FACTORS RELATED TO THE LEVEL OF DIETARY ADEQUACY OF PRESCHOOL CHILDREN FROM TWO SOCIOECONOMIC GROUPS IN RILEY COUNTY, KANSAS

by

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INTRODUCTION

Good eating habits are of prime importance in the growth and development of children. Since lifetime food patterns are initiated in childhood, faulty eating habits should be detected during this period. Good physical and mental health in adulthood depends on adequate nutrition in the formative years.

Nearly one-third of all families in the United States have preschool children, and slightly more than one-tenth of the total population is from 1 to 5 years of age (U. S. Bureau of Census, 1964). Yet relatively little is known about the nutritional status of this substantial segment of the population. Collecting dietary information on preschool children is difficult because so few of them are found in organized groups such as nursery schools. Research workers must obtain the cooperation of mothers in recording food intakes of preschool children in the home.

Studies of dietary intake of school-age children (Eppright et al., 1955) indicated deficiencies in various nutrients; however, the age at which these deficiencies first occur has not been established. Family income and knowledge and attitude of the homemaker concerning nutrition have been shown to affect the diets of older children and adults (Young et al., 1956b), but the relationship of these factors to the intakes of preschool children has not been substantiated.

The purpose of this study was to determine the relationship of various factors to the level of dietary adequacy of 49 preschool children from 2 socioeconomic groups. Factors included

were: sex, age, weight and height of child; nutrition knowledge, attitude toward nutrition and attitude of permissiveness toward the child's eating habits of mother; and income of family.

REVIEW OF LITERATURE

Evaluation of Nutritional Status

An integral part of the science of nutrition is an evaluation of nutritional status. Evaluations can be based on: 1) biochemical analysis, 2) clinical analysis, 3) physical growth and development and 4) dietary investigation. The most complete picture of nutritional status would be based on all of these criteria; however, the usual practice in investigation is to include only 2 or 3 of them.

The Interdepartmental Committee on Nutrition for National Defense (ICNND, 1960) endorsed nutritional status assessments based on clinical and biochemical analyses and dietary information. They strongly defended the validity of this combination by contending that "major disagreement among the 3 approaches, if consistently found in population groups (as opposed to individuals) and if not explained by recent changes in dietary intakes, must be regarded as a strong indication of error in the assessment."

Biochemical Analysis. Analyses of the blood are used to determine serum concentrations of vitamin A, carotene, ascorbic acid, protein, hemoglobin and cholesterol (ICNND, 1963). The urine can be analyzed for creatinine, thiamine, riboflavin,

N'-methylnicotinamide and nitrogen. Williams et al. (1951) stated that biochemical analysis is the most objective method of assessing nutritional status and that it permits an evaluation of nutrient reserve. The use of biochemical data in assessing the status of groups of people has been found valuable by public health physicians, but clinical and dietary methods are favored for individual evaluation (Gershoff, 1961). A limitation in usefulness of biochemical information was cited by the National Research Council (1949) in that specific standards for interpreting data are lacking. However, its value in assessing the general nutritional status of groups was noted. In their work with school children, Marlatt et al. (1956) suggested that additional investigation of biochemical data was needed to improve the predicted value of specific nutrients at various ages.

Clinical Analysis. Clinical analysis is a frequent criterion used in assessing nutritional status; however, it usually is used in combination with other means of evaluation. In a nutritional survey in Groton Township, New York (Moore and Shaw, 1951), observations were made on the eyes, lips, gums, teeth, tongue, buccal mucosa, skin, palpation of the thyroid gland, tendon reflexes, lower extremities and blood pressure. The investigators postulated that the small number of significant physical findings may have accounted for their lack of correlation with dietary intake and blood level of nutrients.

Physical examinations are part of the routine investigation of children participating in the Child Research Council study in Denver (Beal, 1965). During their first 10 years of life, these

children are examined 45 times to assure that poor health will not be a factor in their dietary intakes.

Clinical procedures were cited by Williams et al. (1951) as being highly subjective and of little or no value in assessing the intermediate state between good nutrition and malnutrition. Moore and Shaw (1951) commented that lack of agreement among physicians concerning the presence of deficiency symptoms was substantiated in the Groton Township study when 21 of the 31 cases of a particular deficiency sign (red tongue) were reported by one physician with the other 10 cases scattered among the reports of the other 4 physicians.

Physical Growth and Development. While growth alone is not an adequate index of nutrition, it is a tool frequently included in nutritional surveys to give a picture of individual growth compared with specific standards. One standard utilized in various surveys of children was developed by Jackson and Kelly (1945) from 13,500 height and 11,100 weight observations of Iowa City boys and girls from birth to 18 years of age. They summarized their data in charts showing median plus and minus one standard deviation for height and mean plus the sixteenth and eighty-fourth percentiles for weight.

Since food intake influences growth, weight and body composition, the Committee on Nutritional Anthropometry of the Food and Nutrition Board (1956) suggested that these 3 factors might serve as useful, though limited, criteria of nutritional status. They pointed out that evaluating nutritional status in children is more difficult than in adults because of differential growth

patterns and varying rates of sexual maturation. The importance of comparing a child's weight and dimensions with earlier measurements rather than with standards established for given ages was stressed. A list of measurements to be taken for different aged children was presented; those listed for 1- to 6-year-old youngsters were:

1. Length (crown to heel), stem length (crown to rump) and weight.
2. Head circumference (eliminated after 3 years of age) and chest circumference at mid-inspiration.
3. Bicristal diameter (width of pelvic girdle).
4. Skinfold over the triceps, below scapula and on chest.
5. Postero-anterior X-ray film of the hand and wrist.

In studying the relationship between the size and rate of growth and dietary intake of calories and protein of children from birth to 18 years, Stuart et al. (1958) measured body weight and height, obtained measurements of subcutaneous calf tissue and muscle from anteroposterior roentgenograms and assessed skeletal age using roentgenograms of the hands.

In a recent publication, Beal (1965) discussed methods of determining body composition used in the Child Research Council studies of children from birth to 10 years of age. The Council has employed skinfold thicknesses and clinical estimation of relative thickness of muscle and fat layers for many years. More recently, they have made potassium-40 counts of body content and X-rays of the major long bones of the left extremities to show the successive development of bone, muscle and fat. Measurements

of the width of bone, muscle and fat are analyzed and are correlated with weight, height and other body measurements. Beal stated that these comparisons may prove to be a link in understanding growth and dietary intake.

Dietary Investigation. The dietary survey is a means often chosen by research workers to study relative dietary adequacies of population groups. Leverton (1960) and Young and Pilcher (1950) alleged that dietary studies do not measure nutritional status as such but stated that they do provide information upon which improvements in nutrition can be based. Gershoff (1961) and Leverton (1960) pointed out that poor correlation of dietary intake and biochemical and clinical analyses often occur because the latter 2 methods reflect lifetime practices of food intake while dietary surveys provide a picture of present patterns. On the other hand, the ICNND (1960) maintained that unless there had been a recent change in dietary intake, a lack of agreement among clinical, biochemical and dietary data would result from error in assessment.

The availability of some standard for interpreting the data obtained is presupposed in dietary studies (ICNND, 1960). The accepted standard for dietary adequacy in the United States is the Recommended Dietary Allowance (RDA) proposed by the Foods and Nutrition Board of the National Research Council (NRC). Published in 1943, the recommendations were revised in 1945, 1948, 1953, 1958 and 1963 to reflect judgments based on current knowledge of nutritional needs of healthy people living in the United States under present conditions. The allowances are designed to

provide a level of intake sufficiently above the physiological requirements to accommodate increased needs that may occur during stress (Food and Nutrition Board, 1964). In using the allowances as a guide to nutritional adequacy, comparison should be made on a group rather than on an individual basis. The Food and Nutrition Board (1964) stated that "the allowances are intended to serve as goals toward which to aim in planning food supplies and as guides for the interpretation of food consumption records of groups of people."

The RDA for children from 1 to 3 years and 4 to 6 years remained relatively unchanged in the 1945, 1948 and 1953 revisions. In 1948 the reference weight of the 1- to 3-year-old children was decreased from 29 to 27 lbs. The reference weight for the 4- to 6-year-old youngsters was decreased in 1953 from 42 to 40 lbs. The first change in nutrient recommendation occurred in 1953 when the riboflavin allowance was increased for the younger group. In 1958 the recommendations for calories and thiamine were raised for both age groups; the riboflavin recommendation was increased for the older children and the niacin recommendation was stated in terms of mg equivalents instead of mg. In 1963, the age divisions were changed to "1-3 years" and "3-6 years" so that a child between 3 and 4 years of age would be included in the older group. The reference weight for the younger group was returned to the original 29 lbs and the reference height of the older group was decreased from 43 to 42 inches. A major change in nutrient allowances occurred in 1963 when protein, calcium, thiamine and riboflavin allowances were

reduced for both age groups. In addition, the calorie allowance was reduced and the iron recommendation was increased for the older children and an increase in iron, niacin equivalents and ascorbic acid was recommended for the younger children.

Dietary Survey Methods

Though dietary surveys are a common technique employed in investigating nutritional status, exact procedures vary greatly. The advantages and disadvantages of each appear as research workers search for the most effective method.

Recall. In studying different surveys based on recall diets, Leitch and Aitken (1950) found that recording diets for 2 days from memory was unsatisfactory and tended to result in an underestimation of consumption. Underestimation of intake from 24-hour recalled diets also was found by Thomson (1958) among pregnant women in Scotland. Interviewing 163 mothers concerning the first 6 years of their children's lives, Bryan and Anderson (1960) found the "retrospective dietary interview" method effective in assessing the intake of milk and vitamin D. In reviewing studies of grade-school children, pregnant women and college students, Young et al. (1952b) found that the 24-hour recall gave approximately the same results as the 7-day record in determining group means for most nutrients, but stated that they could not be used interchangeably to determine individual intake.

Dietary History. Since the nutritional status of a person can be only as good as his past and present food habits, detailed dietary histories can provide valuable information. An

individual's usual pattern of eating, substantiated by a check list to indicate customary consumption of specific foods and further verified by a dietary record, will present useful data on average intake over a considerable period (Burke, 1947). By comparing these data with those of other individuals in the same study and to an arbitrary standard, the relative nutritional status of an individual can be evaluated. Stuart et al. (1958) employed diet histories in their longitudinal studies of Boston children from birth to 18 years.

Daily Food Record. The most widely used dietary survey method involves recording the daily food intake. The length of time varies from 1 to 7 days with 3 days (Eppright et al., 1955; Marlatt et al., 1956; Metheny et al., 1962 and Patton et al., 1961) and 7 days (Ford, 1959; Marlatt et al., 1956 and Macy and Hunscher, 1951) being the most common. The alteration in food intake on week-ends led Thomson (1958) to use the 7-day period in his study of pregnant women. When 3-day records were used for school children, week-ends were avoided because the patterns of food consumption were likely to differ significantly between week-ends and school days (Eppright et al., 1952).

Thomson (1958) stated that weighing the food was the only reliable method of determining intake. The accuracy of weighing also was extolled by Trulson and McCann (1959), but they cautioned that this method appeared to alter food intake. Eppright et al. (1952) noted the impracticality of asking subjects to weigh their food in a mass study. Recording the diet in household measures and translating these into weights were regarded as an

acceptable method by Leitch and Aitken (1950). The plausibility of recording food intake in household measures also was noted by Eppright et al. (1952). However, in comparing the results of weighed and estimated servings, they found that the mean of the estimated diets exceeded that of the weighed diets. The differences were significant at the 5% level for calories, protein, calcium, vitamin A and riboflavin and at the 1% level for fats.

Among other variables found in the daily record method was the frequency of collection of the dietary records. Guthrie (1964), in her survey of 9- to 24-month-old infants, reported a higher ascorbic acid intake when records were picked up weekly rather than daily. However, she noted no other differences in nutrient intake.

Dietary Intake of Preschool Children

Recent Investigations. Dietary studies of preschool children are few, but they do give an indication of the range of intake of specific nutrients. Six studies will be discussed with regard to the number of children surveyed, the method of dietary investigation used and the other criteria employed in the evaluation of nutritional status.

Boston, Massachusetts. In 1932 the Department of Maternal and Child Health of the Harvard School of Public Health began longitudinal studies of children from birth to 18 years of age. Burke et al. (1959) reported on the calorie and protein consumption of 125 children participating in this study. The interview method used was an annual or semi-annual dietary history with a

cross-check of specific foods and food groups. Body measurements, roentgenograms of several areas, pediatric, orthopedic and dental evaluations and hemoglobin determinations also were included in this survey (Stuart et al., 1958).

Columbus, Ohio. Metheny et al. (1962) investigated the dietary intake of 87 children from 2½ to 5½ years of age who were enrolled in day-care centers and nursery schools in Columbus. Three-day food intake records were kept of the children at school and at home.

Denver, Colorado. Beal (1953, 1954, 1955, 1956, 1961, 1965) reported the dietary intake of upper middle class children who were participating in the Child Research Council study of growth and development. The number of children increased from 46 to 64 as the study progressed. Quarterly detailed histories checked by 4-day food records provided the data on food consumption during the first 5 years of life. Physical examinations and determinations of growth patterns as previously described are part of the continuing investigation.

Detroit, Michigan. Calorie intake of 10 healthy 4- to 9-year-old children was determined during 45 consecutive 5-day balance periods by Macy and Hunscher (1951). Comprehensive investigations of visible and invisible growth and analyses of urine, feces and blood also were conducted.

Groton Township, New York. Dietary information on 78 boys and 61 girls from 1 to 6 years of age was included in the data from a nutritional study of Groton Township, New York, conducted by staff of Cornell University (Young and Pilcher, 1950).

Nutrient intake was determined from family food records kept for one week in the spring and fall and from individual records kept for one mid-week day in the fall. Blood analysis and physical findings also were included in the evaluation of nutritional status.

Iowa City, Iowa. Numerous 3-day records of 51 children from 1 to 4 years of age and 2 or 3 consecutive 5-day records on 67 youngsters from 4 to 11 years of age were kept by the nursing staff and students of the Department of Pediatrics at the State University of Iowa in a study of protein requirements for children (Stearns et al., 1958). Most of the subjects under 2 years of age were children of staff members while the other children were from a local orphanage. They stayed in a separate ward in the hospital during the study. In addition to dietary records, urinary creatinine determinations were made.

Comparison with Recommended Dietary Allowance. Some comparison with the RDA was made in all the surveys mentioned. In the Groton Township study, the mean nutrient intake for different ages and sexes was listed, but the intake of the preschool children was not discussed (Young et al., 1950).

Over-all Intake. The nutrient intake of the majority of children in the Denver study equalled or exceeded the RDA (Beal, 1953, 1954, 1955, 1956). Niacin and iron were the exceptions, with only 25% of the children meeting the recommendation. Of the 87 preschool children surveyed in Columbus, 21% met the RDA for all nutrients, 61% had diets meeting 67 to 100% of the RDA and the remaining 18% consumed a diet containing at least one

nutrient which fell below 67% of the RDA (Metheny et al., 1962). The younger children in the Groton Township study had the most adequate diets of any age group studied when compared with the RDA (Young and Pilcher, 1950).

Food Energy. The mean calorie intake of 46 Denver children showed relatively close agreement with the RDA. Beal (1953) found that intake of calories, carbohydrate and fat increased from birth to 5 years of age with a rapid increase in calorie consumption for the first 12 to 18 months followed by a slight increase to 3 or 4 years when the intake again accelerated. In the Detroit study of 10 children, Macy and Hunscher (1951) reported that the average calorie intake ranged from 95 to 113% of the RDA. From these data the investigators concluded that objections to the RDA as being unnecessarily high might not be justified. When calorie intake was related to growth in this study, it was found that as few as 10 calories per kilogram of body weight could make a difference in satisfactory weight gain. Metheny et al. (1962) reported that only 60% of the Columbus children met the RDA for calories. In the Boston study, the average calorie intake of the children under 6 exceeded the recommendations of the NRC (Burke et al., 1959). Stearns et al. (1958) found that the mean calorie intake of the children in Iowa City was similar to that of the RDA.

Protein. Median protein intake of the Denver children was higher than the RDA during the first year with a plateau being reached between 18 months and 3 years (Beal, 1953). From 3 to 5 years, the median intake was similar to that recommended by the

NRC. In Columbus, 89% of the preschool children surveyed met the RDA for protein (Metheny et al., 1962). Among the Iowa City children investigated by Stearns et al. (1958), the mean protein intake was well above that of the RDA. Burke et al. (1959) also found that the protein intake in the Boston survey exceeded the NRC recommendations.

Calcium. Data from 58 children in the Denver study showed that calcium intake rose steadily from birth to 9 months, then fell to the lowest level between 2 and 3 years and accelerated again to reach the RDA level of 1.0 gm at 5 years (Beal, 1954). Forty percent of the Columbus children fell below the allowance for calcium (Metheny et al., 1962).

Iron. Only about 50% of the preschoolers in the Columbus study met the RDA for iron, making it the least well supplied nutrient (Metheny et al., 1962). More than 75% of the children from 2½ to 5 years of age in the Denver study fell below the RDA. The fact that the children had generally satisfactory levels of hemoglobin and erythrocytes led Beal (1954) to postulate that they might be consuming an adequate amount of iron. A decline in iron intake was observed after one year of age as the use of table food was introduced.

Vitamin A. Nearly all of the Columbus children met the RDA for vitamin A (Metheny et al., 1962). After 3 months of age, over 75% of 64 Denver children consumed more vitamin A than the NRC recommended (Beal, 1956). Intake was divided between animal and plant sources with a relatively constant intake of animal vitamin A consumed at all ages. Intake of vitamin A from plant

sources showed more fluctuation with a decline during the second and third years followed by an increase.

Thiamine. Slightly more than one-half of the Denver children from 1 to 5 years met the RDA for thiamine (Beal, 1955). The pattern of intake remained the same from 15 months to 3 years and increased steadily after that. Only 59% of the Ohio children met the RDA making this nutrient one of the least well supplied (Metheny et al., 1962).

Riboflavin. After a rise in the first year, riboflavin intake by the Denver children decreased during the second and third years (Beal, 1955). From ages 3 to 5, 75% of the children had a riboflavin intake greater than that recommended by the NRC. Ninety-five percent of the children investigated by Metheny et al. (1962) met the RDA and none of the children fell below the 67% level.

Niacin. The greatest contrast between the Columbus and Denver studies was found in niacin intake. Metheny et al. (1962) reported that 97% of the Columbus children met the RDA for niacin; this percentage was exceeded only by that of vitamin A. Only 25% of 63 Denver children met the recommendation of the NRC; however, Beal (1955) explained that no evidence of an inadequacy was observed in growth rate or deficiency symptoms. Undoubtedly one explanation for this difference is the change in NRC recommendation for niacin. In the 1958 revision of the RDA, niacin was broadened to include tryptophan, a precursor of niacin. By these new standards, undoubtedly a larger percentage of children in the Denver study would have met the RDA.

Ascorbic Acid. After the first year, the dietary intake of ascorbic acid of approximately 75% of the Denver children met the RDA. Beal (1956) termed the consistency of intake of each child during the first 5 years as remarkable. Eighty-five percent of the Columbus children met the RDA; however, 8% fell below the 67% mark even though some of the children received orange juice at school.

Age and Sex Differences. No distinction in recommended dietary allowance for boys and girls below 9 years of age is made by the NRC. Beal (1953) cited a difference in calorie intake between the boys and girls in her study, but details were not given. She did report that after 2 years of age, the mean of the girls was lower than that of the boys. For calcium, there was a sex difference from 6 to 15 months of age, with the boys having a higher intake (Beal, 1954). The sex difference in protein intake was not apparent until after 18 months (Beal, 1961). In the Groton Township study (Young et al., 1950), the mean intake for all nutrients for boys 4 to 6 years of age exceeded that for the girls. In the younger children, the median intake of the boys was higher than that of the girls except for calories, protein, vitamin A and niacin.

Socioeconomic Differences. Metheny et al. (1962) classified incomes into 4 levels and found that 100% of the Columbus children, whose families had incomes in the $5,501 to $7,250 category, had good diets. The remaining percentages ranged from 72 in the lowest level to 81 in the highest level. In the Groton Township study, Wilhelmy et al. (1950) found no relationship between

income and nutrient intake; they explained that the high level of income may have obscured any relationship.

Interrelationship of Nutrients

Interrelationships among certain nutrients may be expected since many foods are rich in more than one nutrient. Most of the similarities noted in the literature were among protein, iron and the B-vitamins. In discussing the nutritive value found in the diets of Iowa school children, Eppright et al. (1954) noted that thiamine, riboflavin and niacin could be estimated from the mean daily protein intake. Food energy intake showed a trend which was strikingly similar to that of protein and B-complex vitamins. Stevens et al. (1963) did not include data on the B-vitamins and iron in their discussion of dietary intake of 5 groups of adults because of the belief that level of protein intake could serve as an index for these nutrients. Swanson et al. (1959) stated that protein intake was a satisfactory index of the adequacy of thiamine, riboflavin, niacin and iron intake but was not satisfactory for calcium, ascorbic acid and vitamin A.

The mean daily intake of thiamine, riboflavin, niacin, iron and calcium was highly related to the mean daily intake of protein for Iowa, Kansas and Ohio school children (Marlatt et al., 1956). The average daily intake of thiamine was found to be more highly related to the average caloric intake than were any of the other nutrients. Riboflavin intake was significantly related to calcium intake as well as to protein intake.

Beal (1954) noted the sharp contrast between the accelerated intake pattern of calories, the rather stationary level of protein and the decreasing intake of calcium and iron. The configuration of the thiamine intake curve was similar to that of protein with both showing a plateau from 15 months to 3 years. Riboflavin showed the same decrease during the second and third years that calcium did.

Nutrition Knowledge and Practices of the Homemaker

Nutrition knowledge and practices are frequently ascertained through the use of open-end-type questionnaires. Questions used in a study conducted in Syracuse and Rochester, New York, concerned balanced diets, the Basic Seven, food value of specific items and foods needed daily (Young et al., 1956a). The homemakers gave correct answers to the questions far more often than they could give reasons for their answers. This prompted the conclusion that the greatest need in nutritional knowledge was an understanding of the basic value of each food. Age was an important factor in relative nutrition knowledge in this study. Homemakers under 40 knew considerably more than the middle-aged group, who in turn knew more than those over 60. In practice the New York homemakers fed their families better than their theoretical knowledge would indicate though the weakest areas in both practice and knowledge concerned citrus fruits, tomatoes and cabbage; green, leafy and yellow vegetables; and milk, cheese and ice cream (Young et al., 1956b).

In a survey of 17 Kansas homemakers with preschool children, Jordan (1962) found that an understanding of why a particular food was essential for family meals was lacking. However, the majority of homemakers were able to name substitutes for food items. In this study, no relationship was evident between educational level and nutrition knowledge. Homemakers with higher nutrition knowledge scores purchased food items belonging to the milk, cheese and ice cream group and to the potato and other fruits and vegetables group more frequently than did those with lower scores.

PROCEDURE

Selection of Participants

The persons interviewed in this study were homemakers of Riley County, Kansas, who had children between the ages of 1 and 6 years. Names of 41 families receiving Aid to Families with Dependent Children (AFDC) who were listed on the Riley County Welfare roll in April, 1964, and of 16 families with children in the Kansas State University Nursery School (NS) during the summer of 1964 were obtained. Of the AFDC mothers, 19 participated in the study, 2 started records but did not finish them, 10 declined to participate, 7 could not be contacted and 3 were dropped from the welfare roll during the study. Only one of the 16 NS mothers declined to participate in the study. At least one child, but no more than 2 children in each family were selected for subjects of the dietary survey. Where there were more than 2 children, lots were drawn to determine the subjects.

Interview Schedule

The interview schedule was that being developed for the North Central Cooperative Project, NC-75 (Forms I, II, III and IV, Appendix). Form I included information pertaining to characteristics and income of family and weight and height of child. Form II was the record sheet for food eaten by the preschool child with accompanying instructions for recording the food eaten. Form III was a test concerning the homemaker's knowledge of nutrition and Form IV was a test of attitudes toward nutrition and attitude of permissiveness toward the child's eating habits.

The Interview

Interviews were begun on April 30, 1964, and continued through July with homemakers of families receiving AFDC. Since many of the AFDC families did not have phones, the interviews were conducted whenever the homemaker could be found at home. Most of the interviews were conducted during the first 7 days of the month. Only 3 homemakers were interviewed after that period with the last one being on the twelfth day.

Interview appointments were made by phone with the mothers of the NS children. The interviews were conducted from June 11 to July 3, 1964.

First Interview. The first of the 2 interview sessions included: 1) introducing the study and explaining the need for the cooperation of the homemaker; 2) obtaining information for Form I concerning family characteristics; 3) explaining the

method of keeping 7-day dietary records for the child and giving a set of measuring cups, measuring spoons, a spatula and a small ruler to the mother to aid in accurate measurement of the food. Arrangements were made with the nursery school staff to provide the mothers of the NS children with the child's food intake at the noon meal for Monday, Tuesday and Wednesday during the week of the survey. When possible the records of the AFDC children were collected daily after the interviewer had checked to assure that the information was complete. A visit on the second day to examine records and answer questions was made to the NS mothers; the completed records were collected at the end of the period.

Second Interview. The second interview, which was conducted at the end of the 7-day dietary record period, included: 1) administering the tests regarding nutrition knowledge and attitude toward nutrition and permissiveness, 2) weighing and measuring the preschool child and 3) obtaining information on family income. At this time, mothers in the AFDC group were asked to record the food intake of their child for 3 days at the end of the month. Of the 19 mothers, only one refused to cooperate. In addition, records were so inadequate on one child that they were not used. The last 3-day record was concluded on July 30, 1964.

Tabulation of Data

The data collected during the interviews were tabulated to categorize the children by sex and age and to determine composition of families, age of mother, education of parents,

employment of mother and family income. Tests of nutrition knowledge, attitude toward nutrition and attitude of permissiveness toward the child's eating habits were scored.

The amount of each food listed in the daily food record was converted to weights by the use of Home and Garden Bulletin No. 72 (Consumer and Food Economics Research Division, ARS, 1964), Food Values of Portions Commonly Used (Bowes and Church, 1963) and Handbook of Food Preparation (American Home Economics Association, 1964). The nutritive value of each food was calculated from food composition tables by Watt and Merrill (1963) and Bowes and Church (1963). Mean daily nutrient intake from food for each child was determined for: 1) food energy, 2) protein, 3) calcium, 4) iron, 5) vitamin A, 6) thiamine, 7) riboflavin, 8) niacin equivalents and 9) ascorbic acid. Since the RDA for niacin includes preformed niacin plus niacin from tryptophan and the food composition tables include only preformed niacin, the amount of tryptophan in the diet was estimated based on an assumed value of 1% tryptophan for the dietary protein (Morgan, 1959). The amount of tryptophan was divided by 60 and included in the niacin equivalent intake value. Mean total daily nutrient intake including food supplements also was calculated for those who took vitamins.

Evaluation of Dietary Data

Individual Nutrients. The mean daily intake of each nutrient in the child's diet was compared with the NRC recommendation

for his age group (Food and Nutrition Board, 1964). The evaluation levels used were:

I - Mean nutrient intake was at least 100% of the NRC Recommended Dietary Allowance.

II - Mean nutrient intake was less than 100% but not less than 67% of the NRC Recommended Dietary Allowance.

III - Mean nutrient intake was less than 67% of the NRC Recommended Dietary Allowance.

Over-all Diet. The mean daily intake of all nutrients of each child was classified according to 3 levels based on the RDA. The levels were essentially the same as those used for the individual nutrients but the evaluation of total intake of the over-all diet reflected the lowest level of adequacy of any one nutrient as follows:

I - Mean intake of all nutrients was at least 100% of the NRC Recommended Dietary Allowance.

II - Mean intake of one or more nutrients was less than 100% but not less than 67% of the NRC Recommended Dietary Allowance.

III - Mean intake of at least one nutrient was less than 67% of the NRC Recommended Dietary Allowance.

Test Scores

Scores from the tests were used to determine whether the mother's nutrition knowledge and attitude toward nutrition and toward permissiveness were reflected in the nutritional adequacy

of the diet of her child. The scores were ranked in the following classifications:

1 - Above 75th percentile.

2 - 50th to 75th percentile.

3 - 25th to 50th percentile.

4 - Below 25th percentile.

Weight and Height of Children

The weight and height of each child were plotted on the growth charts by Jackson and Kelly (1945). The children were grouped into 4 divisions according to their position on the chart.

Weight Divisions.

1 - 84th percentile or above.

2 - Median up to 84th percentile.

3 - 16th percentile up to median.

4 - Below 16th percentile.

Height Divisions.

1 - Mean + 1 SD or above.

2 - Mean up to mean + 1 SD.

3 - Mean - 1 SD up to mean.

4 - Below mean - 1 SD.

RESULTS AND DISCUSSION

Description of Subjects and Their Families

Dietary records were obtained on 49 children from 34 families in Riley County, Kansas, from April 30 to July 30, 1964.

Information concerning household characteristics and nutrition knowledge and attitude was obtained from the children's mothers. The participants were of various racial, ethnic and socioeconomic backgrounds.

Sex and Age of Subjects in Dietary Survey. Twenty-eight of the 49 children participating in the study were members of AFDC families. The remaining 21 subjects, who will be referred to as NS children, included 15 children attending Kansas State University Nursery School and 6 of their siblings. The distribution of the children by group, sex and age is given in Table 1.

TABLE 1

Number of children by group, sex and age

Group	Sex	No.	1 to 3 years of age	3 to 6 years of age
AFDC	Girls	12	5	7
	Boys	16	7	9
NS	Girls	9	1	8
	Boys	12	2	10

Composition of Family. Fifteen of the 19 AFDC families (79%) were female-headed compared with 2 out of 15 NS families (13%). The number of children per family ranged from 1 to 8 with a mean of 3.7 children for the AFDC families. The mean number of children for the NS families was 2.0 with a range from 1 to 4. There were 5 infants under 12 months of age among the AFDC children; there were no infants in the NS families.

Age of Mother. The age range of the mothers is given in Table 2. A correspondingly large percentage of both groups was found in the 21- to 30-year-age bracket with a comparable though smaller percentage in the 31- to 40-year-age group. Two AFDC mothers were in the youngest age group while 2 NS mothers were in the 41-years-or-more category.

TABLE 2

Age of mothers

Group	No.	20 yrs or less		21-30 yrs		31-40 yrs		41 yrs or more	
		No.	%	No.	%	No.	%	No.	%
AFDC	19	2	10	12	63	5	26	0	0
NS	15	0	0	9	60	4	27	2	13

Education of Parents. Sixty percent of the NS mothers had 16 or more years of education while 68% of the AFDC mothers had attained a level of 8 to 11 years (Table 3). In the AFDC group, 6 had completed high school and one was taking some college classes. In the NS group, all but one had gone to college and 9 had received a degree. The educational level of the 4 AFDC fathers was from 8 to 11 years. Among the 13 NS fathers, all had completed college and all but one held advanced degrees or had completed some graduate courses.

Employment of Mother. The majority of the mothers did not work outside the home. Of the AFDC mothers, 3 worked full-time and 2 part-time. Only one of the NS mothers was employed

TABLE 3

Education of mothers

Group	No.	8-11 yrs		12 yrs		13-15 yrs		16 yrs or more	
		No.	%	No.	%	No.	%	No.	%
AFDC	19	13	68	6	32	0	0	0	0
NS	15	0	0	1	7	5	33	9	60

full-time; 2 others worked part-time in connection with their educational pursuits.

Family Income. Annual income before taxes for all AFDC families was below $5000 (Table 4). The 5 families in the $3001 to $5000 category as well as most of the families with incomes below $3000 had another source of income besides AFDC. The majority of NS families received an income over $7000. The family head in 3 of the 4 families in the lowest 2 categories were university students.

TABLE 4

Number of families by group at 5 levels of income

Group	No.	$3000 or below	$3001 to 5000	$5001 to 7000	$7001 to 10,000	Above $10,000
AFDC	19	14	5	0	0	0
NS	15	2	2	0	5	6

Dietary Intake Records

Mean Daily Nutrient Intake. The mean daily nutrient intake for each child was obtained from the 7-day dietary records (Table 25, Appendix). In some instances records for fewer than 7 days were used when it was impossible to obtain records for an entire week. A comparison of mean and range of daily nutrient intake for the 2 age groups of AFDC and NS children is shown in Table 5. The RDA for the 2 age groups also is given.

The mean daily intake of each nutrient was evaluated according to 3 levels of adequacy as specified in the procedure. In Table 5, a number without an underline indicates Level I; single underline, Level II; and double underline, Level III.

The mean daily intake of each group and age division met the RDA for all but 2 nutrients. The mean iron intake of all 4 groups fell below the RDA. In addition, mean intake of both age groups of AFDC children was below the RDA for calcium and of both age groups of NS children for calories.

In regard to range of intake, the high intake for each nutrient exceeded the RDA with the exception of iron for the older NS children and iron and calories for the younger NS children. In general, the low intake of each nutrient except niacin was below the RDA. However, the low protein intake of the younger AFDC and the low protein, calcium, vitamin A and riboflavin intakes of the younger NS children exceeded the RDA.

Adequacy of Children's Diets. The over-all nutrient intake of each child was evaluated according to 3 levels of adequacy as

TABLE 5

Mean and range of daily nutrient intake for AFDC and NS children by age

Group	Range	Food energy	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid
		cal	g	mg	mg	IU	mg	mg	mg	mg
1 to 3 years of age										
AFDC	Mean	1318	49.8	768*	6.2	2396	.70	1.31	16.6	44
	High	1889	76.7	1466	13.1	3905	1.04	2.41	29.0	109
	Low	998	35.4	376	3.7	888	.48	.74	13.0	14
NS	Mean	973	52.7	1290	3.6	4251	.62	2.05	12.9	72
	High	1096	58.2	1523	5.2	5547	.88	2.37	15.5	159
	Low	778	44.7	959	2.0	2776	.47	1.56	11.5	25
RDA		1300	32.0	800	8.0	2000	.50	.80	9.0	40

TABLE 5 (concl.)

Group	Range	Food energy	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid
		cal	g	mg	mg	IU	mg	mg	mg	mg
3 to 6 years of age										
AFDC	Mean	1642	59.6	732	9.2	3526	.97	1.47	21.2	53
	High	2324	96.7	1425	13.9	5959	1.40	2.39	29.9	92
	Low	1107	37.9	413	5.1	1286	.46	.76	12.9	17
NS	Mean	1428	52.1	918	6.7	3975	.82	1.61	17.0	86
	High	1908	68.1	1760	9.6	7486	1.15	2.98	21.6	335
	Low	1047	31.9	497	5.0	1849	.52	.88	11.5	29
RDA		1600	40.0	800	10.0	2500	.60	1.00	11.0	50

* Number without underline indicates Level I; single underline, Level II; and double underline, Level III.

specified in the procedure. The number of children by group, sex and age at 3 levels of adequacy is shown in Table 6. The majority of children is concentrated in Levels II and III. There is a greater distribution of AFDC children than NS children among the various categories. The differences in levels of adequacy between boys and girls weremuch more striking among the NS children than among the AFDC children. Over one-half of the NS boys were in Level II while all but one of the NS girls were in Level III. In Table 7, each of the 3 characteristics of group, sex and age is considered separately in grouping the children in the 3 levels of adequacy.

TABLE 6

Number of children by group, sex and age at 3 levels of adequacy

Group	Sex	No.	Level I		Level II		Level III	
			1-3 yrs	3-6 yrs	1-3 yrs	3-6 yrs	1-3 yrs	3-6 yrs
AFDC								
	Girls	12	0	1	3	4	2	2
	Boys	16	0	1	2	6	5	2
NS								
	Girls	9	0	0	0	1	1	7
	Boys	12	0	0	0	7	2	3

Group Differences. Two of the 28 AFDC children (7%) were classified in Level I but none of the NS children fell in this category (Table 7). Fifty-four percent of the AFDC children and 38% of the NS children were included in Level II. More than one-third of the AFDC children and nearly two-thirds of the NS

children fell in Level III. Combining both groups, 4% were classified in Level I, 47% in Level II and 49% in Level III. This contrasts sharply with the Columbus study of 87 preschool children by Metheny et al. (1962) who classed 21, 61 and 18% of the children in Levels I, II and III, respectively. In their study, some of the children ate both breakfast and lunch at the day-care center. All of the NS children in the current study ate lunch at the nursery school for 3 days during the survey.

Sex Differences. The difference in adequacy based on sex classification was not as great as between group and age divisions, but the majority of the boys did fall in the higher 2 divisions (Table 7). Fifty-seven percent of the girls were classified in Level III.

TABLE 7

Number and percentage of children by group, by sex and by age at 3 levels of adequacy

Division	No.	Level I		Level II		Level III	
		No.	%	No.	%	No.	%
Group							
AFDC	28	2	7	15	54	11	39
NS	21	0	0	8	38	13	62
Sex							
Girls	21	1	5	8	38	12	57
Boys	28	1	4	15	54	12	43
Age (yrs)							
1-3	15	0	0	5	33	10	67
3-6	34	2	6	18	53	14	41
Total	49	2	4	23	47	24	49

Age Differences. Dividing all the children into 2 age groups, the 3- to 6-year-old children had better nutrient intake than the 1- to 3-year-old children (Table 7). Fifty-nine percent of the older children consumed diets classified in Level II or above while 67% of the younger children fell into the lowest category.

Evaluation of Nutrient Intake with RDA. The number of nutrients that fell below 100 and 67% of the RDA was determined for each child. The percentage of diets that were classified in the 3 levels of adequacy also was calculated.

Number of Nutrients below 100% of the RDA. The distribution of children by number of nutrients that did not meet 100% of the RDA (Levels II and III) is given in Table 8. With the exception of the NS boys, the majority of children was below 100% in 3 or more nutrients with one girl in each group having an intake below 100% in 7 nutrients. Six children in the AFDC group were below 100% in 5 or more nutrients compared with 2 children in the NS group.

TABLE 8

Number of children by group and age with diets that were below 100% of the RDA in 1 to 7 nutrients

Group	Sex	No.	Number of nutrients below 100% of the RDA						
			1	2	3	4	5	6	7
AFDC									
	Girls	11	3	2	2	2	0	1	1
	Boys	15	5	2	3	1	2	2	0
NS									
	Girls	9	0	1	5	1	1	0	1
	Boys	12	2	6	3	1	0	0	0

Table 9 shows the number of nutrients in which the children fell below 67% of the RDA (Level III). One AFDC boy had 4 nutrients falling in this category. The majority of AFDC children referred to in this table was below 67% of the RDA in 2 nutrients while 8 of the 13 NS youngsters fell below the 67% level in one nutrient.

TABLE 9

Number of children by group and age with diets that were below 67% of the RDA in 1 to 4 nutrients

Group	Sex	No.	Number of nutrients below 67% of the RDA			
			1	2	3	4
AFDC						
	Girls	4	1	2	1	0
	Boys	7	1	4	1	1
NS						
	Girls	8	5	3	0	0
	Boys	5	3	1	1	0

Nutrients at 3 Levels of Adequacy. The percentage of children's diets supplying nutrients at 3 levels of adequacy is given in Table 10. Niacin was the most adequately supplied nutrient by NRC standards with the diets of all the children meeting the 100% level. Ninety-six percent of the AFDC children met the recommendation for protein, 89% met the RDA for thiamine and riboflavin and 75% consumed the recommended amount of vitamin A. These same nutrients were the most adequately supplied in the diets of the NS children with vitamin A and riboflavin recommendations being met by a slightly larger percentage than were the allowances for protein and thiamine. A similar pattern was found

TABLE 10

Percentage of children's diets supplying nutrients at 3 levels of adequacy

Group	Level	Food energy	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid
AFDC	I	43	96	32	35	75	89	89	100	61
	II	57	4	46	32	18	11	11	0	14
	III	0	0	21	32	7	0	0	0	25
NS	I	14	90	62	0	95	90	95	100	67
	II	76	10	29	38	5	10	5	0	24
	III	10	0	10	62	0	0	0	0	10

by Metheny et al. (1962) except that thiamine was not one of the better supplied nutrients.

Iron was the least adequately supplied nutrient in both groups with 32% of the AFDC children and 62% of the NS children falling in Level III. Over one-third of the AFDC children but none of the NS children were classified in Level I for iron intake. In the Denver study by Beal (1954, 1955) the RDA for iron and niacin was met by only 25% of the children making these nutrients the least well supplied.

A slightly smaller percentage of the AFDC children was included in Level I for calcium than for iron but the percentage in Level III also was lower. Sixty-two percent of the NS children met the RDA for calcium.

Calorie intake was more adequate among the AFDC children than among the NS children with 43% of the former group falling into Level I and the remainder falling into Level II. Only 14% of the NS children were classified in Level I and 10% were in Level III. Approximately the same percentage from both groups was in Level I for ascorbic acid intake but more of the AFDC children fell in Level III.

Comparison of Time Periods. The AFDC families received their checks from the Riley County Welfare Department at the first of the month. Since this money had to last for an entire month, the question arose as to whether food consumption at the end of the month might be less than at the beginning. Therefore, in addition to the 7-day food record obtained at the beginning of the month, a 3-day record was obtained at the end of the month

for all but 3 of the AFDC children. The individual mean intake for each child for the 3-day period is given in Table 26 (Appendix).

A comparison of mean daily nutrient intake for the 2 periods for 25 AFDC children is given in Table 11. Since 3 children did not have 3-day records, their intake was excluded in calculating the 7-day means in this table. In general, the girls of both age groups had a higher level of nutrient intake at the beginning of the month while the reverse was true for the boys. Of all the nutrients, the intake of thiamine appeared to be the most consistent during the 2 periods. Ascorbic acid had the greatest variation within the 2 periods with a 94% greater intake for the younger girls and a 39% higher intake for the older girls during the earlier period. The younger boys had a 74% higher intake of ascorbic acid during the end-of-the-month period while the older boys had approximately the same intake during each period. Vitamin A intake also showed a sizeable variation with a 22% higher intake for the older boys and over a 40% increase for the younger boys and girls in the later period. During the earlier period only the older girls had a higher intake (35%) of vitamin A.

The number of girls with diets that were below 100% of the RDA was the same in both periods while the number of boys was one less in the later period (Table 12). In comparing the total number of nutrients that fell below 100% of the RDA for the 2 periods, there were fewer nutrients in this category for the 7-day period than for the 3-day period for both boys and girls. The difference was greater for the girls who had 23 nutrients in

TABLE 11

Mean daily nutrient intake of APDC children for 7-* and 3-day periods by age and sex

Sex	Period	No.	Food energy	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid
			cal	g	mg	mg	IU	mg	mg	mg	mg
1 to 3 years of age											
Girls											
	7 day	4	1453	57.0	749	8.0	2848	0.82	1.39	20.5	72
	3 day	4	1389	52.6	676	6.8	4194	0.76	1.34	18.7	37
Boys											
	7 day	6	1296	48.7	882	5.5	1967	0.68	1.38	15.2	27
	3 day	6	1358	48.5	863	6.1	2824	0.71	1.47	15.0	47
3 to 6 years of age											
Girls											
	7 day	6	1550	57.8	694	9.2	3556	0.93	1.45	20.4	57
	3 day	6	1575	56.9	605	8.4	2626	0.86	1.26	20.5	41
Boys											
	7 day	9	1762	63.2	793	9.6	3695	1.04	1.56	22.6	50
	3 day	9	1847	67.3	848	11.1	4514	1.04	1.61	23.1	54

* 7-day means exclude intake of the 3 children for whom there were no 3-day records.

TABLE 12

Number of children by sex with diets that were below 100% of the RDA in 1 to 6 nutrients in 2 time periods

Sex	Period	No.	Number of nutrients below 100% of the RDA					
			1	2	3	4	5	6
Girls								
	7 day	9	3	2	2	1	0	1
	3 day	9	1	1	3	1	3	0
Boys								
	7 day	14	5	2	3	1	2	1
	3 day	13	3	4	0	2	2	2

this category in the 7-day period and 31 in the 3-day period. The 3 children who were not included in the 3-day study and who also were not included in the 7-day data in Table 12 were below the 100% level in 4, 6 and 7 nutrients in the 7-day survey.

The number of children who consumed nutrients below 67% of the RDA is shown in Table 13. Only 2 girls were classified in this group during the 7-day period while 6 were during the 3-day period. The number of boys was the same in each period but the total number of nutrients below 67% of the RDA was slightly higher in the 7-day period.

In general, the girls had better diets at the beginning of the month based on higher mean intake for each nutrient and fewer number of nutrients that fell below 100% of the RDA. On the other hand, the picture was not as clear in regard to the boys' diets. Their mean intake was higher and there were slightly fewer nutrients that fell below 67% of the RDA at the end of the month; however, slightly more nutrients fell below 100% of the RDA during this period.

TABLE 13

Number of children by sex with diets that were below 67% of the RDA in 1 to 4 nutrients in 2 time periods

Sex	Period	No.	Number of nutrients below 67% of the RDA			
			1	2	3	4
Girls						
	7 day	2	0	1	1	0
	3 day	6	3	1	2	0
Boys						
	7 day	6	1	4	0	1
	3 day	6	3	1	2	0

Effect of Supplementation. The main interest in this study was the daily food intake of preschool children. Since vitamin and mineral supplements add to nutrient intake, consideration was given to their effect in raising the nutritional adequacy of the children's diets. The mean daily nutrient intake including supplements for those who took vitamin supplements is given in Table 27 (Appendix). None of the supplements given to the children in this study contained minerals. All but 2 of the supplements contained the 5 vitamins for which there are recommended dietary allowances in amounts 1 to 3.75 times the RDA for the nutrient. The 2 exceptions contained none of the B-complex vitamins and one of these, cod liver oil, contained no ascorbic acid. The number and percentage of families who gave supplements to their children sometime during the year, those who gave supplements to their children during the study and those who did not give supplements are given in Table 14.

TABLE 14

Number and percentage of families giving vitamin supplements to their children

Group	No.	Families giving supplements sometime during the year		Families giving supplements during the study		Families not giving supplements	
		No.	%	No.	%	No.	%
AFDC	19	10	53	4	26	9	47
NS	15	11	73	9	60	4	27

Only 4 AFDC families used vitamin supplements during the study. For the 5 children from these 4 AFDC families receiving a supplement, the level of adequacy was improved for vitamin A and ascorbic acid. One child moved from Level III to Level I in regard to ascorbic acid intake but remained classified in Level III for over-all dietary adequacy because calcium and iron intakes were below 67% of the RDA. None of the 5 AFDC children taking a supplement moved into a group with a higher level of adequacy because of Level III intake of other nutrients.

The lack of improvement in dietary adequacy from vitamin supplements also was true for the 13 children from the 9 NS families who used supplements. In 8 cases, no benefit was realized from the supplement because the children were consuming diets which exceeded the RDA for the 5 vitamins. Since the niacin intake of all the children was higher than the recommendation, no dietary improvement was gained from supplementing with niacin. Three children raised their level of adequacy for ascorbic acid, one from Level II to I and 2 from Level III to I.

Two children benefited from additions of thiamine, one from vitamin A and one from riboflavin.

While some improvement in nutrient adequacy was realized from the use of vitamin supplements, no over-all benefit was gained because other nutrients fell below the RDA. Since 53% of the AFDC families and 73% of the NS families used supplements sometime during the year, the value of supplementation may have been overrated by the mothers thus providing a feeling of false security that nutritional requirements were being met.

Comparison of the Diets of Siblings. There were 15 pairs of siblings in this study, 9 from AFDC families and 6 from NS families. Both children in each family were classified at the same level of adequacy for their over-all diet with the exception of one pair of AFDC siblings and one pair of NS siblings. One of the AFDC children had a dietary classification in Level I while her younger sister was classified in Level II because her diet was below the RDA in one nutrient. The NS pair was below the RDA in 3 nutrients each, but the younger sister was in Level III for 2 of them.

A comparison between siblings based on the number of nutrients that did not meet 100% of the RDA showed more variation than did the comparison of over-all dietary adequacy. The differences can be noted by comparing the data in Table 25 (Appendix) for children in the same family, i.e., 1a and 1b. Two pairs of siblings were below 100% of the RDA for the same nutrients at the same level of adequacy while 2 other pairs were below the recommendation in the same nutrients but at different levels of

adequacy. However, a majority of the children differed from their sibling in 1 to 3 nutrients which fell below 100% of the RDA. The number of pairs differing in one nutrient was 6; 2 nutrients, 2; and 3 nutrients, 3. This difference suggests that consumption within a family was not as consistent as the similarity in dietary levels indicated.

Interrelationship of Nutrients. Relationships among various nutrients can be expected in the normal diet. To investigate the relationships that existed in this study between pairs of nutrients, the percentage of children with intake for 2 nutrients at the same level of adequacy was calculated (Table 15). The "level of adequacy of intake" will be referred to as the "level of intake" in the following discussion. Information regarding relationships among 3 or more nutrients can be found in Table 25 (Appendix).

A relationship of thiamine, riboflavin and niacin with calories would be expected since their recommended intake is based on the recommended calorie intake. This relationship was greater for the AFDC children than for the NS children; however, even for them the highest percentage was only 54% for both thiamine and riboflavin. Marlatt et al. (1956) found that thiamine was the most highly related nutrient to food energy but in this study only 39% of the children had the same level of intake of calories and thiamine.

Calories and iron were among the least well supplied nutrients. Eighteen of the 21 NS children did not meet the RDA for calories and they also were below the recommendation for iron.

TABLE 15

Percentage of children with the same level of adequacy of intake for different nutrients

Nutrients	Protein	Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid
Food energy								
AFDC	46	46	46	61	54	54	43	43
NS	24	38	38	19	19	19	14	33
Total	37	43	43	43	39	39	31	39
Protein								
AFDC		32	36	79	93	93	96	57
NS		67	0	95	90	95	90	62
Total		47	20	86	92	94	94	59
Calcium								
AFDC			32	32	39	32	32	32
NS			19	67	62	62	62	43
Total			26	47	49	45	45	37
Iron								
AFDC				50	36	39	36	64
NS				0	0	0	0	19
Total				29	20	22	20	45

TABLE 15 (concl.)

Nutrients	Protein	Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid
Vitamin A								
AFDC					75	86	75	64
NS					95	90	95	67
Total					84	88	84	65
Thiamine								
AFDC						86	89	54
NS						86	90	67
Total						86	90	59
Riboflavin								
AFDC							89	57
NS							95	62
Total							92	59
Niacin equiv.								
AFDC								61
NS								67
Total								63

Sixteen of the 29 AFDC children fell short of the calorie recommendation and 14 of them also were below the RDA for iron.

Protein, thiamine, riboflavin and niacin were 4 of the most adequately supplied nutrients in this study with 86% of the NS children and 82% of the AFDC children meeting the recommended intake for all 4 nutrients. This similarity in adequacy agreed with findings by various workers (Eppright et al., 1954; Stevens et al., 1963; Swanson et al., 1959 and Marlatt et al., 1956). However, contrary to findings by these same investigators, there was little relationship found between protein and iron with only 20% of the children having similar levels of intake for the 2 nutrients.

Ninety-five percent of the NS children and 79% of the AFDC children had the same level of intake for protein and vitamin A. This similarity in adequacy suggests the importance of animal sources of vitamin A. This importance was further indicated by the percentage of children (47%) who had similar levels of intake of calcium and vitamin A. Only 8 children did not meet the RDA for vitamin A. These 8 children also were below the recommendation for calories which suggests that the recommended intake of vitamin A is dependent upon calorie intake.

A relationship between calcium and riboflavin intake was found by Beal (1954) and Marlatt et al. (1956) but the relationship in the present study is not clear. The calcium recommendation was met by a much smaller percentage of children than was the riboflavin recommendation; however, 45% of the children had the same level of intake of both nutrients. The percentage with

the same level of intake for calcium and riboflavin was higher for the NS children than for the AFDC children and the percentage of NS children meeting the recommended intake for calcium was almost double that of the AFDC children. The relationship between calcium and riboflavin intake was more apparent when the dietary adequacy of the children was high.

An inverse relationship was found between iron and calcium. The explanation for this may be that there is only a trace of iron in milk. All of the 13 NS children who met the RDA for calcium were below the recommendation for iron. Seven of the AFDC children met the recommendation for calcium but not for iron and 8 others met the RDA for iron but not for calcium. Only 19% of the NS children and 32% of the AFDC children had the same level of intake of calcium and iron.

When calories were considered in relationship to calcium and iron, the pattern changed. The 8 NS children who did not meet the RDA for calcium also were below the recommendation for calories and iron. Nine of the AFDC children who were below the recommendation for calcium and iron also were below the RDA for calories. The 2 children who were classified in Level I for all nutrients had a calorie consumption 35 and 41% above the RDA. This indicated that the intake of calories has an important influence on the level of intake of calcium and iron and may change their relationship.

Relationship between Adequacy of Child's Diet and Family Income

In most of the studies of preschool children that were discussed previously, either no comparison was made between level of family income and level of dietary adequacy of the child or else the income level was so high that any relationship was obscured. Metheny et al. (1962) did report that the percentage of children who had good diets was greater in families receiving over $5,500 annual income than for those in families receiving a lesser amount.

In studying the relationship that existed in this survey, the number of the AFDC and NS children by level of dietary adequacy and level of family income was determined (Table 16). The income of all of the AFDC families was under $5000. The range in income for the NS families was broader with the majority being above $7000.

TABLE 16

Number of children by group, level of dietary adequacy and family income

Group	Level	No.	Family income				
			$3000 or below	$3001 to 5000	$5001 to 7000	$7001 to 10,000	Over $10,000
AFDC	I	2	2	0	0	0	0
	II	15	9	6	0	0	0
	III	11	11	0	0	0	0
NS	I	0	0	0	0	0	0
	II	8	3	1	0	2	2
	III	13	0	1	0	5	7

All of the families of AFDC children classified in Levels I and III for dietary adequacy received less than $3000 annual income. Nine of the children in Level II were from families receiving less than $3000 with the family income for the remainder of the children at this level being from $3001 to $5000.

All but 2 of the NS children whose family received over $10,000 annual income were classified in Level III for dietary adequacy and 5 of the 7 children from families in the second highest income category were in the lowest level of dietary adequacy. The children from the families in the $3000-or-below category fell in Level II.

These data would indicate an inverse relationship between family income and dietary adequacy of the child.

Weight and Height Status

Comparison of Children's Weight and Height with Jackson and Kelly Standard. The weights and heights of all children were plotted on the growth charts developed by Jackson and Kelly (1945) for boys and girls (Figs. 1 and 2). Tables 17 and 18 show the number and percentage of the children in each of the 4 divisions on the charts.

Weight. The children were distributed more evenly in the divisions of the weight scale than of the height scale. The tendency to concentrate in the 2 middle sections was true of all the children collectively as well as when they were divided into group and sex. The AFDC children were equally divided by the median while slightly over one-half of the NS children fell on the lighter side.

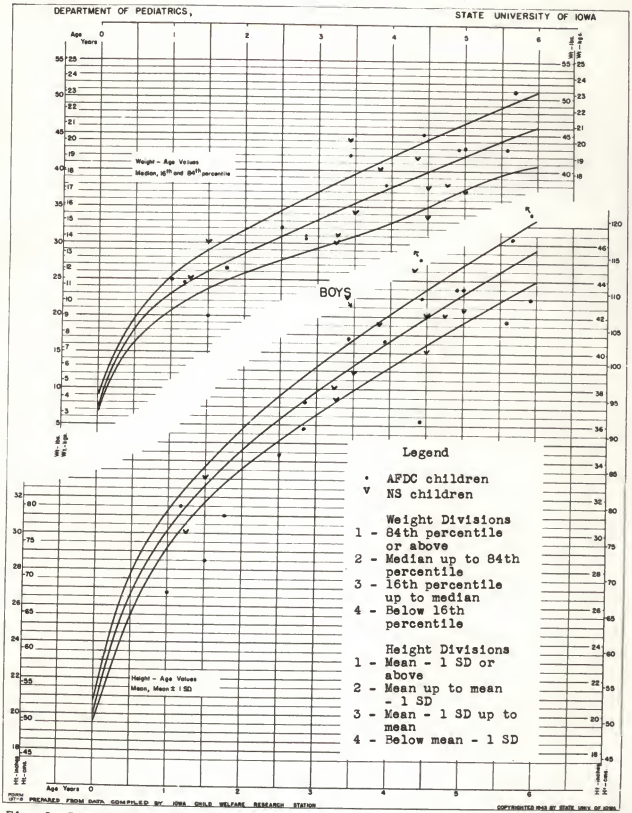

Fig. 1 Distribution of AFDC and NS boys on Jackson and Kelly growth chart.

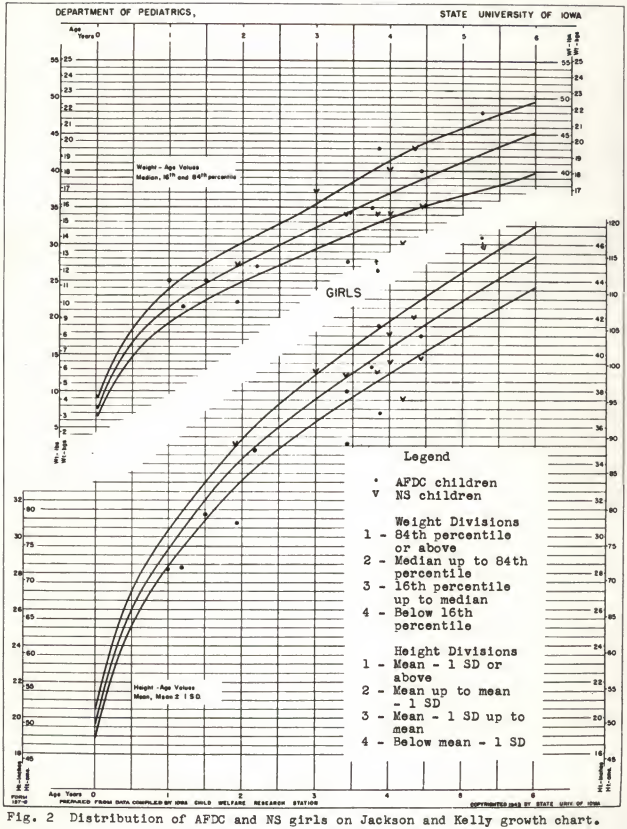

Fig. 2 Distribution of AFDC and NS girls on Jackson and Kelly growth chart.

TABLE 17

Number and percentage of children by group and sex according to distribution by weight on Jackson and Kelly growth chart

Group	Sex	No.	Position on Jackson and Kelly growth chart							
			1		2		3		4	
			No.	%	No.	%	No.	%	No.	%
AFDC										
	Girls	12	3	25	2	17	4	33	3	25
	Boys	16	3	19	6	38	4	25	3	19
	Total	28	6	21	8	29	8	29	6	21
NS										
	Girls	9	1	11	3	33	4	44	1	11
	Boys	12	2	17	3	25	4	33	3	25
	Total	21	3	14	6	29	8	38	4	19
Total		49	9	18	14	29	16	33	10	20

Height. Over 60% of the children fell below the mean height of the Jackson and Kelly standard; 35% were in the shortest division. For AFDC children, almost 50% were in the shortest category with only 11% in the tallest division. The majority of the NS children were concentrated in the 2 middle divisions with the same percentage, 19, in the 2 extreme positions. On the whole, the NS boys and girls were distributed more evenly among the 4 divisions. The AFDC girls were concentrated in the 2 lowest categories and the AFDC boys predominated in the second and fourth divisions.

In general, the children were slightly lighter and slightly shorter than the Jackson and Kelly standard. The NS children were taller than the AFDC children and were slightly lighter in weight.

TABLE 18

Number and percentage of children by group and sex according to distribution by height on Jackson and Kelly growth chart

Group	Sex	No.	Position on Jackson and Kelly growth chart							
			1		2		3		4	
			No.	%	No.	%	No.	%	No.	%
AFDC										
	Girls	12	2	17	0	0	5	42	5	42
	Boys	16	1	6	6	38	1	6	8	50
	Total	28	3	11	6	21	6	21	13	46
NS										
	Girls	9	2	22	3	33	2	22	2	22
	Boys	12	2	17	3	25	5	42	2	17
	Total	21	4	19	6	29	7	33	4	19
Total		49	7	14	12	24	13	26	17	35

Relationship of Dietary Adequacy to Weight and Height. In determining whether any relationship existed between dietary adequacy and physical measurements, the percentages of children in 3 levels of dietary adequacy at 4 divisions of weight and height were compared. The weight, height and age to the nearest month of all the children are listed in Table 28 (Appendix). The position on the growth chart, with 1 being the tallest or heaviest division and 4 being the shortest or lightest division, also are given. These data, as summarized in Tables 19 and 20, show the percentage of children in each of the 4 weight and height categories at each of the 3 levels of dietary adequacy.

Weight. With only 2 children classified in Level I of dietary adequacy, no relationship at this level can be seen with

weight. Sixty percent of the children in Level II were equally divided between the 2 highest categories. In Level III, 67% of the youngsters were in the lower half of the scale while only 8% were in the heaviest division. A relationship appeared to exist between weight and dietary adequacy in that the majority of children at Level II was in the 2 highest categories while the majority in Level III was in the 2 lowest ones.

TABLE 19

Percentage of children in 3 levels of dietary adequacy at 4 weight divisions

Dietary level	No.	Weight divisions			
		1	2	3	4
I	2	0	50	50	0
II	23	30	30	17	22
III	24	8	25	46	21

Height. In Level II, the children were scattered in the 4 height divisions with similar concentrations above and below the mean. Forty-two percent of the children in Level III were in division 4 and over two-thirds were concentrated in the lower half of the scale. This would suggest that a relationship exists between lower dietary adequacy and shorter height.

TABLE 20

Percentage of children in 3 levels of dietary adequacy at 4 height divisions

Dietary level	No.	Height divisions			
		1	2	3	4
I	2	0	50	50	0
II	23	22	26	22	30
III	24	8	21	29	42

Nutrition Knowledge and Attitude Tests

The test scores of nutrition knowledge and attitude were based on the degree of certainty of the answers of the 33 mothers who completed the tests. Eight points were the maximum number given to a correct answer where the highest degree of certainty was indicated followed by 5, 3, 2 and 1 for decreasing degrees of certainty. Where wrong answers were given, the same point scale for the degree of certainty was subtracted from the total score. Where the respondent could not answer a question, as indicated by circling both answers, the score was zero. The scores of the homemakers on the 3 tests and the quartile rank of each score are given in Table 29 (Appendix).

Nutrition Knowledge. In the nutrition knowledge test of 35 statements (Form III, Appendix), the highest possible score was 280. The highest score attained was 205 and the lowest score was -65. There were 5 negative scores. The scores of the 33 mothers were divided into 4 quartiles which are explained in the procedure. The number and percentage of mothers in each group, with

1 indicating the highest quartile and 4 the lowest, is shown in Table 21.

TABLE 21

Number and percentage of mothers classified into 4 quartiles based on nutrition knowledge scores

Group	No.	Quartile							
		1		2		3		4	
		No.	%	No.	%	No.	%	No.	%
AFDC	18	0	0	4	22	6	33	8	44
NS	15	8	53	5	33	2	13	0	0

The NS mothers had better scores than the AFDC mothers on the nutrition knowledge test. All of the scores in the highest division were achieved by NS mothers while all those in the lowest quartile were attained by the AFDC mothers.

Attitude toward Nutrition. The attitude of the homemaker toward nutrition was assessed through the use of questions 2, 3, 5, 6, 7, 10, 12, 13, 14, 15, 17, 19, 20 and 21 in Form IV (Appendix). Based on the 14 questions, the highest score possible was 112. The highest score on this test was 112 and the lowest was 8 indicating that the attitude of the mothers toward nutrition was better than their knowledge. The percentage of AFDC and NS homemakers in the 4 quartiles is given in Table 22.

One AFDC mother scored in the highest division with the remainder in this category being NS mothers. With this exception, the percentages of homemakers classified in the 4 divisions were about the same for both the nutrition knowledge test and the test of attitude toward nutrition.

TABLE 22

Number and percentage of mothers classified into 4 quartiles based on attitude toward nutrition scores

Group	No.	Quartile							
		1		2		3		4	
		No.	%	No.	%	No.	%	No.	%
AFDC	18	1	6	3	17	7	39	7	39
NS	15	7	47	6	40	2	13	0	0

Attitude of Permissiveness toward the Child's Eating Habits. Questions 1, 4, 8, 9, 11, 16 and 18 of Form IV (Appendix) were used to determine the homemaker's attitude of permissiveness toward the child's eating habits. The highest possible score for a favorable attitude of permissiveness was 56 and the lowest possible score, indicating a highly unfavorable attitude, was -56. The scores ranged from 47 to -56 with 21 negative scores. The scores were divided into 4 quartiles and the number and percentage of homemakers in each group are shown in Table 23.

TABLE 23

Number and percentage of mothers classified into 4 quartiles based on attitude of permissiveness toward the child's eating habits scores

Group	No.	Quartile							
		1		2		3		4	
		No.	%	No.	%	No.	%	No.	%
AFDC	18	7	39	3	17	3	17	5	28
NS	15	1	7	6	40	5	33	3	20

A different pattern was apparent in this test than in the other 2 tests in that AFDC mothers predominated in the highest division. Only one NS mother scored in the upper quartile. A larger percentage of AFDC mothers than NS mothers had scores in the lowest quartile but the latter group did not have any scores in division 4 in the other 2 tests. This would suggest a lack of relationship between both scores of nutrition knowledge and attitude toward nutrition and scores on attitude of permissiveness toward the child's eating habits.

Relationship of Dietary Adequacy of Child and Scores of Mother. The relationship between the level of dietary adequacy of the child and the scores of the mother for each test was investigated by calculating the percentage of children at each dietary level and each rank of mothers' scores (Table 24). One of the AFDC children in Level I is not included because there were no test scores for his mother.

Nutrition Knowledge. Only 12% of the children classified in Level III for dietary adequacy were in the lowest quartile for mothers' test scores and over one-half of these children were classified in the top 2 quartiles. Fifty-two percent of the children in Level II were in the lowest 2 quartiles for mothers' test scores.

Attitude toward Nutrition. Sixty-two percent of the children in dietary Level III were in the top 2 quartiles and 61% of those in Level II were in the lower 2 quartiles for mothers' test scores.

TABLE 24

Percentage of children by level of dietary adequacy and ranking of mothers' score on 3 tests

Level	No.	Quartile ranking of mother's score			
		1	2	3	4
		Nutrition Knowledge			
I	1*	0	0	100	0
II	23	17	30	13	39
III	24	33	25	29	12
		Attitude toward Nutrition			
I	1*	0	0	100	0
II	23	22	17	44	17
III	24	29	33	17	21
		Attitude of Permissiveness toward Child's Eating Habits			
I	1*	100	0	0	0
II	23	22	30	22	26
III	24	25	25	29	21

* One child in Level I is not included because there were no test scores for his mother.

Attitude of Permissiveness toward the Child's Eating Habits. The children were distributed evenly among the 4 quartiles of mothers' test scores for Levels II and III of dietary adequacy. It is of interest that the one child in Level I fell in the highest quartile for mothers' score of permissiveness.

From these comparisons there does not seem to be any relationship between level of dietary adequacy of the child and the mother's scores on any of the 3 tests.

SUMMARY

The purpose of this study was to determine the relationship of various factors to the level of dietary adequacy of preschool children from 2 socioeconomic groups. Seven-day records of daily food intake were obtained for 28 AFDC and 21 NS children in 34 families from April 30 to July 30, 1964. The mothers of these children were interviewed regarding family characteristics and income and were tested on nutrition knowledge, attitude toward nutrition and attitude of permissiveness toward the child's eating habits. These factors as well as the sex, age, weight and height of the child were compared to their level of dietary adequacy.

The AFDC children had better diets than the NS children with 7% ranking in Level I, 54% in Level II and 39% in Level III. None of the NS children were classified in Level I, 38% in Level II and 62% in Level III. The boys had slightly better diets than the girls with 58% of the boys in Levels I and II and 57% of the girls in Level III. Dividing the children by ages, nearly 60% of the older children consumed diets classified in Level II or above while 67% of the younger children fell in Level III.

Niacin was the most adequately supplied nutrient by NRC standards closely followed by protein, thiamine and riboflavin. Over one-half of the children met the RDA for vitamin A and ascorbic acid. Iron was the least adequately supplied nutrient with fewer of the NS children than AFDC children meeting the recommendation. Food energy and calcium requirements were met

by less than one-half of the children with the NS children having the lower intake in calories and the AFDC children in calcium.

In addition to the 7-day records of food intake obtained for the AFDC children at the beginning of the month, 3-day records at the end of the month also were collected to determine whether food intake varied within the month. In general, the diets of the girls were better at the beginning of the month and those of the boys at the end of the month.

The majority of NS children and a few AFDC children took vitamin supplements. In investigating the benefit derived from the use of supplements, it was found that the levels of intake for the 5 vitamins was raised considerably but the over-all dietary level of the child was not improved because the level of intake of other nutrients, especially the minerals, was below that of the RDA.

There were 15 pairs of siblings in the study; with only 2 exceptions they were classified in the same level of over-all dietary adequacy. In spite of the similarity in classification, a majority of the children differed from their sibling in 1 to 3 nutrients which fell below the RDA indicating that consumption within a family may not be as consistent as the similarity in dietary levels would suggest.

An investigation was made of relationships among the various nutrients. The relationships among protein, thiamine, riboflavin and niacin were very strong. However, contrary to findings in the literature there was little relationship found between protein and iron. An inverse relationship between iron and calcium was

noted; when the RDA was met for iron, intake fell below the recommendation for calcium and vice versa. This relationship was changed by calorie intake in that when calories were low the intake of iron and calcium also fell below the RDA and when it was high, the recommendation for the 2 nutrients was met. The relationship between calories and each of the other nutrients was not as strong as expected but it was more apparent among the AFDC children where the calorie intake was higher than among the NS children.

An inverse relationship was found between level of family income and dietary adequacy of the child.

In general, the children were slightly lighter and slightly shorter than the standard. The NS children were taller than the AFDC children and weighed slightly less. A positive relationship appeared to exist between weight and dietary adequacy in Levels II and III and between short height and lower dietary adequacy.

The NS mothers scored higher on the tests of nutrition knowledge and attitude toward nutrition whereas the AFDC mothers indicated a somewhat more favorable attitude of permissiveness toward the child's eating habits. No relationship between dietary adequacy of the child and test scores of the mother was apparent.

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APPENDIX

IDENTIFYING INFORMATION

Form I

Head of Household_____ Visits to obtain data:

Street Address_____ Apt.___ 1st: Date____ Time____ a.m. p.m.

City_____ Country_____ 2nd: Date____ Time____ a.m. p.m.

State_____ Phone_____ 3rd: Date____ Time____ a.m. p.m.

1. List all people who live in the household by relationship to head, sex, age, etc.

(a) Relation to head	(b) Sex	(c) Age	(d) Highest year school completed	(e) Occupation	(f) Kind of business or industry	(g) Hours worked per week
1. Head						
2.						
3.						
4.						
5.						
6.						
7.						

2. Were you or your husband or your parents or your husband's parents born in another country? If yes, check and indicate what country.

_____husband where_____
_____wife where_____
_____husband's father where_____
_____husband's mother where_____
_____wife's father where_____
_____wife's mother where_____

3. Do you ever give your child a vitamin or mineral supplement?

_____yes

_____no

If yes, answer the following:

_____Name of supplement

_____How much and how often

_____On whose recommendation

Form I (concl.)

4. From which of the following sources did you or other members of the household receive income during 1963.

Income sources	Year 1963
a. Wages or salaries (after personal, Federal, and State income taxes)	$ _____
b. OASDI (Old Age, Survivors, and Dependents Insurance), Veterans pensions, other retirement pensions, insurance annuities, compensation, dependency allotments	$ _____
c. Unemployment insurance	$ _____
d. Interest, dividends, rents, royalties, etc. (net)	$ _____
e. Regular contributions and gifts from family or friends (include alimony)	$ _____
f. Public assistance: (1) Aid to dependent children and home aid	$ _____
(2) Other (include general assistance, aid to disabled, aid to blind, old age assistance)	$ _____
g. Private agency assistance: _____	$ _____
h. Other income: Roomers, boarders, baby-sitting, and odd jobs _____ _____	$ _____
i. Total	$ _____

5. (a) Child's first name _____

(b) Date of birth _____
month day year

(c) Present weight _____ lb.

(d) Present height _____ in.

Form II

RECORD OF FOOD EATEN BY THE PRESCHOOL CHILD

Day of Week________________ Schedule No.________

Time of Day	Kind of Food Child Eats and Drinks and Description	Amount Cups, Tsp, Tbsp, or Size	Did the Child Eat -- Alone? Yes	If no, with whom	At Home? Yes	If no, where	At a Table? Yes	If no, where

INSTRUCTIONS FOR FORM II

1. Record the time when any food is eaten.
2. Record all food the child eats or drinks for 7 consecutive days.
3. Record amount the child eats or drinks using the following utensils for measurements.
   a) set of "standard" measuring cups
   b) 1 cup liquid measuring cup
   c) set of "standard" measuring spoons
   d) ruler

Record only the amount eaten, not what is left on plate.

Beverages
- list kind of beverages, such as whole milk, chocolate milk
- record by cups (1/4, 1/3, 1/2, 2/3, 3/4, 1) or tbsp.

Breadstuffs
- list kinds of breads or rolls, such as whole wheat, rye, hamburger
- record bread in number or parts of slices
- record rolls by number
- measure and record butter, margarine, jam and other spreads
- enriched or not

Cereals
- list kinds of cereal, such as raisin bran, cornflakes
- measure added milk, cream, or sugar

Cheese
- list kind of cheese, such as cottage, Cheddar
- record cottage cheese by tbsp.
- record Cheddar cheese in slices as 2" x 2" x 1/8" or by ounce or by slice

Desserts
- list kind of dessert, such as apple pie, chocolate pudding
- record puddings and ice cream by cups (1/4, 1/3, 1/2, 2/3, 3/4, 1)
- record cake in inches as 2" x 2" x 2 1/2"
- record cupcakes by diameter as 2 3/4" diameter
- indicate if cake or cupcake is frosted
- record pies in fraction as 1/8 of 8" pie

Eggs
- record number and method of preparation

Fish, Meat and Poultry
- list kind and method of preparation as broiled, fried, roasted
- record in inches as 2" x 3" x 1/4" or 1 wing; 1 drumstick
- record the number of shrimp, scallops, fish sticks wieners, sausages

Fruits and Juices
- list the form (fresh, frozen or canned) and kind of juices
- list the form and kind of fruit
- if fresh fruit, specify if small, medium, large

INSTRUCTIONS FOR FORM II (concl.)

Mixed Foods (Casseroles, Salads) - record amounts of ingredients in recipe

Vegetables - list kind of vegetable, such as broccoli, mashed potatoes with milk and butter added
- record cooked vegetables in cups (1/4, 1/3, 1/2, 2/3, 3/4, 1) or tbsp.
- record raw celery as portion of 1 stalk
- measure added butter and sauces

4. Record where food is eaten, such as home of relative or friend, day-care center, nursery school, restaurant.

EXAMPLES

Kind of Food Child Eats and Drinks and Description	Amount Child Eats (cup, tbsp., tsp., number)
Corn Flakes with sugar whole milk	3/4 cup 1/2 tsp. 1/2 cup
Toasted cheese sandwich	1 slice bread 1 slice processed cheese, 3" x 3" x 3/16" 1 tsp. margarine
Raw apple	1/2 of small apple
Canned peaches	1 peach half 2 tbsp. juice
Fried chicken	1 leg
Roast beef (arm roast)	1 thin slice, 4 1/2" x 2"
Mashed potatoes with milk and butter added	1/4 cup
Gravy on potatoes	1 tbsp.
Raw carrot sticks	4 - 3" long
Cherry pie	1/8 of a 9" pie
Chocolate candy bar (with almonds)	1 - 5 cent bar
Canned pineapple grapefruit juice drink, sugar added	3/4 cup
Tuna noodle casserole 1/4 lb. uncooked noodles 1 - 7 oz. can tuna fish 1 can cream of mushroom soup 1/4 cup crushed potato chips	3/4 cup

Form III

NUTRITION KNOWLEDGE

Directions

Some statements concerning nutrition are given below. Please indicate whether or not you think a statement is true or false. Circle "T" for true and "F" for false.

After you have reached this decision indicate the degree of certainty you have about the answer.

Circle:

1. if you are very confident you have decided correctly
2. if you are almost certain you have decided correctly
3. if you are half certain you have decided correctly
4. if you are not very sure you have decided correctly
5. if you are not sure of your answer but have a guess or hunch

If you are completely unsure of the answer, circle both "T" and "F" but do not circle a degree of certainty.

Please be sure to respond twice to every statement.	True or False	Degree of Certainty
1. Good eating habits are important to health.	T F	1 2 3 4 5
2. In a family, including a father, mother, son 16 years old and an 18 year old daughter, the father should have the largest serving of meat.	T F	1 2 3 4 5
3. Protein-rich foods, such as meat, milk and eggs, provide liberal amounts of several nutrients needed for the growth of small children.	T F	1 2 3 4 5
4. It is better not to include orange juice and milk in the same meal because the orange juice causes the milk to curdle in the stomach.	T F	1 2 3 4 5
5. By the end of the first year babies should have learned to use a variety of foods besides milk, as a one-sided milk diet may be inadequate for total growth and development.	T F	1 2 3 4 5
6. School age children need multiple vitamin pills to ensure good health.	T F	1 2 3 4 5

Form III (cont'd.)

	True or False	Degree of Certainty
7. The term well-balanced when applied to a day's diet means that all of the food groups in the daily plan are included in amounts recommended.	T F	1 2 3 4 5
8. Chemicals now used to bleach flour are harmful to human beings.	T F	1 2 3 4 5
9. Vitamins aid the body in making use of its building and maintenance materials, hence serious vitamin deficiency may affect many parts of the body.	T F	1 2 3 4 5
10. When children have enough food to satisfy their appetites their diets are certain to be nutritionally adequate.	T F	1 2 3 4 5
11. Healthy adults should take food supplements or vitamin pills to ensure having all the nutrients needed for good nutrition.	T F	1 2 3 4 5
12. A good nutritional practice is to eat a wide variety of types of foods from day to day.	T F	1 2 3 4 5
13. Eggs can completely replace milk in the diet so far as nutrients are concerned.	T F	1 2 3 4 5
14. Carbonated beverages are a desirable food item in the diets of young children.	T F	1 2 3 4 5
15. Citrus fruits include strawberries, raspberries and blueberries.	T F	1 2 3 4 5
16. Skim milk contains the same amounts of the body building minerals and protein as whole milk.	T F	1 2 3 4 5
17. No reducing diet should contain bread or potatoes.	T F	1 2 3 4 5
18. A meal consisting of sirloin steak, French fries, head lettuce salad and coffee provides at least one-third of all the nutrients needed daily by adults.	T F	1 2 3 4 5
19. Most fat children and adults have a glandular disturbance.	T F	1 2 3 4 5

Form III (cont'd.)

	True or False	Degree of Certainty
20. Milk is a suitable food mainly for infants and growing children.	T F	1 2 3 4 5
21. Apples are an excellent source of vitamin C.	T F	1 2 3 4 5
22. Foods that taste sour are generally not good for people.	T F	1 2 3 4 5
23. Foods enriched with vitamin D help to ensure the normal development of bones and the prevention of rickets.	T F	1 2 3 4 5
24. Gelatin, or jello, desserts are a good source of protein.	T F	1 2 3 4 5
25. Nuts are hard to digest.	T F	1 2 3 4 5
26. All people should use a low-fat, low-cholesterol diet to prevent heart disease and strokes.	T F	1 2 3 4 5
27. Cheese is constipating.	T F	1 2 3 4 5
28. A glass of lemonade can be substituted for a glass of orange juice so far as the vitamin C in the two products is concerned.	T F	1 2 3 4 5
29. Grape juice is an important source of nutrients which guard against anemia.	T F	1 2 3 4 5
30. If a person eats regularly he should be rated as having good food habits.	T F	1 2 3 4 5
31. The term well-balanced when applied to a meal means only that it is not too starchy or too fat.	T F	1 2 3 4 5
32. The greater the percentage of poly-unsaturated fats in a food the greater the health giving properties of that food.	T F	1 2 3 4 5
33. The four groups of foods in the daily food guide are Dairy Foods, Meats, Citrus Fruits, and Cereals.	T F	1 2 3 4 5

Form III (concl.)

	True or False	Degree of Certainty
34. Healthy, active, young children require some concentrated sweets in their diets each day for energy needs.	T F	1 2 3 4 5
35. Gelatin will help to prevent brittle, chipped fingernails.	T F	1 2 3 4 5

Form IV

ATTITUDE TOWARD NUTRITION AND ATTITUDE OF PERMISSIVENESS TOWARD THE CHILD'S EATING HABITS

Directions

Some statements concerning the nutritional and eating habits of preschool children are given below. We are interested in your judgment of each statement in terms of how well it reflects your attitude. If the statement describes how you feel about your child's nutrition or eating habits, please circle the "A" (agree); if the statement does not describe how you feel, please circle the "D" (disagree).

After you have made the above decision, please indicate the degree of certainty you have about the decision. If you made the decision you must have been at least 50% certain that the statement describes your feelings. Thus, if you are not very confident about your judgment, circle 50%. If you are very confident about your judgment, circle 90%. In general:

circle 50% if at least 50% certain but not as certain as 60%
circle 60% if at least 60% certain but not as certain as 70%
circle 70% if at least 70% certain but not as certain as 80%
circle 80% if at least 80% certain but not as certain as 90%
circle 90% if at least 90% certain

Please be sure to respond twice to every statement, unless you are completely uncertain about your answer. In that case, circle both "A" and "D" but do not circle a degree of certainty. This response indicates you have read the statement but could not decide if it does or does not describe your feelings.

A good way to keep these directions in mind is to imagine you were to respond to the items again. How certain are you that you would again respond just as you did this time?

- - - - - - - - - - -

1. I let the child choose whatever he wants for breakfast.	A D	50	60	70	80	90
2. Children's foods have so many vitamins added that I don't have to bother about nutrition.	A D	50	60	70	80	90
3. I feel my child's nutrition now will be extremely important as he grows older.	A D	50	60	70	80	90
4. As long as the child doesn't pick the same thing constantly, I feel it is all right to let him select his own food.	A D	50	60	70	80	90

Form IV (cont'd.)

5. As long as my child is not sick, I guess I must be feeding him right.	A D	50	60	70	80	90
6. Nutrition is important, and one should not be careless about it.	A D	50	60	70	80	90
7. Even if I give vitamins, I feel that I should be concerned about my child's diet.	A D	50	60	70	80	90
8. Children are more likely to eat well if they select the meat for the meal.	A D	50	60	70	80	90
9. If my child says, "Let's have_____ for lunch," I feel that I should do so.	A D	50	60	70	80	90
10. I feel that if the child drinks milk, I don't have to worry about nutrition.	A D	50	60	70	80	90
11. Because the children are fussy about what they eat, I feel it is necessary to let them pick what they want for meals.	A D	50	60	70	80	90
12. As long as the doctor doesn't say anything to me about nutrition, I don't think I need to worry about it.	A D	50	60	70	80	90
13. I feel that as long as my child is gaining weight I don't have to worry about his nutrition.	A D	50	60	70	80	90
14. I just don't have time to think much about nutrition.	A D	50	60	70	80	90
15. Nutrition is not so important as long as my child eats a lot.	A D	50	60	70	80	90
16. I believe a child should be allowed to choose what he wants for breakfast and lunch, even if it means a little more preparation for me.	A D	50	60	70	80	90
17. I am concerned about getting my child to eat "good" foods throughout the day.	A D	50	60	70	80	90
18. Children should be allowed to eat whatever they want.	A D	50	60	70	80	90

Form IV (concl.)

19. Nutrition is not so important if my child has plenty of liquids.	A D	50	60	70	80	90
20. Young children don't grow correctly when they have improper diets.	A D	50	60	70	80	90
21. I believe that a child should not be permitted to have a diet which is deficient in protein, minerals and vitamins.	A D	50	60	70	80	90

TABLE 25

Mean daily nutritive intake and dietary level of 7-day diets of children by group and age

Child*	Sex	Food energy	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid	Dietary level
		cal	g	mg	mg	IU	mg	mg	mg	mg	
AFDC Group - 1 to 3 years of age											
1a	M	1504	54.3	1053	7.1**	2997	0.78	1.43	16.8	46	II
2a	M	1142	43.0	842	5.2	1342	0.56	1.16	13.5	18	III
3a	F	1889	76.7	778	13.1	2971	1.04	1.56	29.0	109	II
4a	M	1241	40.0	438	6.6	1959	0.59	0.90	14.7	15	III
6a	M	1765	71.1	1425	7.7	3613	0.86	2.35	18.7	38	II
8a	F	1469	57.6	1180	5.5	2575	0.76	1.96	17.0	51	II
9a	F	1054	42.5	547	5.3	3905	0.48	1.07	13.0	61	III
11a	M	1177	35.4	376	4.8	1654	0.59	0.74	13.1	14	III
12a	M	1101	51.5	1055	3.7	2113	0.64	1.58	14.5	26	III
14a	M	1046	35.7	438	4.5	888	0.67	0.82	13.3	26	III
15a	F	998	26.7	432	4.3	2166	0.58	0.80	13.4	76	III
16a	F	1456	56.8	607	8.9	3682	0.90	1.25	22.5	52	II

TABLE 25 (cont'd.)

Child*	Sex	Food energy	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid	Dietary level
		cal	g	mg	mg	IU	mg	mg	mg	mg	
AFDC Group - 3 to 6 years of age											
1b	M	2324	74.1	660	13.9	3237	1.40	1.46	29.3	57	II
2b	F	1107	40.7	789	5.1	1286	0.56	1.22	12.9	18	III
4b	M	1359	43.8	464	7.9	2150	0.64	0.89	16.2	17	III
5a	M	1765	71.1	1425	7.7	3613	0.86	2.35	21.1	38	II
7a	F	1409	56.1	600	9.5	3676	0.90	1.47	22.0	46	II
8b	F	2259	77.6	1024	11.4	3273	1.32	2.01	26.5	92	I
10a	M	2166	96.7	1323	11.6	5227	1.19	2.39	29.9	63	I
11b	F	1122	37.9	413	5.6	1766	0.46	0.76	13.5	69	III
12b	M	1433	55.2	882	6.3	2960	0.91	1.53	18.3	34	III
13a	M	1806	49.1	563	10.0	3746	1.13	1.22	20.8	50	II
13b	M	1826	49.7	570	10.3	3784	1.15	1.24	21.0	50	II
16b	F	1585	56.4	594	10.3	4234	1.04	1.29	20.3	58	II
17a	M	1471	60.3	599	8.5	2582	0.87	1.22	22.0	61	II
18a	F	1423	58.7	560	10.8	5896	1.05	1.52	21.4	70	II

TABLE 25 (cont'd.)

Child*	Sex	Food energy	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid	Dietary level
		cal	g	mg	mg	IU	mg	mg	mg	mg	
18b	M	1708	68.8	650	10.4	5959	1.26	1.72	24.8	76	II
19a	F	1515	57.5	596	7.8	3030	0.73	1.19	19.6	56	II
NS Group - 1 to 3 years of age											
21a	M	1045	58.2	1389	3.5	4431	0.88	2.22	15.5	159	III
25a	F	1096	55.1	1523	2.0	2776	0.52	2.37	11.8	32	III
34a	M	778	44.7	959	5.2	5547	0.47	1.56	11.5	25	III
NS Group - 3 to 6 years of age											
21b	F	1368	31.9	497	5.2	5209	0.99	0.88	12.9	335	III
22a	F	1279	46.2	786	5.2	2602	0.63	1.19	14.0	66	III
23a	M	1452	65.4	1698	9.1	3720	1.15	2.80	20.9	51	II
23b	M	1449	67.7	1760	9.6	4616	1.14	2.98	21.6	54	II
24a	M	1608	63.6	1137	6.5	5057	0.90	1.97	20.5	64	III
25b	M	1503	68.1	1284	5.4	4328	0.75	2.25	20.6	59	III
26a	M	1348	55.7	904	6.8	7486	0.74	1.69	17.9	91	II

TABLE 25 (concl.)

Child*	Sex	Food energy	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid	Dietary level
		cal	g	mg	mg	IU	mg	mg	mg	mg	
27a	F	1290	43.4	974	5.7	3119	0.66	1.59	13.1	45	III
28a	F	1579	58.9	830	7.1	3958	0.79	1.60	19.0	40	II
29a	M	1554	50.3	658	7.5	3639	0.75	1.29	20.0	72	II
30a	M	1803	58.2	1186	8.1	4748	0.88	1.71	16.9	41	II
31a	M	1047	41.4	623	5.0	2994	0.65	1.25	13.2	99	III
31b	F	1294	50.8	834	6.5	3371	0.85	1.62	16.2	126	III
32a	F	1329	46.8	608	6.5	3067	0.68	1.10	16.8	44	III
33a	F	1210	40.4	534	5.8	3193	0.64	1.12	13.3	89	III
33b	M	1546	54.2	769	7.3	3978	0.94	1.47	16.8	86	II
34b	F	1142	36.5	599	5.3	1849	0.52	1.01	11.5	29	III
35a	M	1908	59.1	841	8.2	4618	1.08	1.47	20.2	150	II

* Number indicates family. Letter indicates (a) only or younger child and (b) older child.

** Number without underline indicates dietary Level I; single underline, Level II; and double underline, Level III.

TABLE 26

Mean daily nutritive intake and dietary level of 3-day diets of APDC children by age

Child*	Sex	Food energy	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid	Dietary level
		cal	g	mg	mg	IU	mg	mg	mg	mg	
1 to 3 years of age											
1a*	M	1725	52.2	780**	9.6	4697	0.87	1.33	16.6	115	II
2a	M	1037	42.1	770	5.1	1892	0.59	1.35	12.2	16	III
3a	F	1747	75.7	842	8.7	3194	0.98	1.78	26.9	45	I
4a	M	1188	38.2	335	6.3	3814	0.49	0.71	15.2	28	III
6a	M	1904	67.8	1534	7.2	3730	1.02	2.54	18.1	28	II
8a	F	1262	51.5	1018	4.1	2196	0.57	1.68	15.1	22	III
12a	M	1393	59.2	1395	4.4	2018	0.70	2.14	16.1	52	III
14a	M	899	31.7	362	4.2	795	0.59	0.75	11.9	42	III
15a	F	915	24.4	294	5.8	7218	0.51	0.57	10.8	41	III
16a	F	1632	59.0	549	8.5	4167	0.99	1.34	22.1	40	II
3 to 6 years of age											
1b	M	2506	81.0	785	16.3	4756	1.33	1.57	28.3	106	II
2b	F	1070	42.0	728	5.4	1815	0.61	1.32	12.9	16	III

TABLE 26 (concl.)

Child*	Sex	Food energy	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid	Dietary level
		cal	g	mg	mg	IU	mg	mg	mg	mg	
4b	M	1419	52.5	367	9.6	5814	0.63	0.91	20.9	40	III
5a	M	1948	72.9	1764	14.4	3656	1.03	2.65	21.9	62	II
7a	F	1582	61.5	467	10.4	2112	1.00	1.25	24.5	76	III
8b	F	1594	60.7	558	8.6	2542	0.93	1.26	21.3	59	II
10a	M	2446	124.2	1128	15.8	6565	1.75	2.30	49.4	57	I
12b	M	1680	62.7	1128	6.8	1924	0.80	1.82	19.3	50	II
13a	M	1877	53.8	673	10.2	5921	1.05	1.44	20.1	48	II
13b	M	1877	53.8	673	10.2	5921	1.05	1.44	20.1	48	II
16b	F	1582	59.5	548	8.4	4154	0.99	1.24	24.8	40	II
17a	M	1112	43.8	600	6.7	4866	0.80	1.18	16.3	43	II
18a	F	1562	55.1	445	8.4	1048	0.81	1.03	19.1	27	III
18b	M	1756	61.1	517	9.9	1206	0.91	1.17	20.9	30	III
19a	F	2058	62.7	884	9.0	4087	0.82	1.46	20.6	28	II

* Number indicates family. Letter indicates (a) only or younger child and (b) older child.

** Number without underline indicates dietary Level I; single underline, Level II; and double underline, Level III.

TABLE 27

Mean daily nutritive intake and dietary level of 7-day supplemented diets of NS children by age

Child*	Sex	Food energy	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid	Dietary level
		cal	g	mg	mg	IU	mg	mg	mg	mg	
1 to 3 years of age											
21a*	M	1045	58.2	1389	3.5	6831	1.60	3.12	24.5	204	III
25a	F	1096	55.1	1523	2.0	5176	1.24	3.27	20.8	77	III
34a	M	778	44.7	959	5.2	7947	1.67	2.52	21.5	65	III
3 to 6 years of age											
21b	F	1368	31.9	497	5.2	7609	1.71	1.78	12.9	380	III
22a	F	1279	46.2	786	5.2	5602	0.63	1.19	14.0	126	III
24a	M	1608	63.6	1137	6.5	8057	0.90	1.97	20.5	124	III
25b	M	1503	68.1	1284	5.4	9328	1.95	3.75	30.6	119	III
26a	M	1348	55.7	904	6.8	9886	1.46	2.59	26.9	136	II
27a	F	1290	43.4	974	5.7	8119	2.66	3.59	33.1	95	III
29a	M	1554	50.3	658	7.5	8639	3.25	3.79	40.0	122	II
31a	M	1047	41.4	623	5.0	7994	2.15	3.05	25.2	259	III

TABLE 27 (concl.)

Child*	Sex	Food energy	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin equiv.	Ascorbic acid	Dietary level
		cal	g	mg	mg	IU	mg	mg	mg	mg	
31b	F	1294	50.8	834	6.5	8371	2.35	3.42	28.2	286	III
34b	F	1142	36.5	599	5.3	5849	2.02	2.21	21.5	104	III

* Number indicates family. Letter indicates (a) only or younger child and (b) older child.

** Number without underline indicates dietary Level I; single underline, Level II; and double underline, Level III.

TABLE 28

Age, weight, height and positions on Jackson and Kelly growth chart of children by group

Child*	Age	Weight	Height	Positions on Jackson and Kelly growth chart	
				Weight	Height
	yr mo	lbs	in.		
AFDC Group					
1a	1- 0	25.0	26.8	2	4
1b	5- 8	51.0	46.2	1	2
2a	1- 9	26.5	31.0	3	4
2b	3- 5	27.5	35.1	4	4
3a	1-11	22.0	30.8	4	4
4a	2- 6	32.0	34.4	2	4
4b	3-11	38.0	40.6	2	2
5a	5-11	34.0	43.0	4	4
6a	1- 2	24.5	31.5	2	2
7a	4- 5	40.0	41.0	2	3
8a	1- 2	21.5	28.2	3	4
8b	3- 5	34.0	38.0	3	3
9a	1- 6	25.0	31.2	2	3
10a	5- 0	43.0	43.5	2	2
11a	2-10	31.0	37.2	3	3
11b	3-10	26.5	36.8	4	4
12a	1- 6	20.0	28.5	4	4
12b	4- 5	27.5	36.2	4	4
13a	3- 5	42.0	40.8	1	1
13b	4- 5	45.0	43.0	1	2
14a	2-10	30.5	35.8	3	4
15a	2- 2	27.0	34.8	3	3
16a	1- 0	25.0	28.2	1	4
16b	3- 9	35.0	39.2	3	3
17a	5- 7	43.0	41.8	3	4
18a	3-10	43.0	41.5	1	1
18b	4-11	43.0	43.5	2	2
19a	5- 3	48.0	46.4	1	1
NS Group					
21a	1- 6	30.0	33.0	1	2
21b	3- 0	37.0	39.0	1	1
22a	4- 2	30.0	37.5	4	4
23a	3- 3	30.0	38.0	4	3
23b	5- 0	37.0	42.2	4	3
24a	4- 6	37.5	42.0	3	2

TABLE 28 (concl.)

Child*	Age	Weight	Height	Positions on Jackson and Kelly growth chart	
				Weight	Height
	yr mo	lbs	in.		
25a	1-11	27.0	35.0	2	1
25b	3- 6	34.0	38.8	3	3
26a	3- 5	44.0	43.0	1	1
27a	4- 0	34.0	39.5	3	3
28a	4- 0	40.0	41.0	2	2
29a	4- 6	33.5	40.0	4	4
30a	4- 4	41.5	44.5	2	1
31a	3- 3	31.0	37.2	3	3
31b	4- 4	43.0	42.0	2	2
32a	3-10	34.0	39.0	3	3
33a	3- 5	34.0	38.8	3	2
33b	3- 9	38.0	42.0	3	3
34a	1- 3	25.0	30.0	2	4
34b	4- 5	35.0	39.8	3	4
35a	3-10	40.0	41.5	2	2

* Number indicates family; letters indicate (a) only or youngest child and (b) older child.

TABLE 29

Scores and rank of homemakers' tests of nutrition knowledge, attitude toward nutrition and attitude of permissiveness toward child's eating habits by group

Homemaker*	Test** Scores			Rank		
	NK	AN	AP	NK	AN	AP
AFDC Group						
1	24	109	-13	4	1	3
2	15	80	- 8	4	3	2
3	-63	81	-12	4	3	3
4	72	61	-38	2	4	4
5	105	71	-45	2	3	4
6	-65	8	47	4	4	1
7	66	45	15	3	4	1
8	59	68	21	3	3	1
9	31	27	29	3	4	1
10	No scores					
11	52	70	10	3	3	1
12	56	95	-21	3	2	3
13	8	68	8	4	3	2
14	-19	12	- 8	4	4	2
15	26	37	12	3	4	1
16	- 5	28	12	4	4	1
17	-26	100	-40	4	2	4
18	72	70	-40	2	3	4
19	147	98	-53	2	2	4
NS Group						
21	200	112	-28	1	1	3
22	33	96	-42	3	2	4
23	173	82	6	1	3	2
24	151	104	- 4	1	1	2
25	77	86	35	2	2	1
26	101	112	-56	2	1	4
27	160	86	- 6	1	2	2
28	110	98	-24	2	2	3
29	73	101	6	2	1	2
30	58	80	1	3	3	2
31	139	109	-35	2	1	4
32	203	100	-14	1	2	3
33	205	99	- 8	1	2	2
34	201	107	-25	1	1	3
35	169	109	-16	1	1	3

* Number indicates family.

** NK - Nutrition Knowledge; AN - Attitude Toward Nutrition and AP - Attitude of Permissiveness Toward Child's Eating Habits.

FACTORS RELATED TO THE LEVEL OF DIETARY ADEQUACY OF PRESCHOOL CHILDREN FROM TWO SOCIOECONOMIC GROUPS IN RILEY COUNTY, KANSAS

by

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The relationship of various factors to level of dietary adequacy of 49 preschool children from 2 socioeconomic groups was determined. Twenty-eight children were members of families receiving Aid to Families with Dependent Children (AFDC); the others included 15 children attending Kansas State University Nursery School (NS) and 6 of their siblings. Seven-day dietary records were classified into 3 levels of nutrient intake based on Recommended Dietary Allowance (RDA) of National Research Council.

The AFDC children had better diets than the NS children with 7% of them ranking in Level I, 54% in Level II and 39% in Level III. None of the NS children were classified in Level I, 38% in Level II and 62% in Level III. The boys had slightly better diets than the girls with 58% of the boys in Levels I and II and 57% of the girls in Level III. Nearly 60% of the 3- to 6-year-old children consumed diets classified in Level II or above while 67% of the 1- to 3-year-old children fell in Level III.

Niacin was the most adequately supplied nutrient, closely followed by protein, thiamine and riboflavin. Over one-half of the children met the RDA for vitamin A and ascorbic acid. Iron was the least adequately supplied nutrient with fewer NS children than AFDC children meeting the RDA. Calorie and calcium allowances were met by fewer than one-half of the children with NS children having the lower intake in calories and AFDC children in calcium.

Food records of AFDC children obtained at the beginning of the month were compared with records collected at the end of the

month. Slightly fewer nutrients fell below the RDA for the earlier period.

The majority of NS children took vitamin supplements which raised levels of intake for 5 vitamins. However, over-all dietary level of the diets was not improved because the level of intake of other nutrients was below the RDA.

Thirteen of the 15 pairs of siblings were classified at the same level of overall dietary adequacy. Nevertheless, a majority of the children differed from their sibling in 1 to 3 nutrients which fell below the RDA indicating that consumption within a family was not as consistent as similarity in dietary levels suggested.

Relationships among protein, thiamine, riboflavin and niacin intakes were strong, but there was little relationship found between protein and iron. An inverse relationship between iron and calcium was noted. However, when calorie intake was low, intakes of iron and calcium both fell below the RDA and when it was high, recommendations for both nutrients were met. The relationship of calories with each of the other nutrients was not as strong as expected, but it was more apparent among AFDC children where the calorie intake was higher than among NS children.

An inverse relationship was found between level of family income and dietary adequacy of the child.

In general, the children were slightly lighter and slightly shorter than the Jackson and Kelly standard. The NS children were taller than AFDC children and weighed slightly less.

A positive relationship appeared to exist between weight and dietary adequacy in Levels II and III and between short height and lower dietary adequacy.

The NS mothers scored higher on tests of nutrition knowledge and attitude toward nutrition while AFDC mothers indicated a more favorable attitude of permissiveness toward the child's eating habits. No relationships between dietary adequacy of child and test scores of mother were apparent.