00	0.00	99.60
riboflavin, mg.				
variance component	0.00	0.00	0.00	0.73
per cent	0.08	0.75	0.00	99.17
niacin, mg.				
variance component	0.02	0.25	0.00	20.79
per cent	0.08	1.19	0.00	98.72
vitamin B_6, mg.				
variance component	0.00	0.00	0.00	0.17
per cent	0.00	0.00	0.00	100.00

Table 90: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
calcium, mg.				
variance component	0.00	0.99	0.16	0.10
per cent	0.00	0.95	1.50	97.55
phosphorus, mg.				
variance component	0.00	0.00	0.39	0.73
per cent	0.00	0.00	5.06	94.94
magnesium, mg.				
variance component	6.12	0.34	0.00	0.27
per cent	0.23	1.24	0.00	98.53
iron, mg.				
variance component	0.00	0.00	0.08	8.42
per cent	0.00	0.02	0.99	98.99

Table 91: Variance component estimates of energy and nutrient intake from snacks of Kansas fifth grade students (N = 1165) from 24-hour dietary recall interviews

	variance component			
	BED	USD/BED	school/USD/BED	error
energy, kcal				
variance component	0.00	0.00	0.62	0.18
per cent	0.00	0.00	3.24	96.76
protein, gm.				
variance component	0.12	0.00	9.67	0.20
per cent	0.01	0.00	4.52	95.48
fat, gm.				
variance component	0.00	0.00	19.48	0.52
per cent	0.00	0.00	3.59	96.41
carbohydrate, gm.				
variance component	0.00	0.56	0.00	0.34
per cent	0.00	1.65	0.00	98.35
vitamin A, I.U.				
variance component	0.16	0.00	0.51	0.17
per cent	0.88	0.00	2.88	96.24
ascorbic acid, mg.				
variance component	10.00	0.00	0.00	0.21
per cent	0.47	0.00	0.00	99.53
thiamin, mg.				
variance component	0.00	0.01	0.00	0.15
per cent	0.00	5.58	0.00	94.42
riboflavin, mg.				
variance component	0.00	0.04	0.03	1.03
per cent	0.00	3.39	2.76	93.85
niacin, mg.				
variance component	0.04	0.00	0.72	13.70
per cent	0.27	0.00	5.00	94.72
vitamin B_6, mg.				
variance component	0.00	0.00	0.00	0.16
per cent	0.00	2.10	0.00	97.90

Table 91: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
calcium, mg.				
variance component	0.36	0.33	0.00	0.89
per cent	0.39	3.59	0.00	96.02
phosphorus, mg.				
variance component	0.23	0.00	0.14	0.68
per cent	0.33	0.00	2.03	97.63
magnesium, mg.				
variance component	0.52	0.00	65.85	0.15
per cent	0.03	0.00	4.16	95.80
iron, mg.				
variance component	0.02	0.00	0.00	6.92
per cent	0.36	0.00	0.00	99.64

APPENDIX U

Analysis of Variance, Variance Component Estimates, Means, Standard Deviations, and Coefficients of Variation for Energy and Nutrient Intake from Breakfast, Lunch, and Dinner of Kansas Fifth Grade Students from 24-hour Dietary Recall Interviews

Table 92: Analysis of variance of energy and nutrient intake from breakfast, lunch, and dinner of Kansas fifth grade students (N = 1302) from 24-hour dietary recall interviews

	source of variation[1]			
mean squares	BED	USD/BED	school/USD/BED	error[2]
breakfast				
energy, kcal	0.87	0.12	0.13	0.94
protein, gm.	142.81	180.30	100.21	0.12
fat, gm.	202.77	289.21	269.87	0.25
carbohydrate, gm.	2533.20	0.25	3290.90	0.20
vitamin A, I.U.	1.00	0.34	0.39	0.28
ascorbic acid, mg.	3964.01	0.35	0.56	0.34
thiamin, mg.	0.29	0.29	0.16	0.21
riboflavin, mg.	0.42	0.31	0.41	0.30
niacin, mg.	37.55	14.98	13.82	14.74
vitamin B_6, mg.	0.84	0.31	0.46	0.30
calcium, mg.	0.59	0.10	0.12	0.72
phosphorus, mg.	0.50	0.96	0.71	0.71
magnesium, mg.	5270.02	0.29	3243.58	0.27
iron, mg.	63.05	20.50	35.15	26.31

[1]

source	df	expected mean squares
BED	9	$\sigma^2+16.46\sigma_s^2+31.60\sigma_{USD}^2+128.16\sigma_{BED}^2$
USD/BED	65	$\sigma^2+12.22\sigma_s^2+15.13\sigma_{USD}^2$
school/USD/BED	24	$\sigma^2+14.33\sigma_s^2$
error	1203	σ^2

[2]Between individual students.

Table 92: (cont.)

mean squares	source of variation			
	BED	USD/BED	school/USD/BED	error
lunch				
energy, kcal	0.61	0.36	0.20	0.12
protein, gm.	339.42	479.28	346.88	0.20
fat, gm.	1102.47	1512.43	454.20	0.53
carbohydrate, gm.	0.13	0.55	0.43	0.14
vitamin A, I.U.	0.26	0.14	0.26	0.60
ascorbic acid, mg.	5620.07	0.34	4018.60	0.98
thiamin, mg.	0.88	0.44	0.18	0.09
riboflavin, mg.	0.45	0.24	0.52	0.31
niacin, mg.	17.71	44.79	34.38	16.54
vitamin B_6, mg.	0.20	0.57	0.25	0.09
calcium, mg.	0.10	0.17	0.60	0.47
phosphorus, mg.	0.65	0.15	0.56	0.36
magnesium, mg.	3575.06	0.43	3224.54	0.90
iron, mg.	17.30	20.96	9.89	4.22
dinner				
energy, kcal	0.37	0.21	0.26	0.19
protein, gm.	583.22	372.51	661.67	0.40
fat, gm.	1089.55	598.19	1080.11	0.61
carbohydrate, gm.	4437.46	0.31	2195.45	0.29
vitamin A, I.U.	0.14	0.13	0.30	0.20
ascorbic acid, mg.	3111.71	1375.34	2310.28	0.21

Table 92: (cont.)

	source of variation			
mean squares	BED	USD/BED	school/USD/BED	error
thiamin, mg.	0.23	0.19	0.36	0.32
riboflavin, mg.	0.92	0.75	0.67	0.72
niacin, mg.	28.19	20.21	16.27	21.52
vitamin B_6, mg.	0.12	0.17	0.16	0.18
calcium, mg.	0.10	0.14	0.12	0.10
phosphorus, mg.	0.57	0.11	0.14	0.74
magnesium, mg.	3643.44	0.25	1409.46	0.27
iron, mg.	11.16	10.22	11.12	8.85

Table 93: Variance component estimates of energy and nutrient intake from breakfast, lunch, and dinner of Kansas fifth grade students (N = 1302) from 24-hour dietary recall interviews

	variance component			
	BED	USD/BED	school/USD/BED	error
breakfast				
energy, kcal				
variance component	0.00	0.16	0.24	0.94
per cent	0.00	0.02	2.47	95.51
protein, gm.				
variance component	0.00	5.05	0.00	0.12
per cent	0.00	3.87	0.00	96.13
fat, gm.				
variance component	0.00	1.49	1.54	0.25
per cent	0.00	0.60	0.62	98.79
carbohydrate, gm.				
variance component	2.59	0.00	92.68	0.20
per cent	0.13	0.00	4.50	95.37
vitamin A, I.U.				
variance component	0.51	0.00	0.73	0.28
per cent	1.73	0.00	2.48	95.79
ascorbic acid, mg.				
variance component	13.22	0.00	0.15	0.34
per cent	0.37	0.00	4.34	95.28
thiamin, mg.				
variance component	0.00	0.01	0.00	0.21
per cent	0.00	3.75	0.00	96.25
riboflavin, mg.				
variance component	0.00	0.00	0.01	0.30
per cent	0.43	0.00	2.52	97.05
niacin, mg.				
variance component	0.17	0.07	0.00	14.74
per cent	1.13	0.45	0.00	98.41
vitamin B_6, mg.				
variance component	0.00	0.00	0.01	0.30
per cent	1.57	0.00	3.73	94.70

Table 93: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
calcium, mg.				
variance component	0.00	0.00	0.33	0.72
per cent	0.00	0.00	4.32	95.68
phosphorus, mg.				
variance component	0.00	0.16	0.21	0.71
per cent	0.00	2.21	0.03	97.76
magnesium, mg.				
variance component	18.74	0.00	38.17	0.27
per cent	0.68	0.00	1.39	97.93
iron, mg.				
variance component	0.42	0.00	0.62	26.31
per cent	1.55	0.00	2.26	96.19
lunch				
energy, kcal				
variance component	0.31	0.12	0.54	0.12
per cent	0.23	8.53	4.02	87.22
protein, gm.				
variance component	0.00	10.13	9.91	0.20
per cent	0.00	4.51	4.41	91.09
fat, gm.				
variance component	0.00	69.14	0.00	0.53
per cent	0.00	11.44	0.00	88.56
carbohydrate, gm.				
variance component	0.40	0.11	0.20	0.14
per cent	2.27	6.15	11.17	80.41
vitamin A, I.U.				
variance component	0.12	0.00	0.14	0.60
per cent	1.67	0.00	18.60	79.72
ascorbic acid, mg.				
variance component	11.43	0.00	212.40	0.98
per cent	0.95	0.00	17.71	81.33

Table 93: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
thiamin, mg.				
variance component	0.00	0.02	0.00	0.09
per cent	0.81	15.37	4.85	78.96
riboflavin, mg.				
variance component	0.00	0.00	0.01	0.31
per cent	1.01	0.00	4.60	94.39
niacin, mg.				
variance component	0.00	0.86	1.24	16.54
per cent	0.00	4.62	6.68	88.70
vitamin B_6, mg.				
variance component	0.00	0.02	0.01	0.09
per cent	0.00	19.04	9.37	71.59
calcium, mg.				
variance component	0.00	0.76	0.94	0.47
per cent	0.00	13.75	1.69	84.56
phosphorus, mg.				
variance component	0.00	0.66	0.14	0.36
per cent	0.00	14.94	3.19	81.87
magnesium, mg.				
variance component	0.00	0.96	161.90	0.90
per cent	0.00	8.26	13.92	77.82
iron, mg.				
variance component	0.00	0.79	0.40	4.22
per cent	0.00	14.55	7.33	78.12
<u>dinner</u>				
energy, kcal				
variance component	0.14	0.00	0.48	0.19
per cent	0.70	0.00	2.46	96.84
protein, gm.				
variance component	3.17	0.00	18.19	0.40
per cent	0.75	0.00	4.31	94.94
fat, gm.				
variance component	6.24	0.00	32.94	0.61
per cent	0.96	0.00	5.09	93.95

Table 93: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
carbohydrate, gm.				
variance component	5.02	0.54	0.00	0.29
per cent	0.17	1.81	0.00	98.02
vitamin A, I.U.				
variance component	0.11	0.00	0.64	0.20
per cent	0.52	0.00	3.02	96.46
ascorbic acid, mg.				
variance component	20.72	0.00	14.90	0.21
per cent	0.97	0.00	0.70	98.33
thiamin, mg.				
variance component	0.00	0.00	0.00	0.32
per cent	0.51	0.00	0.82	98.67
riboflavin, mg.				
variance component	0.00	0.00	0.00	0.72
per cent	0.11	0.69	0.00	99.20
niacin, mg.				
variance component	0.05	0.21	0.00	21.52
per cent	0.22	0.96	0.00	98.82
vitamin B_6, mg.				
variance component	0.00	0.00	0.00	0.18
per cent	0.00	0.04	0.00	99.96
calcium, mg.				
variance component	0.00	0.11	0.17	0.10
per cent	0.00	1.04	1.66	97.30
phosphorus, mg.				
variance component	0.00	0.00	0.43	0.74
per cent	0.00	0.00	5.42	94.58
magnesium, mg.				
variance component	3.42	0.63	0.00	0.27
per cent	0.12	2.28	0.00	97.59
iron, mg.				
variance component	0.01	0.00	0.16	8.85
per cent	0.08	0.00	1.76	98.16

Table 94: Means, standard deviation, and coefficients of variation of energy and nutrient intake in breakfast, lunch, and dinner of Kansas fifth grade students (N = 1302) from 24-hour dietary recall interviews

	breakfast			lunch			dinner		
	mean	standard deviation	coefficient of variation	mean	standard deviation	coefficient of variation	mean	standard deviation	coefficient of variation
			%			%			%
energy, kcal	445	306	69	746	343	46	782	434	56
protein, gm.	15.4	11.2	72	28.3	14.3	50	32.8	20.0	61
fat, gm.	15.7	15.7	100	33.5	23.1	69	37.6	24.6	65
carbohydrate, gm.	61.7	44.3	72	86.3	37.8	44	79.5	54.1	68
vitamin A, I.U.	1629	1685	103	1602	2441	152	2140	4520	211
ascorbic acid, mg.	35.5	58.0	163	25.1	31.2	124	28.6	45.8	160
thiamin, mg.	0.46	0.46	101	0.42	0.30	72	0.49	0.57	116
riboflavin, mg.	0.64	0.55	85	0.76	0.55	73	0.73	0.85	116
niacin, mg.	3.1	3.8	122	4.9	4.1	83	6.8	4.6	68
vitamin B_6, mg.	0.5	0.5	114	0.5	0.3	62	0.5	0.4	80
calcium, mg.	323	269	83	427	216	51	312	317	101
phosphorus, mg.	304	266	88	419	189	45	387	273	70
magnesium, mg.	51.0	51.9	102	49.4	30.1	61	56.9	51.8	91
iron, mg.	2.93	5.13	175	4.04	2.05	51	4.96	2.97	60

APPENDIX V

F Ratios for Analysis of Effects of Selected Variables on Total Day and by Meal for Energy and Nutrient Intake of Kansas Fifth Grade Students Who Reported Eating on the Day of 24-hour Dietary Recall Interviews

Table 95: F ratios for analysis of effects of selected variables on total day's energy and nutrient intake (with supplements) of Kansas fifth grade students (N = 1230) from 24-hour dietary recall interviews

	mean square error	F ratios for effects of:		
		sex	place of residence	sex x place
energy, kcal	694962.96	52.83***	0.12	0.00
protein, gm.	1021.42	66.35***	0.53	0.76
fat, gm.	2135.48	33.52***	0.14	0.05
carbohydrate, gm.	11857.17	35.27***	0.33	0.36
vitamin A, I.U.	37995554.50	6.67**	0.03	0.42
ascorbic acid, mg.	32465.26	0.16	0.19	0.87
thiamin, mg.	1.11	11.00***	1.62	0.41
riboflavin, mg.	2.93	18.64***	0.45	3.53
niacin, mg.	112.71	17.17***	0.41	0.48
vitamin B_6, mg.	1.21	19.66***	0.40	2.60
calcium, mg.	403193.95	35.39***	1.07	1.04
phosphorus, mg.	315949.14	45.70***	0.00	0.79
magnesium, mg.	9299.02	41.22***	3.06	1.79
iron, mg.	113.66	19.97***	2.61	0.90

** $P \leq 0.01$ *** $P \leq 0.001$

Table 96: F ratios for analysis of effects of selected variables on total day's energy and nutrient intake (without supplements) of Kansas fifth grade students (N = 1230) from 24-hour dietary recall interviews

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	694962.96	52.83***	0.12	0.00
protein, gm.	1021.17	66.25***	0.52	0.74
fat, gm.	2135.48	33.52***	0.14	0.05
carbohydrate, gm.	11857.17	35.27***	0.33	0.36
vitamin A, I.U.	32993298.74	9.22**	0.05	0.55
ascorbic acid, mg.	10385.01	4.41	0.73	0.71
thiamin, mg.	0.83	22.78***	1.11	0.23
riboflavin, mg.	2.70	22.45***	0.56	2.31
niacin, mg.	68.18	44.87***	1.96	0.17
vitamin B_6, mg.	0.84	41.70***	0.03	3.18
calcium, mg.	397868.63	36.36***	1.49	1.02
phosphorus, mg.	315924.77	45.56***	0.00	0.77
magnesium, mg.	9289.87	40.64***	2.90	1.67
iron, mg.	51.19	39.37***	4.88	1.02

** $P \leq 0.01$ *** $P \leq 0.001$

Table 97: F ratios for analysis of effects of selected variables on energy and nutrient intake from breakfast of Kansas fifth grade students (N = 1126) from 24-hour dietary recall interviews[1]

	mean square error	F ratios for effects of:		
		sex	place of residence	sex x place
energy, kcal	82696.85	30.01***	2.31	0.46
protein, gm.	111.90	20.37***	1.39	0.63
fat, gm.	245.39	9.49**	0.72	0.01
carbohydrate, gm.	1799.83	29.51***	3.54	0.37
vitamin A, I.U.	2916265.15	27.60***	0.77	5.50*
ascorbic acid, mg.	3639.29	0.19	2.29	3.30
thiamin, mg.	0.21	19.43***	1.05	0.19
riboflavin, mg.	0.27	13.59***	3.77	2.61
niacin, mg.	15.10	16.96***	0.85	3.66
vitamin B_6, mg.	0.30	14.38***	3.97*	5.58*
calcium, mg.	69664.19	12.55***	4.20*	0.50
phosphorus, mg.	68616.18	16.85***	1.13	0.52
magnesium, mg.	2714.59	14.03***	0.00	0.78
iron, mg.	28.60	14.32***	1.96	2.75

[1] Includes only those students who reported eating breakfast on day of recall interview.

* $P \leq 0.05$ ** $P \leq 0.01$ *** $P \leq 0.001$

Table 98: F ratios for analysis of effects of selected variables on energy and nutrient intake from lunch of Kansas fifth grade students (N = 1213) from 24-hour dietary recall interviews[1]

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	125939.04	20.81***	2.04	0.07
protein, gm.	208.91	21.34***	2.69	0.09
fat, gm.	585.96	14.25***	1.28	0.00
carbohydrate, gm.	1648.75	11.18***	0.36	0.53
vitamin A, I.U.	7198266.02	0.05	0.30	0.48
ascorbic acid, mg.	1222.96	2.32	0.01	0.13
thiamin, mg.	0.11	0.74	0.33	0.72
riboflavin, mg.	0.32	4.25*	0.43	0.12
niacin, mg.	18.24	12.12***	7.99**	0.15
vitamin B_6, mg.	0.11	12.88***	2.56	0.01
calcium, mg.	51576.29	18.05***	0.00	0.03
phosphorus, mg.	39726.06	18.53***	0.31	0.08
magnesium, mg.	1120.34	9.62**	8.59**	0.37
iron, mg.	4.94	11.03***	5.14*	0.04

[1]Includes only those students who reported eating lunch on day of recall interview.

* $P \leq 0.05$ ** $P \leq 0.01$ *** $P \leq 0.001$

Table 99: F ratios for analysis of effects of selected variables on energy and nutrient intake from dinner of Kansas fifth grade students (N = 1196) from 24-hour dietary recall interviews[1]

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	177295.27	21.32***	0.12	0.00
protein, gm.	371.45	31.22***	0.24	0.69
fat, gm.	592.54	13.41***	0.01	0.04
carbohydrate, gm.	2770.74	11.28***	0.09	0.19
vitamin A, I.U.	21047399.29	2.06	0.33	0.31
ascorbic acid, mg.	2127.27	4.20*	1.35	0.01
thiamin, mg.	0.33	6.53*	0.15	0.14
riboflavin, mg.	0.76	5.77*	0.27	0.00
niacin, mg.	20.58	17.93***	0.98	0.18
vitamin B_6, mg.	0.17	19.06***	0.68	0.00
calcium, mg.	101068.01	14.38***	0.71	0.03
phosphorus, mg.	72687.74	22.00***	0.34	0.25
magnesium, mg.	2676.41	19.93***	3.24	1.32
iron, mg.	8.33	23.53***	1.43	0.23

[1] Includes only those students who reported eating dinner on day of recall interviews.

* $P \leq 0.05$ *** $P \leq 0.001$

Table 100: F ratios for analysis of effects of selected variables on energy and nutrient intake from snacks of Kansas fifth grade students (N = 1103) from 24-hour dietary recall interviews[1]

	mean square error	F ratios for effects of: sex	place of residence	sex × place
energy, kcal	190200.68	5.95*	0.19	0.00
protein, gm.	211.25	9.58**	0.21	0.59
fat, gm.	538.75	4.00*	0.04	0.12
carbohydrate, gm.	3490.37	3.75	0.95	0.24
vitamin A, I.U.	1775809.14	1.69	1.70	0.00
ascorbic acid, mg.	2120.51	0.66	2.44	0.00
thiamin, mg.	0.16	2.77	2.98	0.82
riboflavin, mg.	1.13	6.92**	0.08	2.44
niacin, mg.	13.48	3.46	0.85	0.01
vitamin B_6, mg.	0.16	5.31*	0.16	1.36
calcium, mg.	94501.68	5.85*	0.13	1.79
phosphorus, mg.	70162.27	6.33*	0.37	1.14
magnesium, mg.	1551.54	5.75*	1.19	0.03
iron, mg.	7.07	2.80	0.23	0.62

[1] Includes only those students who reported eating snacks on day of recall interviews.

* $P \leq 0.05$ ** $P \leq 0.01$

APPENDIX W

F Ratios for Analysis of Effects of Selected Variables and Least Square Means and Standard Errors for Energy and Nutrient Intake from Breakfast, Lunch, and Dinner of Kansas Fifth Grade Students from 24-hour Dietary Recall Interviews

Table 101: F ratios for analysis of effects of selected variables on energy and nutrient intake from breakfast of Kansas fifth grade students (N = 1230) from 24-hour dietary recall interviews

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	93553.28	29.23***	1.34	0.40
protein, gm.	123.56	20.83***	0.76	0.55
fat, gm.	246.44	10.68**	0.45	0.01
carbohydrate, gm.	1994.79	29.06***	2.28	0.32
vitamin A, I.U.	2910392.33	28.66***	0.47	5.18*
ascorbic acid, mg.	3451.75	0.39	1.92	3.16
thiamin, mg.	0.21	20.57***	0.69	0.19
riboflavin, mg.	0.28	14.72***	2.66	2.28
niacin, mg.	14.72	18.17***	0.57	3.53
vitamin B_6, mg.	0.30	15.58***	3.17	5.23*
calcium, mg.	73115.33	13.67***	3.04	0.44
phosphorus, mg.	71012.59	17.92***	0.69	0.48
magnesium, mg.	2717.76	15.27***	0.01	0.76
iron, mg.	26.94	15.46***	2.20	2.82

* $P \leq 0.05$ ** $P \leq 0.01$ *** $P \leq 0.001$

Table 102: F ratios for analysis of effects of selected variables on energy and nutrient intake from lunch of Kansas fifth grade students (N = 1230) from 24-hour dietary recall interviews

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	131986.23	20.37***	2.10	0.09
protein, gm.	217.35	20.99***	2.73	0.11
fat, gm.	593.53	14.32***	1.34	0.00
carbohydrate, gm.	1730.56	11.09***	0.41	0.56
vitamin A, I.U.	7133325.70	0.06	0.28	0.50
ascorbic acid, mg.	1214.81	2.40	0.01	0.14
thiamin, mg.	0.11	0.81	0.37	0.75
riboflavin, mg.	0.32	4.38*	0.37	0.10
niacin, mg.	18.32	12.24***	8.03**	0.16
vitamin B_6, mg.	0.11	12.95***	2.62	0.02
calcium, mg.	53462.65	17.85***	0.00	0.02
phosphorus, mg.	41666.98	8.17***	0.36	0.10
magnesium, mg.	1140.31	9.72**	8.59**	0.32
iron, mg.	5.10	11.04***	5.16**	0.05

* $P \leq 0.05$ ** $P \leq 0.01$ *** $P \leq 0.001$

Table 103: F ratios for analysis of effects of selected variables on energy and nutrient intake from dinner of Kansas fifth grade students (N = 1230) from 24-hour dietary recall interviews

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	190872.82	15.92***	0.30	0.01
protein, gm.	394.06	24.79***	0.45	0.54
fat, gm.	618.76	10.21**	0.00	0.02
carbohydrate, gm.	2884.16	8.51**	0.22	0.23
vitamin A, I.U.	20600444.22	1.76	0.39	0.28
ascorbic acid, mg.	2093.79	3.61	1.53	0.02
thiamin, mg.	0.33	5.48*	0.08	0.12
riboflavin, mg.	0.75	4.75*	0.17	0.00
niacin, mg.	21.44	14.13***	1.31	0.23
vitamin B_6, mg.	0.18	15.77***	0.92	0.00
calcium, mg.	101325.96	12.29***	0.50	0.03
phosphorus, mg.	75261.45	17.81***	0.54	0.19
magnesium, mg.	2702.73	17.00***	3.59	1.17
iron, mg.	8.85	18.27***	1.82	0.14

* $P \leq 0.05$ ** $P \leq 0.01$ *** $P \leq 0.001$

Table 104: Least square means and standard errors for energy and nutrient intake from breakfast, lunch, and dinner of Kansas fifth grade students (N = 1230) from 24-hour dietary recall interviews

	least square means and standard errors													
	energy	protein	fat, total	carbo-hydrate	vita-min A	ascorbic acid	thiamin	ribo-flavin	niacin	vita-min B_6	calcium	phos-phorus	magne-sium	iron
	kcal	gm.	gm.	gm.	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
breakfast														
female	503 ±47	20.8 ±1.7	22.9 ±2.4	54.8 ±6.8	1268 ±261	40.4 ±9.0	0.39 ±0.07	0.67 ±0.08	2.9 ±0.6	0.4 ±0.1	357 ±41	347 ±41	54.0 ±8.0	4.35 ±0.79
male	612 ±46	24.1 ±1.7	26.2 ±2.4	70.6 ±6.7	1868 ±257	42.8 ±8.8	0.53 ±0.07	0.81 ±0.08	4.0 ±0.6	0.5 ±0.1	422 ±41	421 ±40	67.4 ±7.8	5.69 ±0.78
lunch														
female	667 ±56	23.9 ±2.2	30.2 ±3.7	76.3 ±6.4	1703 ±408	26.6 ±5.3	0.40 ±0.05	0.63 ±0.09	4.5 ±0.6	0.4 ±0.0	330 ±35	348 ±31	41.9 ±5.2	3.69 ±0.34
male	774 ±55	28.3 ±2.2	36.3 ±3.7	85.4 ±6.3	1744 ±402	30.2 ±5.2	0.42 ±0.05	0.70 ±0.08	5.5 ±0.6	0.4 ±0.0	394 ±35	405 ±31	48.8 ±5.1	4.18 ±0.34
dinner														
female	643 ±67	25.5 ±3.0	30.6 ±3.8	79.6 ±8.2	1370 ±695	25.8 ±7.0	0.43 ±0.09	0.52 ±0.13	5.7 ±0.7	0.4 ±0.1	228 ±49	287 ±42	41.4 ±7.9	4.24 ±0.45
male	757 ±66	32.0 ±3.0	35.8 ±3.7	89.9 ±8.1	1765 ±684	31.5 ±6.9	0.52 ±0.09	0.64 ±0.13	6.8 ±0.7	0.5 ±0.1	301 ±48	363 ±41	55.4 ±7.8	5.08 ±0.45

APPENDIX X

Analysis of Variance and Variance Component Estimates for Percentages of Recommended Dietary Allowances for Energy and Nutrient Intake from Total Day and by Meal of Kansas Fifth Grade Students from 24-hour Dietary Recall Interviews

Table 105: Analysis of variance for percentages of Recommended Dietary Allowances for total day's energy and nutrient intake (with supplement) from Kansas fifth grade students (N = 1204) from 24-hour dietary recall interviews

	source of variation[1]			
mean squares	BED	USD/BED	school/USD/BED	error[2]
energy, kcal	2469.99	0.17	1236.88	0.11
protein, gm.	4419.15	0.62	0.73	0.54
vitamin A, I.U.	0.38	0.24	0.32	0.19
ascorbic acid, mg.	0.88	0.14	0.19	0.12
thiamin, mg.	0.12	0.12	0.74	0.73
riboflavin, mg.	0.25	0.15	0.19	0.14
niacin, mg.	4440.84	0.48	0.42	0.41
vitamin B_6, mg.	3393.19	0.61	3344.97	0.37
calcium, mg.	4832.96	0.46	3402.07	0.28
phosphorus, mg.	1697.82	0.36	3204.06	0.22
magnesium, mg.	990.49	1263.35	680.98	0.87
iron, mg.	6171.54	0.34	2947.88	0.35

[1]

source	df	expected mean squares
BED	9	$\sigma^2+16.46\sigma_s^2+31.60\sigma_{USD}^2+128.16\sigma_{BED}^2$
USD/BED	65	$\sigma^2+12.21\sigma_s^2+15.13\sigma_{USD}^2$
school/USD/BED	24	$\sigma^2+14.33\sigma_s^2$
error	1203	σ^2

[2]Between individual students.

Table 106: Analysis of variance for percentages of Recommended Dietary Allowances for total day's energy and nutrient intake of Kansas fifth grade students (N = 1204) from 24-hour dietary recall interviews

	source of variation[1]			
mean squares	BED	USD/BED	school/USD/BED	error[2]
energy, kcal	2469.99	0.17	1236.88	0.11
protein, gm.	4395.70	0.62	0.73	0.54
vitamin A, I.U.	0.38	0.19	0.31	0.16
ascorbic acid, mg.	0.95	0.36	0.28	0.41
thiamin, mg.	9438.52	0.97	0.43	0.53
riboflavin, mg.	0.20	0.14	0.16	0.12
niacin, mg.	2139.34	0.29	2231.24	0.24
vitamin B_6, mg.	3296.55	0.42	2559.32	0.26
calcium, mg.	4702.81	0.46	3170.48	0.28
phosphorus, mg.	1691.97	0.36	3204.06	0.22
magnesium, mg.	969.41	1256.78	680.98	0.87
iron, mg.	3060.86	0.20	1995.36	0.16

[1]

source	df	expected mean squares
BED	9	$\sigma^2+16.46\sigma^2_s+31.60\sigma^2_{USD}+128.16\sigma^2_{BED}$
USD/BED	65	$\sigma^2+12.21\sigma^2_s+15.13\sigma^2_{USD}$
school/USD/BED	24	$\sigma^2+14.33\sigma^2_s$
error	1203	σ^2

[2]Between individual students.

Table 107: Analysis of variance on percentages of Recommended Dietary Allowances for energy and nutrient intake from breakfast of Kansas fifth grade students (N = 1193) from 24-hour dietary recall interviews[1]

	source of variation[2]			
mean squares	BED	USD/BED	school/USD/BED	error[3]
energy, kcal.	125.14	191.61	194.61	0.13
protein, gm.	702.34	784.85	387.98	0.56
vitamin A, I.U.	5066.53	0.17	1813.60	0.13
ascorbic acid, mg.	0.16	0.14	0.25	0.14
thiamin, mg.	1709.30	0.18	1094.77	0.12
riboflavin, mg.	2297.65	1512.85	2082.35	0.14
niacin, mg.	1548.07	607.74	539.63	0.53
vitamin B_6, mg.	2953.49	1040.05	1545.21	0.93
calcium, mg.	419.00	674.24	746.23	0.50
phosphorus, mg.	448.20	705.35	414.16	0.49
magnesium, mg.	515.59	285.20	258.49	0.25
iron, mg.	2216.03	724.90	1000.09	0.87

[1] Includes only those students who reported eating breakfast on day of recall interview.

[2]

source	df	expected mean squares
BED	9	$\sigma^2+15.15\sigma^2_s+29.23\sigma^2_{USD}+117.37\sigma^2_{BED}$
USD/BED	65	$\sigma^2+11.16\sigma^2_s+13.82\sigma^2_{USD}$
school/USD/BED	24	$\sigma^2+13.17\sigma^2_s$
error	507	σ^2

[3] Between individual students.

Table 108: Analysis of variance for percentages of Recommended Dietary Allowances for energy and nutrient intake from lunch of Kansas fifth grade students (N = 1282) from 24-hour dietary recall interviews[1]

	source of variation[2]			
mean squares	BED	USD/BED	school/USD/BED	error[3]
energy, kcal	1012.42	606.10	275.31	0.17
protein, gm.	2055.02	0.24	1565.68	0.96
vitamin A, I.U.	0.14	0.78	0.12	0.34
ascorbic acid, mg.	0.22	0.14	0.16	0.39
thiamin, mg.	5885.04	0.30	919.57	0.64
riboflavin, mg.	2483.02	1010.03	2392.81	0.17
niacin, mg.	689.76	0.17	1057.86	0.53
vitamin B_6, mg.	634.76	0.18	776.20	0.26
calcium, mg.	1547.76	0.25	855.28	0.71
phosphorus, mg.	442.41	973.29	383.68	0.24
magnesium, mg.	328.79	411.01	314.60	84.31
iron, mg.	582.37	753.83	290.46	0.13

[1] Includes only those students who reported eating lunch on day of dietary recall interview.

[2]

source	df	expected mean squares
BED	9	$\sigma^2+16.25\sigma_s^2+31.13\sigma_{USD}^2+126.27\sigma_{BED}^2$
USD/BED	65	$\sigma^2+12.02\sigma_s^2+14.91\sigma_{USD}^2$
school/USD/BED	24	$\sigma^2+14.15\sigma_s^2$
error	1184	σ^2

[3] Between individual students.

Table 109: Analysis of variance for percentages of Recommended Dietary Allowances for energy and nutrient intake from dinner of Kansas fifth grade students (N = 1265) from 24-hour dietary recall interviews[1]

	source of variation[2]			
mean squares	BED	USD/BED	school/USD/BED	error[3]
energy, kcal	547.40	317.55	287.38	0.29
protein, gm.	2226.91	0.17	2771.76	0.19
vitamin A, I.U.	7377.25	0.69	0.16	0.11
ascorbic acid, mg.	0.12	0.55	0.95	0.85
thiamin, mg.	1684.71	1200.42	2136.26	0.23
riboflavin, mg.	4433.09	0.35	3246.17	0.36
niacin, mg.	859.61	697.48	461.33	0.76
vitamin B_6, mg.	402.72	491.38	484.04	0.54
calcium, mg.	625.89	935.37	837.65	0.71
phosphorus, mg.	344.15	715.28	840.23	0.51
magnesium, mg.	309.77	212.49	170.97	0.25
iron, mg.	271.30	294.26	279.49	0.28

[1] Includes only those students who reported eating dinner on day of recall interview.

[2]

source	df	expected mean squares
BED	9	$\sigma^2+16.04\sigma_s^2+30.69\sigma_{USD}^2+124.57\sigma_{BED}^2$
USD/BED	65	$\sigma^2+11.86\sigma_s^2+14.71\sigma_{USD}^2$
school/USD/BED	24	$\sigma^2+13.93\sigma_s^2$
error	1166	σ^2

[3] Between individual students.

Table 110: Analysis of variance for percentages of Recommended Dietary Allowances for energy and nutrient intake from snacks of Kansas fifth grade students (N = 1165) from 24-hour dietary recall interviews[1]

	source of variation[2]			
mean squares	BED	USD/BED	school/USD/BED	error[3]
energy, kcal	322.81	392.27	442.82	0.31
protein, gm.	908.92	1147.22	1606.71	1.00
vitamin A, I.U.	1162.48	686.21	1138.95	0.85
ascorbic acid, mg.	9827.51	0.65	0.69	0.85
thiamin, mg.	1303.12	0.16	650.71	0.10
riboflavin, mg.	6729.52	0.80	0.67	0.44
niacin, mg.	549.54	559.15	832.46	0.51
vitamin B_6, mg.	416.53	593.33	447.75	0.48
calcium, mg.	1512.18	912.31	601.38	0.62
phosphorus, mg.	624.70	498.32	607.13	0.47
magnesium, mg.	138.41	160.39	226.72	0.14
iron, mg.	217.82	181.98	207.14	0.22

[1] Includes only those students who reported eating snacks on day of recall interviews.

[2]

source	df	expected mean squares
BED	9	$\sigma^2+14.63\sigma_s^2+27.99\sigma_{USD}^2+114.49\sigma_{BED}^2$
USD/BED	65	$\sigma^2+10.99\sigma_s^2+13.58\sigma_{USD}^2$
school/USD/BED	24	$\sigma^2+12.68\sigma_s^2$
error	1066	σ^2

[3] Between individual students.

Table 111: Variance component estimates for percentages of Recommended Dietary Allowances for total day's energy and nutrient intake (with supplements) of Kansas fifth grade students (N = 1204) from 24-hour dietary recall interviews

	variance component			
	BED	USD/BED	school/USD/BED	error
energy, kcal				
variance component	2.13	0.30	9.96	0.11
per cent	0.19	2.61	0.88	96.32
protein, gm.				
variance component	0.00	0.00	0.14	0.54
per cent	0.00	0.00	2.49	97.51
vitamin A, I.U.				
variance component	0.14	0.00	0.88	0.19
per cent	0.69	0.00	4.36	94.95
ascorbic acid, mg.				
variance component	0.00	0.00	0.47	0.12
per cent	0.00	0.00	3.60	96.40
thiamin, mg.				
variance component	0.00	0.32	0.57	0.73
per cent	0.00	4.15	0.08	95.77
riboflavin, mg.				
variance component	0.96	0.00	0.39	0.14
per cent	0.68	0.00	2.80	96.52
niacin, mg.				
variance component	0.00	0.36	0.54	0.41
per cent	0.00	0.87	0.13	99.00
vitamin B_6, mg.				
variance component	0.00	0.18	0.00	0.37
per cent	0.00	4.63	0.00	95.37
calcium, mg.				
variance component	0.00	0.85	40.68	0.28
per cent	0.00	2.90	1.38	95.72
phosphorus, mg.				
variance component	0.00	0.37	67.78	0.22
per cent	0.00	1.60	2.90	95.50

Table 111: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
magnesium, mg.				
variance component	0.00	36.62	0.00	0.87
per cent	0.00	4.03	0.00	95.97
iron, mg.				
variance component	19.12	0.27	0.00	0.35
per cent	0.54	0.76	0.00	98.69

Table 112: Variance component estimates for percentages of Recommended Dietary Allowances for total day's energy and nutrient intake from Kansas fifth grade students (N = 1204) from 24-hour dietary recall interviews

	variance component			
	BED	USD/BED	school/USD/BED	error
energy, kcal				
variance component	2.13	0.30	9.96	0.11
per cent	0.19	2.61	0.88	96.32
protein, gm.				
variance component	0.00	0.00	0.14	0.54
per cent	0.00	0.00	2.49	97.51
vitamin A, I.U.				
variance component	0.20	0.00	0.10	0.16
per cent	1.08	0.00	5.76	93.15
ascorbic acid, mg.				
variance component	0.44	0.41	0.00	0.41
per cent	1.06	0.98	0.00	97.96
thiamin, mg.				
variance component	0.00	0.35	0.00	0.53
per cent	0.00	6.10	0.00	93.90
riboflavin, mg.				
variance component	0.47	0.00	0.28	0.12
per cent	0.37	0.00	2.20	97.43
niacin, mg.				
variance component	0.00	0.44	0.00	0.24
per cent	0.00	1.76	0.00	98.24
vitamin B_6, mg.				
variance component	0.00	0.11	0.00	0.26
per cent	0.00	4.04	0.00	95.96
calcium, mg.				
variance component	0.00	0.96	26.74	0.28
per cent	0.00	3.31	0.92	95.77
phosphorus, mg.				
variance component	0.00	0.37	67.79	0.22
per cent	0.00	1.60	2.90	95.50

Table 112: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
magnesium, mg.				
variance component	0.00	36.19	0.00	0.87
per cent	0.00	3.99	0.00	96.01
iron, mg.				
variance component	7.02	0.34	27.71	0.16
per cent	0.43	0.21	1.69	97.67

Table 113: Variance component estimates for percentages of Recommended Dietary Allowances for energy and nutrient intake from breakfast of Kansas fifth grade students (N = 1193) from 24-hour dietary recall interviews

	variance component			
	BED	USD/BED	school/USD/BED	error
energy, kcal.				
variance component	0.00	0.51	4.98	0.13
per cent	0.00	0.38	3.70	95.92
protein, gm.				
variance component	0.00	26.77	0.00	0.56
per cent	0.00	4.53	0.00	95.47
vitamin A, I.U.				
variance component	27.34	0.00	36.86	0.13
per cent	1.96	0.00	2.65	95.39
ascorbic acid, mg.				
variance component	0.76	0.00	0.84	0.14
per cent	0.50	0.00	5.58	93.92
thiamin, mg.				
variance component	0.00	0.48	0.00	0.12
per cent	0.00	3.73	0.00	96.27
riboflavin, mg.				
variance component	9.25	0.00	53.52	0.14
per cent	0.64	0.00	3.72	95.64
niacin, mg.				
variance component	7.32	5.04	0.79	0.53
per cent	1.35	0.93	0.15	97.57
vitamin B_6, mg.				
variance component	18.61	0.00	46.82	0.93
per cent	1.87	0.00	4.71	93.42
calcium, mg.				
variance component	0.00	0.00	18.87	0.50
per cent	0.00	0.00	3.65	96.35
phosphorus, mg.				
variance component	0.00	20.25	0.00	0.49
per cent	0.00	3.98	0.00	96.02

Table 113: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
magnesium, mg.				
variance component	1.67	2.05	0.81	0.25
per cent	0.66	0.81	0.32	98.21
iron, mg.				
variance component	14.78	0.00	10.12	0.87
per cent	1.66	0.00	1.13	97.21

Table 114: Variance component estimates for percentages of Recommended Dietary Allowances for energy and nutrient intake from lunch of Kansas fifth grade students (N = 1283) from 24-hour dietary recall interviews

	variance component			
	BED	USD/BED	school/USD/BED	error
energy, kcal				
variance component	0.00	23.21	7.24	0.17
per cent	0.00	11.42	3.56	85.02
protein, gm.				
variance component	0.00	0.65	42.82	0.96
per cent	0.00	6.07	4.01	89.92
vitamin A, I.U.				
variance component	0.55	0.00	0.60	0.34
per cent	1.36	0.00	14.75	83.89
ascorbic acid, mg.				
variance component	0.29	0.58	0.86	0.39
per cent	0.61	0.12	17.85	81.42
thiamin, mg.				
variance component	3.69	0.14	19.35	0.64
per cent	0.45	17.64	2.38	79.52
riboflavin, mg.				
variance component	20.99	0.00	49.85	0.17
per cent	1.19	0.00	2.83	95.97
niacin, mg.				
variance component	0.00	0.50	36.96	0.53
per cent	0.00	8.09	5.94	85.97
vitamin B_6, mg.				
variance component	0.00	0.74	36.63	0.26
per cent	0.00	20.02	9.95	70.03
calcium, mg.				
variance component	0.00	0.11	10.30	0.71
per cent	0.00	13.60	1.24	85.16
phosphorus, mg.				
variance component	0.00	40.97	10.05	0.24
per cent	0.00	14.01	3.43	82.56

Table 114: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
magnesium, mg.				
variance component	0.00	8.79	16.28	84.31
per cent	0.00	8.03	14.88	77.08
iron, mg.				
variance component	0.00	32.68	11.27	0.13
per cent	0.00	18.67	6.44	74.89

Table 115: Variance component estimates for percentages of Recommended Dietary Allowances for energy and nutrient intake from dinner of Kansas fifth grade students (N = 1265) from 24-hour dietary recall interviews

	variance component			
	BED	USD/BED	school/USD/BED	error
energy, kcal				
variance component	1.60	2.01	0.00	0.29
per cent	0.54	0.68	0.00	98.78
protein, gm.				
variance component	10.18	0.00	63.77	0.19
per cent	0.52	0.00	3.26	96.22
vitamin A, I.U.				
variance component	62.65	0.00	0.33	0.11
per cent	0.55	0.00	2.89	96.57
ascorbic acid, mg.				
variance component	0.81	0.00	0.69	0.85
per cent	0.93	0.00	0.80	98.27
thiamin, mg.				
variance component	12.83	0.00	0.00	0.23
per cent	0.54	0.00	0.00	99.46
riboflavin, mg.				
variance component	6.58	0.14	0.00	0.36
per cent	0.18	0.38	0.00	99.44
niacin, mg.				
variance component	0.34	13.05	0.00	0.76
per cent	0.04	1.69	0.00	98.26
vitamin B_6, mg.				
variance component	0.00	0.00	0.00	0.54
per cent	0.00	0.00	0.00	100.00
calcium, mg.				
variance component	0.00	7.91	8.99	0.71
per cent	0.00	1.08	1.23	97.68
phosphorus, mg.				
variance component	0.00	0.00	23.55	0.51
per cent	0.00	0.00	4.40	95.60

Table 115: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
magnesium, mg.				
variance component	0.70	2.04	0.00	0.25
per cent	0.28	0.81	0.00	98.91
iron, mg.				
variance component	0.00	1.04	0.23	0.28
per cent	0.00	0.37	0.08	99.54

Table 116: Variance component estimates for percentages of Recommended Dietary Allowances for energy and nutrient intake from snacks of Kansas fifth grade students (N = 1165) from 24-hour dietary recall interviews

	variance component			
	BED	USD/BED	school/USD/BED	error
energy, kcal				
variance component	0.00	0.00	10.35	0.31
per cent	0.00	0.00	3.22	96.78
protein, gm.				
variance component	0.00	0.00	48.06	1.00
per cent	0.00	0.00	4.60	95.40
vitamin A, I.U.				
variance component	7.28	0.00	22.67	0.85
per cent	0.83	0.00	2.57	96.60
ascorbic acid, mg.				
variance component	39.55	0.00	0.00	0.85
per cent	0.46	0.00	0.00	99.54
thiamin, mg.				
variance component	0.00	0.67	0.00	0.10
per cent	0.00	6.16	0.00	93.84
riboflavin, mg.				
variance component	0.00	0.12	0.19	0.44
per cent	0.00	2.52	4.00	93.48
niacin, mg.				
variance component	1.24	0.00	25.51	0.51
per cent	0.23	0.00	4.76	95.01
vitamin B_6, mg.				
variance component	0.00	10.36	0.00	0.48
per cent	0.00	2.09	0.00	97.91
calcium, mg.				
variance component	2.43	22.71	0.00	0.62
per cent	0.38	3.52	0.00	96.10
phosphorus, mg.				
variance component	1.61	0.00	10.56	0.47
per cent	0.33	0.00	2.18	97.49

Table 116: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
magnesium, mg.				
variance component	0.11	0.00	6.54	0.14
per cent	0.07	0.00	4.35	95.58
iron, mg.				
variance component	0.58	0.00	0.00	0.22
per cent	0.27	0.00	0.00	99.73

APPENDIX Y

Analysis of Variance, Variance Component Estimates, and Means, Standard Deviations, and Coefficients of Variation of Percentage of Recommended Dietary Allowances for Energy and Nutrient Intake from Breakfast, Lunch, and Dinner of Kansas Fifth Grade Students from Dietary Recall Interviews

Table 117: Analysis of variance of percentages of Recommended Dietary Allowances for energy and nutrient intake from breakfast, lunch, and dinner of Kansas fifth grade students (N = 1302) from 24-hour dietary recall interviews

	source of variation[1]			
mean squares	BED	USD/BED	school/USD/BED	error[2]
breakfast				
energy, kcal	80.36	105.97	121.92	0.11
protein, gm.	691.88	884.04	489.58	0.62
vitamin A, I.U.	4682.31	0.17	2037.78	0.13
ascorbic acid, mg.	0.16	0.14	0.22	0.13
thiamin, mg.	1671.24	0.18	1043.87	0.13
riboflavin, mg.	2000.01	0.16	2151.32	0.14
niacin, mg.	1323.64	523.88	534.32	0.52
vitamin B_6, mg.	2618.72	952.92	1474.61	0.92
calcium, mg.	394.66	718.21	897.06	0.52
phosphorus, mg.	343.47	688.65	496.26	0.51
magnesium, mg.	475.62	274.16	311.58	0.25
iron, mg.	2012.18	655.15	1059.45	0.82

[1]

source	df	expected mean squares
BED	9	$\sigma^2+16.46\sigma^2_s+31.60\sigma^2_{USD}+128.16\sigma^2_{BED}$
USD/BED	65	$\sigma^2+12.21\sigma^2_s+15.13\sigma^2_{USD}$
school/USD/BED	24	$\sigma^2+14.33\sigma^2_s$
error	1203	σ^2

[2]Between individual students.

Table 117: (cont.)

mean squares	source of variation			
	BED	USD/BED	school/USD/BED	error
lunch				
energy, kcal	989.42	590.62	319.06	0.18
protein, gm.	1785.25	0.24	1674.74	0.10
vitamin A, I.U.	0.14	0.75	0.12	0.34
ascorbic acid, mg.	0.22	0.14	0.16	0.39
thiamin, mg.	5888.18	0.30	972.58	0.65
riboflavin, mg.	2456.25	1069.76	2660.72	0.17
niacin, mg.	630.24	0.16	1125.28	0.54
vitamin B_6, mg.	633.96	0.18	761.04	0.27
calcium, mg.	1600.65	0.27	941.63	0.73
phosphorus, mg.	415.23	1039.18	388.32	0.25
magnesium, mg.	341.66	404.09	325.97	0.87
iron, mg.	552.07	702.23	308.36	0.14
dinner				
energy, kcal	711.14	352.23	366.93	0.31
protein, gm.	2584.84	0.18	3158.98	0.20
vitamin A, I.U.	6963.00	0.71	0.14	0.11
ascorbic acid, mg.	0.12	0.55	0.92	0.84
thiamin, mg.	1784.98	1189.92	2448.26	0.23
riboflavin, mg.	4776.63	0.36	3428.29	0.36
niacin, mg.	1024.44	720.97	531.92	0.79
vitamin B_6, mg.	363.71	520.33	507.40	0.55

Table 117: (cont.)

mean squares	source of variation			
	BED	USD/BED	school/USD/BED	error
calcium, mg.	684.54	961.92	857.74	0.71
phosphorus, mg.	387.46	789.12	898.66	0.52
magnesium, mg.	334.51	227.62	134.04	0.25
iron, mg.	338.84	317.69	325.27	0.29

Table 118: Variance component estimates of percentages of Recommended Dietary Allowances for energy and nutrient intake from breakfast, lunch, and dinner of Kansas fifth grade students (N = 1302) from 24-hour dietary recall interviews

	variance component			
	BED	USD/BED	school/USD/BED	error
breakfast				
energy, kcal				
variance component	0.00	0.00	0.56	0.11
per cent	0.00	0.00	0.49	99.51
protein, gm.				
variance component	0.00	24.78	0.00	0.62
per cent	0.00	3.84	0.00	96.16
vitamin A, I.U.				
variance component	23.59	0.00	48.77	0.13
per cent	1.67	0.00	3.46	94.87
ascorbic acid, mg.				
variance component	0.53	0.00	0.61	0.13
per cent	0.38	0.00	4.33	95.30
thiamin, mg.				
variance component	0.00	0.49	0.00	0.13
per cent	0.00	3.74	0.00	96.26
riboflavin, mg.				
variance component	5.57	0.00	49.18	0.14
per cent	0.37	0.00	3.28	96.35
niacin, mg.				
variance component	6.29	0.00	0.75	0.52
per cent	1.19	0.00	0.14	98.67
vitamin B_6, mg.				
variance component	15.46	0.00	38.50	0.92
per cent	1.58	0.00	3.94	94.48
calcium, mg.				
variance component	0.00	0.00	26.30	0.52
per cent	0.00	0.00	4.81	95.19
phosphorus, mg.				
variance component	0.00	12.59	0.00	0.51
per cent	0.00	2.41	0.00	97.59

Table 118: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
magnesium, mg.				
variance component	1.67	0.00	4.31	0.25
per cent	0.65	0.00	1.68	97.66
iron, mg.				
variance component	13.16	0.00	16.78	0.82
per cent	1.55	0.00	1.98	96.47
lunch				
energy, kcal				
variance component	0.33	19.25	9.34	0.18
per cent	0.15	8.99	4.36	86.50
protein, gm.				
variance component	0.00	0.53	46.34	0.10
per cent	0.00	4.77	4.17	91.05
vitamin A, I.U.				
variance component	0.58	0.00	0.60	0.34
per cent	1.43	0.00	14.82	83.75
ascorbic acid, mg.				
variance component	0.45	0.00	0.85	0.39
per cent	0.94	0.00	17.77	81.29
thiamin, mg.				
variance component	4.29	0.14	22.19	0.65
per cent	0.52	16.71	2.71	80.05
riboflavin, mg.				
variance component	20.89	0.00	67.26	0.17
per cent	1.17	0.00	3.77	95.06
niacin, mg.				
variance component	0.00	0.38	40.46	0.54
per cent	0.00	6.16	6.48	87.36
vitamin B_6, mg.				
variance component	0.00	0.71	34.48	0.27
per cent	0.00	19.16	9.25	71.59

Table 118: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
calcium				
variance component	0.00	0.12	14.65	0.73
per cent	0.00	13.75	1.69	84.56
phosphorus, mg.				
variance component	0.00	44.32	9.37	0.25
per cent	0.00	14.40	3.04	82.56
magnesium, mg.				
variance component	0.00	7.50	16.69	0.87
per cent	0.00	6.75	15.04	78.21
iron, mg.				
variance component	0.00	27.67	11.75	0.14
per cent	0.00	15.43	6.55	78.02
dinner				
energy, kcal				
variance component	2.72	0.00	3.94	0.31
per cent	0.86	0.00	1.24	97.90
protein, gm.				
variance component	12.88	0.00	82.62	0.20
per cent	0.62	0.00	3.99	95.39
vitamin A, I.U.				
variance component	47.07	0.00	0.23	0.11
per cent	0.42	0.00	2.04	97.54
ascorbic acid, mg.				
variance component	0.83	0.00	0.60	0.84
per cent	0.97	0.00	0.71	98.32
thiamin, mg.				
variance component	14.86	0.00	9.16	0.23
per cent	0.63	0.00	0.39	98.97
riboflavin, mg.				
variance component	8.22	0.10	0.00	0.36
per cent	0.23	0.28	0.00	99.49

Table 118: (cont.)

	variance component			
	BED	USD/BED	school/USD/BED	error
niacin, mg.				
variance component	1.67	10.01	0.00	0.79
per cent	0.21	1.26	0.00	98.54
vitamin B_6, mg.				
variance component	0.00	0.47	0.00	0.55
per cent	0.00	0.09	0.00	99.91
calcium, mg.				
variance component	0.00	8.33	10.31	0.71
per cent	0.00	1.14	1.42	97.44
phosphorus, mg.				
variance component	0.00	0.00	26.12	0.52
per cent	0.00	0.00	4.74	95.26
magnesium, mg.				
variance component	0.45	5.05	0.00	0.25
per cent	0.18	1.97	0.00	97.85
iron, mg.				
variance component	0.10	0.00	2.48	0.29
per cent	0.04	0.00	0.85	99.12

Table 119: Means, standard deviations, and coefficients of variation for percentages of Recommended Dietary Allowances for energy and nutrient intake in breakfast, lunch, and dinner of Kansas fifth grade students (N = 1302) from 24-hour dietary recall interviews

	breakfast			lunch			dinner		
	mean	standard deviation	coefficient of variation	mean	standard deviation	coefficient of variation	mean	standard deviation	coefficient of variation
			%			%			%
energy, kcal	7	11	158	31	14	44	32	18	55
protein, gm.	34.1	24.9	73	62.6	31.8	51	72.6	44.4	61
vitamin A, I.U.	36	36	100	36	58	161	48	104	216
ascorbic acid, mg.	71.2	115.9	163	50.3	62.5	124	57.2	91.6	160
thiamin, mg.	36.54	35.58	97	34.38	25.58	74	39.49	48.14	122
riboflavin, mg.	44.64	38.04	85	52.72	41.20	78	50.77	59.78	118
niacin, mg.	19.1	22.9	120	29.7	23.4	79	41.6	28.0	67
vitamin B_6, mg.	26.6	30.4	114	26.5	16.3	62	29.0	23.4	80
calcium, mg.	27	23	84	53	27	51	26	27	102
phosphorus, mg.	26	22	88	35	16	45	32	23	70
magnesium, mg.	15.8	15.8	100	15.3	9.3	61	17.6	15.8	90
iron, mg.	16.44	28.62	174	22.77	11.83	52	27.90	17.02	61

APPENDIX Z

F Ratios for Analysis of Effects of Selected Variables on Percentages of Recommended Dietary Allowances for Energy and Nutrient Intake from Total Day and by Meal of Kansas Fifth Grade Students Who Reported Eating on the Day of 24-hour Dietary Recall Interviews

Table 120: F ratios for analysis of effects of selected variables on percentages of Recommended Dietary Allowances for total day's energy and nutrient intake (with supplements) of Kansas fifth grade students (N = 1230) from 24-hour dietary recall interviews

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	1146.13	3.50	0.13	0.00
protein, gm.	4965.76	81.63***	0.50	0.79
vitamin A, I.U.	20071.19	1.53	0.06	0.40
ascorbic acid, mg.	129851.04	0.16	0.19	0.87
thiamin, mg.	7614.52	8.88**	1.72	0.56
riboflavin, mg.	14188.35	0.65	0.77	3.70
niacin, mg.	4243.68	1.45	0.34	0.38
vitamin B_6, mg.	3735.23	19.65***	0.40	2.61
calcium, mg.	2816.20	35.05***	1.15	1.06
phosphorus, mg.	2202.93	45.36***	0.01	0.81
magnesium, mg.	893.14	3.38	2.65	1.38
iron, mg.	3508.32	19.85***	2.52	0.92

** $P \leq 0.01$ *** $P \leq 0.001$

Table 121: F ratios for analysis of effects of selected variables on percentages of Recommended Dietary Allowances for energy and nutrient intake of Kansas fifth grade students (N = 1230) from 24-hour dietary recall interviews

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	1146.13	3.50	0.13	0.00
protein, gm.	4964.50	81.52***	0.49	0.78
vitamin A, I.U.	17366.44	0.29	0.10	0.55
ascorbic acid, mg.	41537.47	4.42*	0.73	0.71
thiamin, mg.	5668.85	2.31	1.16	0.32
riboflavin, mg.	12984.32	0.04	0.85	2.50
niacin, mg.	2475.04	0.97	1.95	0.08
vitamin B_6, mg.	2604.54	41.67***	0.03	3.20
calcium, mg.	2779.29	36.01***	1.58	1.04
phosphorus, mg.	2202.76	45.23***	0.01	0.79
magnesium, mg.	892.39	3.22	2.51	1.28
iron, mg.	1581.99	39.07***	4.68*	1.06

* $P \leq 0.05$ *** $P \leq 0.001$

Table 122: F ratios for analysis of effects of selected variables on percentages of Recommended Dietary Allowances for energy and nutrient intake from breakfast of Kansas fifth grade students (N = 1126) from 24-hour dietary recall interviews[1]

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	137.44	0.26	0.96	1.30
protein, gm.	543.62	24.85***	1.42	0.63
vitamin A, I.U.	1374.91	3.88*	1.39	6.23*
ascorbic acid, mg.	14564.20	0.20	2.29	3.28
thiamin, mg.	1263.04	0.46	1.22	0.31
riboflavin, mg.	1312.71	0.06	4.46*	3.25
niacin, mg.	540.06	3.42	1.21	4.12*
vitamin B_6, mg.	938.24	14.36***	3.98*	5.59
calcium, mg.	485.72	12.30***	4.31*	0.54
phosphorus, mg.	477.72	16.63***	1.18	0.55
magnesium, mg.	249.89	1.86	0.02	0.79
iron, mg.	882.80	14.30***	1.93	2.76

[1] Includes only those students who reported eating breakfast on day of recall interview.

* $P \leq 0.05$ *** $P \leq 0.001$

Table 123: F ratios for analysis of effects of selected variables on percentages of Recommended Dietary Allowances for energy and nutrient intake from lunch of Kansas fifth grade students (N = 1213) from 24-hour dietary recall interviews[1]

	mean square error	F ratios for effects of: sex	place of residence	sex × place
energy, kcal	203.12	4.76*	2.23	0.19
protein, gm.	1020.67	27.50***	2.55	0.07
vitamin A, I.U.	4011.35	2.94	0.23	0.34
ascorbic acid, mg.	4891.74	2.31	0.01	0.13
thiamin, mg.	778.05	14.13***	0.44	0.78
riboflavin, mg.	1742.62	4.32*	0.44	0.14
niacin, mg.	613.61	0.02	9.12**	0.47
vitamin B_6, mg.	347.65	12.83***	2.53	0.01
calcium, mg.	805.88	18.05***	0.00	0.03
phosphorus, mg.	275.98	18.40***	0.27	0.07
magnesium, mg.	107.53	0.31	8.29**	0.13
iron, mg.	154.53	10.58**	4.76*	0.02

[1] Includes only those students who reported eating lunch on day of dietary recall interview.

* $P \leq 0.05$ ** $P \leq 0.01$ *** $P \leq 0.001$

Table 124: F ratios for analysis of effects of selected variables on percentages of Recommended Dietary Allowances for energy and nutrient intake from dinner of Kansas fifth grade students (N = 1196) from 24-hour dietary recall interviews[1]

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	298.17	1.73	0.12	0.01
protein, gm.	1798.56	38.01***	0.23	0.71
vitamin A, I.U.	11010.31	0.04	0.26	0.22
ascorbic acid, mg.	8508.80	4.20*	1.35	0.01
thiamin, mg.	2391.48	0.35	0.16	0.16
riboflavin, mg.	3757.01	0.10	0.26	0.00
niacin, mg.	767.00	0.01	1.07	0.28
vitamin B_6, mg.	532.02	19.06***	0.68	0.00
calcium, mg.	705.91	14.26***	0.75	0.03
phosphorus, mg.	506.86	21.83***	0.30	0.26
magnesium, mg.	252.38	3.05	2.93	0.99
iron, mg.	257.05	23.42***	1.35	0.24

[1] Includes only those students who reported eating dinner on day of recall interview.

* $P \leq 0.05$ *** $P \leq 0.001$

Table 125: F ratios for analysis of effects of selected variables on percentages of Recommended Dietary Allowances for energy and nutrient intake from snacks of Kansas fifth grade students (N = 1103) from 24-hour dietary recall interviews[1]

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	324.28	0.04	0.23	0.01
protein, gm.	1026.11	11.36***	0.20	0.56
vitamin A, I.U.	890.22	0.35	1.70	0.01
ascorbic acid, mg.	8481.95	0.66	2.44	0.00
thiamin, mg.	1095.49	0.11	3.14	1.15
riboflavin, mg.	4868.69	1.61	0.01	2.67
niacin, mg.	506.97	0.14	0.84	0.04
vitamin B_6, mg.	506.11	5.32*	0.16	1.36
calcium, mg.	658.14	5.92*	0.13	1.74
phosphorus, mg.	488.22	6.40*	0.37	1.10
magnesium, mg.	148.76	0.63	1.23	0.06
iron, mg.	218.31	2.81	0.23	0.63

[1] Includes only those students who reported eating snacks on day of recall interview.

* $P \leq 0.05$ *** $P \leq 0.001$

APPENDIX AA

F Ratios for Analysis of Effects of Selected Variables on Percentages of Recommended Dietary Allowances for Energy and Nutrient Intake from Breakfast, Lunch, and Dinner of Kansas Fifth Grade Students from 24-hour Dietary Recall Interviews

Table 126: F ratios for analysis of effects of selected variables on percentages of Recommended Dietary Allowances for energy and nutrient intake from breakfast of Kansas fifth grade students (N = 1230) from 24-hour dietary recall interviews

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	112.77	0.00	3.90*	0.07
protein, gm.	599.95	24.94***	0.78	0.55
vitamin A, I.U.	1379.11	4.87*	0.93	5.74*
ascorbic acid, mg.	13813.82	0.40	1.92	3.15
thiamin, mg.	1277.05	0.95	0.82	0.28
riboflavin, mg.	1382.30	0.03	3.21	2.77
niacin, mg.	527.29	4.25*	0.86	3.90*
vitamin B_6, mg.	922.28	15.56***	3.18	5.24*
calcium, mg.	509.71	13.42***	3.13	0.47
phosphorus, mg.	494.41	17.71***	0.73	0.51
magnesium, mg.	251.00	2.65	0.00	0.75
iron, mg.	831.55	15.44***	2.17	2.83

* $P \leq 0.05$ *** $P \leq 0.001$

Table 127: F ratios for analysis of effects of selected variables on percentages of Recommended Dietary Allowances for energy and nutrient intake from lunch of Kansas fifth grade students (N = 1230) from 24-hour dietary recall interviews

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	213.78	4.09*	2.29	0.22
protein, gm.	1061.36	26.93***	2.60	0.09
vitamin A, I.U.	3974.19	2.84	0.21	0.36
ascorbic acid, mg.	4859.16	2.39	0.01	0.14
thiamin, mg.	784.44	13.44***	0.48	0.82
riboflavin, mg.	1759.49	4.00*	0.38	0.12
niacin, mg.	617.62	0.04	9.17**	0.50
vitamin B_6, mg.	352.96	12.90***	2.60	0.02
calcium, mg.	835.35	17.85***	0.00	0.02
phosphorus, mg.	289.48	18.05***	0.32	0.09
magnesium, mg.	109.48	0.24	8.31**	0.11
iron, mg.	159.43	10.60**	4.78*	0.03

* $P \leq 0.05$ ** $P \leq 0.01$ *** $P \leq 0.001$

Table 128: F ratios for analysis of effects of selected variables on percentages of Recommended Dietary Allowances for energy and nutrient intake from dinner of Kansas fifth grade students (N = 1230) from 24-hour dietary recall interviews

	mean square error	F ratios for effects of:		
		sex	place of residence	sex × place
energy, kcal	319.62	2.73	0.31	0.03
protein, gm.	1909.26	30.58***	0.44	0.55
vitamin A, I.U.	10770.20	0.09	0.31	0.19
ascorbic acid, mg.	8374.87	3.61	1.53	0.02
thiamin, mg.	2370.44	0.58	0.09	0.12
riboflavin, mg.	3728.48	0.25	0.16	0.00
niacin, mg.	796.02	0.18	1.41	0.35
vitamin B_6, mg.	542.76	15.78***	0.92	0.00
calcium, mg.	707.66	12.19***	0.54	0.03
phosphorus, mg.	524.78	17.68***	0.49	0.20
magnesium, mg.	254.51	2.13	3.29	0.85
iron, mg.	273.02	18.18***	1.73	0.15

*** $P \leq 0.001$

Table 129: Least square means and standard errors for energy and nutrient intake by meal of Kansas fifth grade students (N = 1230) from 24-hour dietary recall interviews

	least square means[1] and standard errors											
	energy	protein	vitamin A	ascorbic acid	thiamin	riboflavin	niacin	vitamin B_6	calcium	phosphorous	magnesium	iron
	kcal	gm.	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
breakfast												
female	6	45.4	33	80.9[a]	35.86[a]	50.32[a]	19.8	20.9	30	29	18.0[a]	24.20
	±2	±3.7	±6	±18.0	±5.46	±5.68	±3.5	±4.6	±3	±3	±2.4	±4.41
male	6	53.4	38	85.8	38.15	50.73	22.9	28.7	35	35	19.7	31.64
	±2	±3.7	±6	±17.7	±5.38	±5.60	±3.4	±4.6	±3	±3	±2.4	±4.34
lunch												
female	30	52.0	41[a]	53.3[a]	36.98	48.46	30.0[a]	20.0	41	29	14.2[a]	20.57
	±2	±5.0	±10	±10.6	±4.28	±6.41	±3.8	±2.9	±4	±3	±1.6	±1.93
male	28	63.1	34	60.4	30.24	42.94	30.3	24.4	49	34	13.8	23.27
	±2	±4.9	±9	±10.5	±4.22	±6.32	±3.7	±2.8	±4	±2	±1.6	±1.90
dinner												
female	30[a]	55.5	37[a]	51.7[a]	39.76[a]	41.02[a]	38.3[a]	21.2	19	24	14.2[a]	23.66
	±3	±6.7	±16	±14.0	±7.44	±9.33	±4.3	±3.6	±4	±4	±2.4	±2.52
male	28	71.4	35	63.1	37.32	39.00	37.5	27.2	25	30	15.7	28.28
	±3	±6.6	±16	±13.8	±7.33	±9.20	±4.2	±3.5	±4	±3	±2.4	±2.49

[1]Superscript a indicates nonsignificant differences between means.

APPENDIX BB

Details of Analysis of Variance of Selected Variables

Table 130: F ratios for analysis of effects of sex and source of meal on energy and nutrient intake and percentage of Recommended Dietary Allowances at lunch of Kansas fifth grade students

	F ratios for analysis of intakes for effects of:				F ratios for analysis of per cent RDA[1] for effects of:		
	mean square error	sex	school lunch	sex × school lunch	mean square error	sex	school lunch	sex × school lunch
energy, kcal	124378.18	26.31***	4.13*	1.38	200.93	0.81	3.86*	0.95
protein, gm.	208.78	24.33***	2.98	0.93	1023.14	30.44***	3.14	0.91
fat, gm.	567.00	15.87***	6.58*	0.56				
carbohydrate, gm.	1641.90	19.54***	4.73*	1.99				
vitamin A, I.U.	6964853.28	0.86	1.31	4.22*	3896.25	6.41*	0.81	3.43
ascorbic acid, mg.	1187.65	7.38**	0.51	3.27	4752.52	7.39**	0.52	3.26
thiamin, mg.	0.12	1.39	1.29	0.26	803.30	8.38**	1.36	0.42
riboflavin, mg.	0.30	0.69	3.33	1.56	1670.92	7.49**	2.54	1.01
niacin, mg.	17.40	30.69***	29.25***	9.81**	588.60	5.91*	28.93***	7.62**
vitamin B_6, mg.	0.11	12.39***	10.42**	0.29	340.28	12.45***	10.56**	0.29
calcium, mg.	49851.90	8.07**	29.42***	1.65	778.94	8.07**	29.42***	1.65
phosphorus, mg.	39608.84	15.78***	4.96*	0.00	275.93	16.67***	5.20*	0.00
magnesium, mg.	1105.75	10.16**	6.08*	0.96	106.12	0.00	5.61*	0.63
iron, mg.	4.98	12.67***	6.19*	0.30	159.17	12.92***	6.75**	0.33

[1]RDA not established for fat and carbohydrate.

* $P \leq 0.05$ ** $P \leq 0.01$ *** $P \leq 0.001$

Table 131: Analysis of variance for per cent of fat in total day's and lunch energy intake of Kansas fifth grade students (N = 1204) from 24-hour dietary recall interviews

	source of variation[1]			
mean squares	BED	USD/BED	school/USD/BED	error[2]
total day's meals (excluding supplements)				
fat, gm.	68.61	114.85	71.10	48.24
lunch				
fat, gm.	328.28	543.70	95.67	66.22

[1]

source	df	expected mean squares
BED	9	$\sigma^2+16.25\sigma^2_s+31.13\sigma^2_{USD}+126.27\sigma^2_{BED}$
USD/BED	65	$\sigma^2+12.02\sigma^2_s+14.91\sigma^2_{USD}$
school/USD/BED	24	$\sigma^2+14.15\sigma^2_s$
error	1203	σ^2

[2]Between individual students.

Table 132: Variance component estimates for per cent of fat in total day's and lunch energy intake of Kansas fifth grade students from 24-hour dietary recall interviews

	source of variation			
	BED	USD/BED	school/USD/BED	error
total day's meals (excluding supplements)				
fat, gm.				
variance component	0.00	3.16	1.62	48.24
per cent	0.00	5.97	3.05	90.99
lunch				
fat, gm.				
variance component	0.00	30.34	2.08	66.22
per cent	0.00	30.76	2.11	67.13

Table 133: F ratios for analysis of effects of sex and place of residence on per cent of fat from energy intake from total day's and lunch of Kansas fifth grade students from 24-hour dietary recall interviews

	N	mean square error	F ratios for effects of: sex	place of residence	sex × place
total day's (excluding supplements)					
fat, gm.	1293	52.73	0.01	0.19	0.65
lunch					
fat, gm.	1274	92.34	1.39	3.35	0.76

Table 134: F ratios for analysis of effects of sex and source of lunch on per cent of fat from energy intake from total day's and lunch of Kansas fifth grade students from 24-hour dietary recall interviews

	N	mean square error	F ratios for effects of: sex	school lunch	sex × school lunch
total day's (excluding supplements)					
fat, gm.	1293	52.93	0.03	0.38	0.12
lunch					
fat, gm.	1274	92.00	0.55	12.13***	0.02

*** $P \leq 0.001$

Table 135: Analysis of variance of diet rating index of Kansas fifth grade students based on 24-hour dietary recall interviews

mean squares	source of variation[1] BED	USD/BED	school/USD/BED	error[2]
diet rating index (without supplements)	9.54	15.59	15.66	11.92
diet rating index (with supplements)	8.24	11.27	10.92	10.64

[1]

source	df	expected mean squares
BED	9	$\sigma^2+16.35\sigma^2_s+31.36\sigma^2_{USD}+127.30\sigma^2_{BED}$
USD/BED	65	$\sigma^2+12.13\sigma^2_s+15.03\sigma^2_{USD}$
school/USD/BED	24	$\sigma^2+14.22\sigma^2_s$
error	1194	σ^2

[2]Between individual students.

Table 136: Variance component estimates of diet rating index of Kansas fifth grade students based on 24-hour dietary recall interviews

	variance component BED	USD/BED	school/USD/BED	error
diet rating index (without supplements)				
variance component	0.00	0.03	0.26	11.92
per cent	0.00	0.26	2.15	97.59
diet rating index (with supplements)				
variance component	0.00	0.03	0.02	10.64
per cent	0.00	0.25	0.18	99.57

Table 137: F ratios for analysis of effects of selected variables on diet rating index of Kansas fifth grade students based on 24-hour dietary recall interviews

	mean square error	F ratios for effects of: sex	place of residence	sex × place
diet rating index (without supplements)	11.84	17.99***	0.64	0.33
diet rating index (with supplements)	10.32	15.91***	0.29	0.52

*** $P \leq 0.001$

Table 138: F ratios for analysis of effects of selected variables on diet rating index of Kansas fifth grade students based on 24-hour dietary recall interviews

	mean square error	F ratios for effects of: sex	school lunch	sex × school lunch
diet rating index (without supplements)	11.84	9.91**	14.63***	0.55
diet rating index (with supplements)	10.43	8.12**	12.89***	0.42

** $P \leq 0.01$ *** $P \leq 0.001$

ANTHROPOMETRIC MEASUREMENTS AND NUTRIENT INTAKE OF KANSAS FIFTH GRADE STUDENTS

by

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ABSTRACT

The most important goal of nutrition education in elementary schools is to teach children to select diets that will enable them to achieve and maintain a good nutritional state. Nutritional status studies help to identify individuals at risk, those persons and groups whose nutrition should be improved.

As a part of the Kansas Nutrition Education and Training Program Needs Assessment Project a partial nutritional assessment of students in ninety-seven randomly selected elementary schools was conducted. Anthropometric data including height, weight, arm circumference and triceps skinfold were collected from 3,231 fifth grade students and a subsample of 1,309 were randomly selected to be interviewed for 24-hour dietary recalls.

Kansas girls and boys were taller and heavier than those in national studies. Compared to the Ten-State Nutrition Survey, Kansas girls and boys had larger arm circumferences and triceps skinfold measurements. These data, coupled with the tendency toward greater weight, suggest a higher incidence of overweight among Kansas children than among elementary children, nationally. However, findings should be interpreted with caution, since the Kansas sample also was somewhat taller than the national sample. In addition, muscle circumferences, calculated from arm circumferences and triceps skinfold measurements, were similar for Kansas boys but smaller for Kansas girls than their counterparts in the Ten-State Survey.

According to the 24-hour dietary recall interviews, Kansas fifth grade students rarely missed meals. Almost all of the students reported eating breakfast, lunch, and dinner (92, 99, and 97 per cent,

respectively). Also, most of the students (76 per cent) ate an afternoon snack, and 49 per cent consumed an evening snack. School lunch participation was high with 82.7 per cent eating school lunch on the day of the interviews.

School lunches provided higher percentages of the RDAs for protein, vitamin A, ascorbic acid, riboflavin, vitamin B_6, calcium, phosphorus, and iron than lunches carried from home or those from other sources. Snacks provided between 10 and 40 per cent of the RDAs for the nutrients analyzed.

Almost half of the girls and boys had calorie levels exceeding 100 per cent of the Recommended Dietary Allowances (RDA) (44.5 and 45.2 per cent respectively). Protein intakes were high with over 90 per cent consuming over 125 per cent of the RDA.

The majority of the students (girls, 65.8 and boys, 57.6 per cent) did not meet two-thirds of the allowance for magnesium and 37.6 per cent of the girls and 23.7 per cent of the boys did not meet two-thirds of the RDA for iron. More of the boys than girls exceeded 125 per cent of the RDA for calcium (52.0 and 36.5 per cent, respectively). Conversely, more girls than boys consumed low intakes of calcium (21.1 and 12.9 per cent, respectively).

Vitamin B_6 intake was the lowest of all of the B vitamins studied with 28.3 per cent of the girls and 18.4 per cent of the boys consuming less than 66 per cent of the RDA. Although vitamins A and C were consumed in adequate amounts by most of the students, between 12 and 15 per cent had low intakes of these two vitamins. Overall, boys had higher intakes of energy and nutrients than girls.

Data suggest that calorie control should be emphasized in nutrition education efforts among Kansas elementary children, since energy intakes tended to be high and weight of the Kansas students tended to be above the national norms. Intakes of iron, magnesium, calcium, and vitamin B_6 need to be increased for some children.