

THE RELATIONSHIP OF SELECTED VARIABLES TO
THE NUTRITIONAL ADEQUACY OF THE
PRESCHOOL CHILD'S DIET

By

SALLIE NOBLE BURROW
||

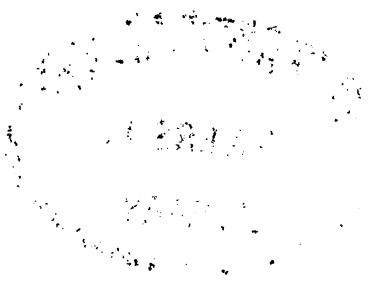
Bachelor of Science in Home Economics

University of Arkansas

Fayetteville, Arkansas

1974

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
MASTER OF SCIENCE
July, 1976



Thesis
1976
B885u
cop. 2



THE RELATIONSHIP OF SELECTED VARIABLES TO
THE NUTRITIONAL ADEQUACY OF THE
PRESCHOOL CHILD'S DIET

Thesis Approved:

Bernice Kopel

Thesis Adviser

Frances Stromberg

Esther Wintepedt

Norman D. Durham

Dean of Graduate College

953272

ACKNOWLEDGMENTS

Gratitude is extended to all those who have contributed to the completion of this study. The writer expresses grateful appreciation to her adviser, Dr. Bernice Kopel for her guidance and interest. Sincere appreciation is also expressed to Dr. Esther Winterfeldt and Dr. Frances Stromberg who have served as advisory committee members.

The writer is greatly indebted to Dr. Edward Shissler, without whose assistance this study would not have been possible. His guidance and interest have been invaluable.

Appreciation is expressed to Miss Mary Leidigh for her kindness, advice, understanding and encouragement.

Grateful acknowledgment is given to Dr. Larry Claypool for his assistance and guidance in the statistical analysis. His patience was greatly appreciated.

Gratitude is also expressed to all the mothers who participated in the study. The writer would also like to thank Mrs. Ruby Moore for her assistance with the dietary recall analysis.

Lastly, greatest appreciation is reserved for her parents, Mr. and Mrs. J. E. Burrow, who gave their constant encouragement and support; and Mrs. Kathleen Peshke, who provided countless assistance. The writer wishes to express her gratitude to them for providing the assistance, cooperation, interest, and support, which made this study possible.

TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION	1
Description of the Problem	1
Statement of Problem	1
Assumptions	2
Objectives of the Study	2
Limitations	3
Definition of Terms	3
II. REVIEW OF THE LITERATURE	5
Nutritional Status Studies on Children	8
United States Department of Agriculture Food Consumption Survey	8
Iron-Deficiency Anemia in Infants and Preschool Children	12
The North Central Regional Study of Diets of Preschool Children	14
Environmental Factors Associated With Preschool Obesity	18
III. PROCEDURES	25
Selection of the Sample	25
Development of the Instrument	25
Pretesting the Instrument	26
Collection of the Data	26
Analysis of the Data	27
IV. RESULTS AND DISCUSSION	29
Introduction	29
Annual Household Income	30
Educational Background of the Respondent	30
Number of Children in Family	32
Maternal Employment	34
Age of the Mother	35
Feeding and Eating Patterns	36
Food Dislikes of the Child	36

TABLE OF CONTENTS (CONTINUED)

Chapter	Page
V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	42
Summary of Findings	43
Recommendations for Nutrition Education	45
Recommendations for Further Study	46
SELECTED BIBLIOGRAPHY	47
APPENDIX A	50
APPENDIX B	52
APPENDIX C	59
APPENDIX D	61
APPENDIX E	63

LIST OF TABLES

Table	Page
I. Nutritive Value of Food Eaten by Children From Birth to 4 Years of Age (Family Incomes Under \$4,000) and Percent Recommended Dietary Allowances	10
II. Household Income And Adequacy of the Child's Diet . . .	31
III. Educational Background of Mother And Adequacy of Child's Diet By Frequency And Percentage	32
IV. Number of Children in Family And Adequacy of Child's Diet by Frequency and Percentage	33
V. Maternal Employment And Adequacy of Child's Diet by Frequency and Percentage	34
VI. Age of Mother And Adequacy of Child's Diet By Frequency and Percentage	35
VII. Food Dislikes of the Child And the Adequacy of the Child's Diet	37
VIII. Pearson-Product Moment Correlation Coefficients	38
IX. Sources of Nutrition Information Used By the Mother . .	40

CHAPTER I

INTRODUCTION

Description of the Problem

Nutritional knowledge is becoming increasingly more relevant and important not only to physicians, dietitians, and nutrition educators, but also to the mother with young children. It has been shown that many nutrition-related conditions and diseases in adulthood could be prevented by good food habits established early in life. Obesity, heart disease, atherosclerosis, hyperlipidemia, and dental caries, among others, may be the direct or indirect result of poor nutritional practices in early childhood.

The nutritional status of our preschool children is a very real and important concern today. This concern includes children who may be undernourished, malnourished, or obese. All three conditions create definite health hazards. Perhaps with the increased awareness of the importance of proper nutrition early in life, it may be possible to prevent rather than cure nutrition related conditions.

Statement of Problem

The purpose of this research was to obtain information concerning the nutritional practices of mothers in regard to the eating habits of their children, ranging in age from one month to four years. This

study was conducted to determine the relationship of background characteristics and eating patterns of the child to the nutritional adequacy of the diet. Recommendations concerning nutrition education for mothers and legislation regarding child nutrition were made on the basis of the findings.

Assumptions

Assumptions which were basic to this study include:

1. The mothers participating in the study were honest in answering the questionnaire to the best of their ability.
2. There will be a relationship between the results of this study and the results of other dietary case studies of children.
3. Today, mothers are aware of the importance of good eating habits.

Objectives of the Study

The objectives of the study were:

1. To determine the adequacy of the diet of the youngest child of each family selected in the sample by evaluating a 24-hour dietary recall of each child on the basis of the 1974 Recommended Dietary Allowances.
2. To determine the relationship between the adequacy of the child's diet and background characteristics, such as:
 - a. income level
 - b. educational background of the mother
 - c. medical problems, such as allergies or physical handicaps of the child
 - d. number of children in the family
 - e. employment of the mother
 - f. age of the youngest child
 - g. age of the mother
 - h. mother's marital status

3. To determine the relationship between the adequacy of the child's diet and eating patterns such as:
 - a. special or modified diet
 - b. regularity of meals
 - c. regularity of snacks
 - d. food dislikes
 - e. ability to feed himself
4. To determine the sources of nutrition information available to and used by the mother.
5. To determine the relationship between the findings of this study with the findings of other dietary studies of children's eating patterns.
6. To provide suggestions and recommendations for nutrition education.

Limitations

This sample was limited to mothers who had at least one child in one-month to four-year age range, who had visited a pediatrician in Stillwater, Oklahoma, between the months of August 1, 1975 and March 1, 1976. The children were younger than four years of age as of November 1, 1975. All the families were living in Stillwater, Oklahoma.

Definition of Terms

For the purpose of clarity, the following terms have been defined:

Adequacy of diet - A diet meeting at least two-thirds of the requirements of nutrients as prescribed by the 1974 Recommended Daily Allowances according to height, weight, sex, and age (31).

Recommended Daily Allowances (RDA) - nutrients essential for maintenance of good nutrition in a healthy, normally active person.

Overweight - An individual who is 10 to 20 percent above the desirable weight (32).

Obesity - A term applied to a person who is 20 percent or more above the desirable weight (32).

Underweight - Denotes those individuals who are more than 10 percent below the established standards for desirable weight (32).

Malnutrition - Improper or inadequate nutrition.

CHAPTER II

REVIEW OF THE LITERATURE

Nutritional assessments of adults have shown the possibility that many diseases and conditions could be prevented in early childhood. Obesity, congestive heart failure, arteriosclerosis, hyperlipidemia, and dental caries, among others, may be the direct or indirect result of poor nutritional practices in early life.

Proper growth and development are dependent on good nutrition in infancy and childhood. In studies by Beal (1), it has been found that the nutrient requirements of the individual child depend on a host of factors unique to that child. The requirements vary not only with chronological age, but also growth rate, maturational level, physical activity, and efficiency of absorption and utilization.

Although use of a single standard of nutrient requirement for a given age and sex simplifies dietary evaluation of groups of children, it may be misleading when applied to an individual child. We must not assume that a child is inadequately nourished if his intake falls below a standard or even below a selected percentage of that standard. Nutrition requirements must be based on each child's personal characteristics. This must be taken into consideration when assessing individuals or groups of children.

In the Child Research Council study of healthy middle-class children, voluntary intakes varied widely. The maximum intakes of calories and protein, for example, were at least twice as high as the minimum intakes at a given age. The range was even greater for mineral and vitamin intakes. Comparison of caloric intakes from 1 to 10 years with the Recommended Dietary Allowance showed that approximately 50 per cent of the boys did not meet the Allowance (4, p. 15).

After three years of age the girls in this series had lower intakes than the boys, and by 6 to 10 years nearly 75 percent of the girls failed to meet the Allowance, and more than ten percent had intakes less than two-thirds of the Allowance. Yet repeated physical examinations and measurements confirmed that they were healthy children with satisfactory gains in both height and weight (2, p. 15).

Evaluation of nutritional status of the child should include not only dietary intake, but also an estimation of general health and present physical condition, activity, rate of growth and maturation, and biochemical determinations. It is also necessary to have some background medical history of the child. This could include birth weight, occurrence of serious or chronic illnesses, and other disorders which could interfere with assimilation and utilization of nutrients.

Food patterns, food availability, buying habits, use of enriched or fortified foods, and the use of vitamin and mineral supplements vary with socioeconomic status, region of the country, and age of the children under study. This information is an important aspect of nutritional assessment and must be taken into consideration.

In determining the nutritional status of a child, several assessments must be made. Anthropometric measurements, such as body weight and length, or height are important in ascertaining

this status. A height-weight chart is used as a standard to compare measurements of individual children or groups of children.

Interpretations of anthropometric measurements of individual infants and children should be made from several observations rather than a single measurement at one given time. Two measurements over a defined period of time permit calculations of growth, while one-time measurements show only size achieved.

Because boys and girls differ in birth size and in rate of growth and body composition and, in some cultures, benefit or suffer nutritionally from a sex preference, it is important to include both sexes in any population sample and to separate observations on body size by sex (4, p. 41).

In evaluating laboratory studies several factors must be taken into consideration, such as whether the levels indicate long-term or present influences of the diet on the nutritional status. Some biochemical measurements including concentrations of hemoglobin, proteins, cholesterol, and vitamin A in blood are fairly stable determinants which reflect long-term dietary influences to a considerable extent. In contrast, levels of water soluble vitamins in blood or urine may fluctuate with dietary intake. This is true of ascorbic acid and carotene in plasma and of thiamine, riboflavin, and other B vitamins in the urine.

Several biochemical measurements are useful in determining the nutritional status of infants and children, including estimation of hemoglobin, serum, transferrin saturation, and plasma ascorbic acid.

There are many anthropometric indices that can be used clinically in assessing children, but aside from height and weight, they may be of limited value in estimating nutritional status of children in the United States. Determination of skin-fold thickness provides an independent measurement of

body fat and its evaluating children should be encouraged (8, p. 44).

Nutritional Status Studies on Children

United States Department of Agriculture Food Consumption Survey

A food and nutrient intake study (34) was conducted in 1965 by the USDA which included children ranging in age from birth to four years of age. A sample of 6,200 households, consisting of 14,500 people, was drawn to be representative of all households in the United States. Food intake for one day was obtained by an interview of individual members in each household selected for the study. Data were collected every day for a period of 12 weeks. A 24-hour recall was chosen in order to include all in-between meal snacks as well as regular meals.

The subsample was taken from low-income families. The study included 408 infants under the age of one year and 307 children ranging from one year to four years. Nursing infants were not included in the study. Infants and children were classified according to family income with categories for yearly incomes of under \$2,000; \$2,000 to \$2,999; and \$3,000 to \$4,000.

The three areas studied were: (a) food intake, (b) nutritive value of diets, and (c) region, income, and age differences. Practically all of the infants in the study received some milk and milk products during 24 hours. Average quantities differed for the three age groups: birth through two months, three through five months, and six through eleven months. At all three income levels, cereal was the first and most frequently used food, other than

formula, by infants under five months. About one-half of these infants were consuming formula with cereal. The use of other foods increased considerably after six months of age.

Baby and/or junior vegetable and meat mixtures (mostly vegetables) were used almost twice as frequently as meat and vegetable mixtures (mostly meats) by infants under one year. At incomes under \$4,000, vegetables alone were infrequently used by infants (birth to five months). At incomes under \$2,000, no fruit was consumed by the youngest infants (birth through two months). Frequency of fruit intake increased with age and income.

Average daily dietary intakes of calories and five nutrients (protein, calcium, vitamin A, iron, and ascorbic acid) were calculated. Table I shows the nutritive value of the food eaten by the children. Average nutritive values of diets of all infants under one year of age met the Recommended Dietary Allowances (RDA) for calories, protein, calcium, vitamin A and ascorbic acid. Average iron intakes were less than one-half of the recommended amount. Average intakes of protein, calcium, and vitamin A were over twice the recommended allowances.

Average diets of infants, birth to two months, furnished less than the NRC Recommended Dietary Allowances for 1968, for iron and ascorbic acid. The shortages of iron and ascorbic acid in diets of these infants might be due to the limited use of iron fortified formulas and because many of them still had not been introduced to iron fortified cereals and citrus juices, according to Steele (34). Infants, 3 to 5 months, had average diets which furnished about one-half the Recommended Dietary Allowances (RDA) for iron. Just as

TABLE I

NUTRITIVE VALUE OF FOOD EATEN BY CHILDREN FROM BIRTH
TO FOUR YEARS OF AGE (FAMILY INCOMES UNDER \$4,000)
AND PERCENT RECOMMENDED DIETARY ALLOWANCES (31)

Age	Calories	Protein	Calcium	Iron	Vitamin A	Ascorbic Acid
Birth-2 months	774	26.9	943	6.0	1,890	34
3-5 months	876	33.4	1,070	5.8	3,330	38
6-11 months	1,029	45.9	1,191	6.1	4,730	28
1 year	1,255	47.9	962	5.9	3,440	37
2 years	1,373	52.9	787	6.7	3,270	35
3 years	1,388	52.6	709	7.7	4,000	34

Percent of Recommended Dietary Allowances						
Birth-2 months	161	299	236	100	126	97
3-5 months	114	239	214	58	222	109
6-11 months	114	287	198	41	315	80
1 year	114	192	137	39	172	92
2 years	110	212	98	45	164	88
3 years	99	99	89	77	160	85

for the younger infants, the shortage of iron for infants three to five months, might have resulted from the limited use of iron fortified formulas and cereals. Average diets for the group of infants, six to eleven months, met the RDA for all nutrients studied except iron. Iron intake was less than one half the RDA. This was due to the type of food selected for the infants rather than insufficient amount.

Iron and ascorbic acid seemed to be the problem nutrients for infants under one year of age. Average iron intake for infants in the three-year age groups ranged from 28 to 55 percent below the RDA.

Diets of children, one to four years, met the RDA for protein and vitamin A. The diets of children, one to two years, furnished less than one-half the amount of iron recommended. Iron intake by three year olds averaged more than three-fourths of the recommendation for this age group. The children's diets of this age group were 10 to 15 percent below the RDA for ascorbic acid. Calcium intake was below the RDA also, but to a lesser extent than for iron and ascorbic acid.

By region, income, and age, no significant differences were found in the intake of iron by infants and children under four years. It was also found that there was no difference for caloric intake and protein. However, mean intakes of vitamin A appeared to be influenced by regional factors, the North having higher values than the South. Mean intakes of ascorbic acid by children one to four years differed by region and income. The North had higher values than the South. Age was a significant factor in the differences found in the mean intake of calcium by children one to

four years. The one-year olds had the highest intake and the three-year olds, the lowest.

Differences appeared in the intakes of calories, protein, calcium, vitamin A and ascorbic acid by infants under one year. Intakes increased with age, with the exception of ascorbic acid, which was highest for infants, three to five months, and lowest for infants, birth to two months.

The conclusions of this study were that on the average, infants under the age of one year met the RDA for more nutrients than did those of children one to four years. All diets were low in iron and the average intakes of ascorbic acid were also below recommended levels for all children one to four years and all infants except the three to five month olds. Average intakes of calcium were below the recommendations for the three-year olds and approached the recommendations for the two-year old children. Diets were, however, above the RDA for protein and vitamin A for all infants and children under four years of age.

Iron-Deficiency Anemia in Infants and Preschool Children

The National Dairy Council in 1971 (25) published an interpretative review of a recent nutrition research paper on iron deficiency anemia in infants and preschool children. The following findings were reported in this study.

Iron deficiency anemia is considered the most common type of anemia. However, to put the problem in perspective, anemia can also be caused by deficiencies of other nutrients needed for red blood cell production, as well as a variety of diseases and hereditary

defects affecting red blood cells. In addition to dietary lack this type of anemia may be caused or enhanced by factors that increase iron need, such as blood loss, parasitic infestation, or defects in iron absorption.

The decline that usually occurs in hemoglobin levels in the first few months of life should be considered a physiological and developmental adaptation. Three factors responsible for this decline in hemoglobin are diminished red cell production, shortened red cell survival, and the increase in blood volume due to rapid growth. Burman describes "three periods in infancy when there is a tendency to low hemoglobin values: at about two months of age, at about six months of age, and during the second half of the second years" (7, p. 3).

The 1974 RDA, established by the National Research Council (31), increased the iron requirement from six mg by the first two months of life to 10 mg at six months, 15 mg from six months to one year, and 15 mg up to the age of three years. This amount of iron, however, is not considered sufficient for infants of low birth weight (including premature infants) and others with reduced iron endowment, who may require as much as two mg of iron/kg/day beginning at two months of age.

The prevalence of anemia is high in the first two years of life, peaking in the second year, as compared to later preschool years. A higher prevalence of iron deficiency anemia was found in lower income groups and minority groups than in the more affluent groups. Some of the studies indicate that the association of low income with anemia may be due to factors associated with poverty—low educational level of the mother, lack of information about diet,

and lack of medical care--rather than income, per se (25).

The prevention and treatment of iron deficiency anemia may be facilitated with the vast education of mothers. For infants, enriched cereals are an important iron source but their use is often discontinued during the first year of life. Encouraging mothers to continue the use of iron-enriched cereals throughout the preschool period has been one approach to the problem (25).

The North Central Regional Study of Diets of Preschool Children

The Cooperative State Research Service (CSRS) sponsored this research to study the socioeconomic or socio-psychological factors affecting food behavior of the young child. The variables they selected for this study included: income, education and occupation of the parents, size of the family, and employment of the mother.

Two thousand mothers of preschool children in 12 North Central states were personally interviewed in 1965 with regard to the eating behavior of their children and certain family characteristics. The interview included questions relating to family characteristics, food buying practices of the family, sources of nutrition information, eating habits and health status of the preschool child; a three-day food record; and tests of the mother's nutrition knowledge and of her attitudes toward nutrition, meal planning, food preparation, and eating behavior.

From the data it was found that 60 percent of the families had incomes in the \$5,000 to \$10,000 range.

High school graduation was the most often reported level of

education completed by the mothers. However, approximately one-third of the parents had not completed high school. Of the 2000 mothers, approximately 15 percent of the mothers were employed outside of the home. Of this 15 percent, nine percent were employed full-time and six percent were employed only part-time. Forty-four percent of the mothers were over 30 years old. Families varied in size, with the average family having two or three children.

The mothers were asked about formal education in nutrition and about people and/or other resources from which they received nutrition information. Seventy-five percent of the mothers had attended organized classes in nutrition. The sources of nutrition instruction as reported by the mothers were: high school (51 percent), junior high school (34 percent), youth organizations (21 percent), elementary school (18 percent), and prenatal classes. Only three percent of the mothers mentioned public health or adult education classes as a source of nutrition information.

Personnel from whom the mothers obtained nutrition information included: physician (60 percent), mother or relative (64 percent), friends or neighbors (29 percent), home economist, dietitian, nutritionist (22 percent), dentist (19 percent), and sales persons (6 percent). The physician was the principal professional person offering nutritional guidance.

The mothers also indicated that they obtained nutrition information from the following sources: magazines (63 percent), newspapers (48 percent), books (47 percent), television (34 percent), radio (21 percent), and extension or other government bulletins (18 percent). The results suggests that mothers of preschool children rely heavily

to have the least favorable attitudes toward meal planning, food preparation, and nutrition. Generally, a high degree of permissiveness was associated with the mothers of the children having the lowest nutrient intakes. Highest food energy intakes, on the other hand, were associated with a high degree of permissiveness, suggesting that "high calorie diets may have resulted from unrestricted use of 'empty calorie' foods" (14, p. 329). Attitudes of the mothers toward nutrition were also less favorable when food energy intakes were high.

In order to obtain a single index of diet adequacy, an overall nutrition score was based on the total nutrient intake and derived for the diet of each child from mean percentile ratings for food energy, protein, calcium, iron, vitamin A, ascorbic acid, thiamin, riboflavin, and niacin. The results showed some tendency for the overall diet quality to improve when mothers had more nutrition knowledge and certain favorable attitudes toward child feeding. Diet quality tended to suffer when mothers believed that children need little guidance in their food selection.

The amount of money spent for food was more highly correlated with adequacy of the diet than were family income, number in the household, or education of the mother. In order of importance, according to the findings of this study, was income, number in the household, money spent for food, and level of education of the mother. Eppright, et al., (14) reported that

Increased efforts in nutrition education need to be exerted for mothers of preschool children in all segments of the population but especially for those living in large cities, those with large families, those with low food budgets, and those who are poorly educated. It appears that nutrition education must focus not only on nutrition

on nutrition education from lay sources.

In conclusion the results from this study showed that the typical family consists of a mother and father in their late 20's or early 30's, with two children. The parents had completed high school and the mother was not working outside of the home. The family had an average annual income, after taxes, between \$5,000 and \$7,000. Few mothers of preschool children worked outside of the home, but mothers with college educations were more inclined to work than were other mothers. The majority of the mothers had obtained some formal nutrition education but relied mostly on lay sources for information in regard to feeding their families.

The second report of the North Central Regional Study of Diets of Preschool Children (14) dealt with the nutrition knowledge and attitudes of mothers and adequacy of the diet. The sample was described in the first part of this study.

The 2,000 mothers were interviewed regarding the eating behavior of their children and certain family characteristics. Trained interviewers administered tests and scales designed to indicate knowledge of nutrition, and attitudes toward (1) meal planning, (2) food preparation, (3) nutrition, and (4) permissiveness in feeding children.

The children were classified into six groups according to the level of total intake of food energy and each nutrient based on foods eaten plus vitamin and/or mineral supplements. Mean test scores were computed for each group. The mothers of the children that were classified in both the lowest and highest groups according to food energy intakes had the lowest nutrition knowledge scores. Also, mothers who had children in the lowest nutrient intakes group tended

facts but also on their application under various conditions of living (14, p. 331).

In conclusion, nutrition knowledge and attitudes toward meal planning, food preparation, nutrition, and permissiveness in feeding children were interrelated factors influencing the quality of the diets of preschool children to varying degrees. The most influential, although negative, was permissiveness.

Of the socioeconomic variables, the amount of money spent for food was the most influential in the quality of the diet of the children. Mothers who had children in the lowest 10 percent in regard to adequacy had a relatively low level of nutrition knowledge and unfavorable attitudes toward meal planning and food preparation.

Environmental Factors Associated With Preschool Obesity

The main purpose of a study conducted by Huenemann, 1961-65 (20), was to identify the environmental factors associated with the development of childhood obesity. Specifically, the data were obtained for children of six months, one year, two years, and three years.

The data Huenemann (20) collected on the four age groups included: (a) body measurements (height, weight, and several circumference measurements and skinfold tests), (b) a three-day quantitative food record, (c) a one-day activity record, and (d) interview (health history, food and activity practices, opinions and beliefs, and social and economic information).

Dietary information was based on a three-day dietary record, supplemented by a home interview. A one-day activity record was kept by the mother. The sample consisted of 448 six-month-old

infants living in Berkeley, Albany, and Kensington, California-- three adjoining communities in the San Francisco Bay Area.

The body measurements of the six month old boys and girls and their reported birth weight and length were recorded. In almost all measurements, the boys were larger than the girls. One significant difference between the sexes was the suprailiac skinfold test. Even at six months, girls had a feminine body conformation. Owen (27) concluded that fat constituted a greater percentage of body weight for girls than for boys, even in infancy.

When the children were grouped by socioeconomic level, the middle level children had the largest subscapular skinfold, were the longest; weighed the most, had the largest chest, biceps, and waist circumferences and had gained the most weight since birth. Huenemann (20) concluded that for some measurements, sex and race made a difference, but that environmental factors also definitely affected body size and shape at the age of six months, since the socioeconomic status made a significant difference (20, p. 483).

The most significant difference between the "fat group" and the "lean group" was the amount of weight gained since birth. The high skinfold measurements associated with high weight gain during the first six months substantiated that those fast growers gained a large amount of fat.

A study by a British investigator, Eid (10), also reported the findings that rapid weight gain during the early months of life may lead to obesity. He found that infants who gained rapidly in the first six months of life were likely to be obese by six to eight years of age. He suggested that educators who work with mothers and

children should try to prevent too rapid weight gain in the early months of life. Beal (2, p. 322) reported a small but significant correlation "between weight gain of the mother during pregnancy and birth weight of the infant."

Hirsch (18) identified that adults with juvenile-onset obesity had increased numbers of fat cells in comparison with the average non-obese person and that this increase in cell number probably occurred early in life. He indicated that once cell proliferation had occurred, the fat content of the cells could be decreased, but not their number. Prevention of obesity, therefore, should begin before multiplication of fat cells occurs.

Brook (6), Institute of Child Health of the University of London, reported a study of 52 obese children divided into two groups, 29 of whom had gained weight excessively in the first year of life and 23 who had not. He found that the early-obese children had more adipose cells than did the late-obese.

Since the anthropometric measurements in the study by Huenemann had shown differences in some body dimensions associated with sex, race, and socioeconomic status, the researcher examined the two groups to determine if any of the variables seemed to be significantly associated with obesity. There were twice as many males as females in the "fat" group and one and a half times as many females as males in the "lean" group. The "fat" group had a higher proportion of Orientals and the "lean" of Caucasians and Negroes. There were more first babies in the "fat" than in the "lean" group. The average caloric intake was a little higher in the "fat" group than the "lean", although not significantly different. Huenemann

discovered that the "fat" children tended to be not only fatter, but also longer and wider.

Huenemann was also concerned with the possibility of the level of activity being related to the weight of the two groups. She compared the activity scores in relationship to caloric intake of individual "fat" and "lean" subjects. She discovered no consistent pattern and was not able to account for obesity and leanness in six-month-old children on the basis of food intake and activity measurements alone.

Huenemann (20) attempted to explain this apparent discrepancy between energy intake and output in this way:

Heredity differences that might cause small differences in energy utilization, perhaps including basal metabolism, and early laying down of fat cell stroma are two possible factors. In line with recent research, we must also recognize the possible variability in conversion of calories to body fat due to dietary source, intake pattern, metabolic adaptations, and other variables (20, p. 485).

In relationship to the nutrient intake, the study reported several findings. The nutrient intake, which included calories, protein, calcium, phosphorus, iron, vitamin A, thiamin, riboflavin, and ascorbic acid, did not differ significantly between the "fat" and "lean" groups. Also the age of introduction to solid foods was about the same for the two groups.

From her research, Huenemann could not support the hypothesis that breast-fed babies were less likely to be obese, at least at the age of six months, than bottle-fed babies. However, she did discover that a few more babies in the "lean" than in the "fat" group were on nonfat and lowfat milk, and significantly more were

still on formula. The average caloric intake of all six-month old infants was lower for those on nonfat and low-fat milk than for those on formula or whole cow's milk. Thus, use of lower fat milk seemed to be effective in lowering caloric intake; it also increased protein intake appreciably. However, the use of low-fat milk or nonfat milk may result in caloric insufficiency for growth in young children. "The probable caloric need for four-month-old children and the need for essential fatty acids and other nutrients may be missing" (20, p. 486).

"The goal is to prevent excess fat deposition, not growth, and the ideal diet is one that achieves growth without obesity" (20, p. 487). So, on the basis of length for an indicator of growth, there was no growth impairment in the six-month old babies. Huenemann concluded that there should be no concern about the consumption of low-fat and nonfat milk by the infants.

In regard to the interviews with the mothers, the mothers' beliefs were discussed.

Mothers of six month old children were extremely conscious of food and not particularly conscious of exercise and activity as possible health hazards.

Interviews with the mothers of "fat" and "lean" babies yielded a profile of the "fat" infant's mother. In many cases, she was fat herself. She was less knowledgeable about good nutrition as evidenced by the foods she listed as good for the baby and the reasons for beliefs. She did not spend as much time cooking or enjoy cooking as much as the mothers of "lean" children. The household was more likely to be "unconventional", i. e., with components of a "hippie" life style or communal living, or she was unmarried, divorced, or separated. She was less likely to withhold a dessert if her child did not finish his meal. She was more likely to be dissatisfied with her child's eating, sometimes wishing that he would eat more and sometimes less. She viewed her

baby realistically as being fatter and growing faster than other children and wished he were thinner. This profile indicates a mother who is perhaps less sure of herself and less accepting of her baby as he is, and of a household that is less regulated than that of the "lean" child. Thus, in Berkeley at least, it behooves us in obesity prevention programs to be aware of this kind of mother (20, p. 486).

In conclusion, the basic findings in six-month-old children when comparing the obese infants with lean infants, were: the obese child had more rapid weight gain since birth, lower birth weight, primary in birth order, questionably higher caloric intake, and obesity of the mother herself. Also, the mother had less knowledge about nutrition and led a less conventional life style.

Nutrition education for mothers with young children is essential before the problem of obesity can be dealt with effectively. Mothers at all income levels need guidance in the selection of infant's and young children's foods to meet the nutritional needs of growing children.

In conclusion, the major findings from the review of literature indicate that infants under the age of one year tended to meet the RDA for more nutrients than did those of children one to four years. All diets were low in iron and the average intakes of ascorbic acid were also below recommended levels for all children one to four years and all infants except the three to five month olds. Average intakes of calcium were below the recommendations for two year old children. Average diets were above the RDA for protein and vitamin A for all infants and children under four years of age.

In regard to iron deficiency anemia, studies indicated that the

association of low income with anemia may be due to factors associated with poverty--low educational level of the mother, lack of information about diet, and lack of medical care--rather than income, per se. In regard to obesity, the obese child gained more weight after birth, tended to have an obese mother, the mother had less knowledge about nutrition, and had a less conventional life style.

CHAPTER III

PROCEDURES

This study was designed to accomplish the objectives as stated in Chapter I. The procedures used in the study were as follows:

(a) selection of the sample, (b) development of the instrument, (c) pretesting the instrument, (d) collection of the data, (e) analysis of the data, and (f) recommendations for nutrition education.

Selection of the Sample

The sampling procedure followed a random selection of 300 families from patients who visited a Stillwater pediatrician during the months of August 1, 1975 to March 1, 1976. A number was assigned to each family and, through further random sampling, 20 families were selected for the pretest and 50 families for the sample. These 50 mothers were contacted to determine if they were willing to participate in the study. A week later, the researcher contacted each family by telephone. Of the 50 families, 40 agreed to participate in the study. Appointments were made at the convenience of the participant and the researcher. The researcher visited each of the families in their own homes.

Development of the Instrument

The basis for the development of the instrument was the Dietary

Questionnaire for Children (8). Only the questions which pertained to the objectives of this study were incorporated by the researcher into the questionnaire. In addition, other questions were formulated by the researcher which would result in obtaining background characteristics of the mother and child, a record of the youngest child's food intake, and eating patterns of the child.

Pretesting the Instrument

The sample for the pretest was 20 mothers who were Stillwater residents. The questionnaire (Appendix B) was mailed with a letter (Appendix A) explaining the purpose of the study. An additional page (Appendix C) was included for the purpose of any further comments, recommendations, or suggestions from the mothers concerning the clarity of the questions. Ten days after the pretest was mailed, a follow-up telephone call was made to those who had not returned the questionnaire. Of the 20 questionnaires mailed, 13 were returned. The responses obtained from the pretest were analyzed by the researcher and it was found that insufficient data would be obtained from the respondents. Consequently, the researcher used personal interviews to obtain the data from the 40 mothers in the sample. It was felt that the participants would provide more information if the researcher was available while the test was being administered.

Collection of the Data

Information from the respondents included: household income level, mother's level of education, child's physical handicaps, number of children in the family, employment of the mother, age of

the children, and age of the mother. A 24-hour dietary recall to determine the adequacy of the diet, and a week's record of food intake, for the purpose of identifying the child's eating patterns, was requested for the youngest child in each of the families selected.

The questions were read to the mother and any which were not clear were discussed for intended meaning. The average length of time for each interview was 30 minutes.

Analysis of the Data

The data were coded for the purpose of keypunching. The researcher keypunched the data onto cards and the Computer Center at Oklahoma State University was utilized for the analysis of the data. A Chi-square was used to determine the significance of the association between the background characteristics of the mother and child and the adequacy of the youngest child's diet. Due to the small number of observations, the results from the Chi-square analysis were not conclusive and did not seem to add to the findings. Instead, frequency and the percentage of children with adequate and inadequate diets were compared to the background characteristics in this study.

The respondents reported that none of the children had medical problems, such as physical handicaps or allergies, which would interfere with the eating habits. Consequently, this variable was not analyzed by the researcher.

The Pearson Product-Moment Correlation Coefficient was used to determine the relationship between the adequacy of the child's diet and eating patterns of the child. The level of significance was at the 0.05 level.

The 24-hour dietary recall was evaluated by a computer program, developed by the Food, Nutrition, and Institution Administration Department at Oklahoma State University. A child's intake of calories, protein, calcium, iron, vitamin A, and ascorbic acid was analyzed according to the 1974 Recommended Dietary Allowances, birth to four year age category (See Appendix E).

To determine the sources of nutrition information available to and used by the mother nine sources were read to the respondent. They were instructed that they could make several selections according to their situation. Most of the respondents indicated four or more sources of nutrition information.

To determine the relationship between the findings of this study with the findings of the other dietary studies of children's eating patterns; background characteristics of mother and child and eating patterns of the child were compared to the adequacy of the child's diet. Findings of previous studies are reported in the review of literature. The interpretations are based on a sample size of 40 respondents for this study.

On the basis of the findings of this study, suggestions and recommendations were made for nutrition education. Chapter IV discusses the results of the data.

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

In this chapter, the researcher discusses the results of the data obtained from the respondents, according to the objectives of this study. Conclusions were drawn on the basis of the findings for each objective.

As defined in Chapter I of this study, two-thirds of the RDA for calories, protein, iron, calcium, vitamin A, and ascorbic acid were considered to be an adequate diet for children in the birth to four years age category. Those diets not meeting two-thirds of the RDA for these nutrients were designated as inadequate. A total points index, a value assigned to each child on the basis of the percent of the total RDA met by the child's food intake, was determined. The total points index showed the least adequate diet was 30 percent of the 1974 RDA and the most adequate food intake was 100 percent. Nineteen subjects (47.5 percent) had food intakes which were adequate for all nutrients. Of the 40 subjects, 21 children (52.5 percent) had food intakes which were inadequate.

The adequacy of the child's diet was compared to: (a) annual household income, (b) mother's level of education, (c) medical problems of the child, (d) number of children in the family,

(e) employment of the mother, (f) age of the youngest child, (g) age of the mother, and (h) mother's marital status. Each of these factors will be discussed individually.

Annual Household Income

The levels of household income, as reported by the respondents, and the adequacy of the children's diets were compared. See Table II.

Of the 40 respondents, 19 (47.5 percent) reported an income under \$8,999. Eight (20 percent) of these children had adequate diets, and 11 children (27.5 percent) had diets which were considered inadequate. Seven respondents (17.5 percent) had incomes at the \$9,000 to \$12,999 level. Three children (7.5 percent) in this income level had adequate diets and four children (10 percent) had inadequate diets. In the income level of \$13,000 and over, there were 14 children (35 percent). Eight children (20 percent) had adequate diets and six children (15.5 percent) had inadequate diets. On the basis of these observations there seemed to be no relationship between the adequacy of the child's diet and the annual household income of the respondents. However, the evidence suggests that as income decreases, the proportion of inadequate diets of children is likely to increase.

Educational Background of the Respondent

Table III identifies the educational background of the respondent and the adequacy of the child's diet. Of the 40 respondents, eight (20 percent) of the respondents reported that their highest level of education completed was high school. Four (10 percent) of these

TABLE II
HOUSEHOLD INCOME AND ADEQUACY OF CHILD'S DIET
BY FREQUENCY AND PERCENTAGE

Income	Children With Adequate Diets		Children With Inadequate Diets	
	No.	Percent	No.	Percent
Under \$8,999	8	20.0	11	27.5
\$9,000 to \$12,999	3	7.5	4	10.0
over \$13,000	8	20.0	6	15.5
Totals	19	47.5	21	52.5

N = 40

had children who met the adequate diet requirements and four (10 percent) children did not. Thirteen respondents (32.5 percent) had completed one to three years of college. It was found that three (7.5 percent) of their children had adequate diets and 10 (25 percent) had inadequate diets. There were 14 respondents (35 percent) who had completed a baccalaureate degree. Ten (25 percent) of these had children with adequate diets and four (10 percent) had children who did not have adequate diets. There were five respondents (12.5 percent) who had completed more than four years of college. Of these five respondents, there were two children (5 percent) with adequate diets and three (7.4 percent) with inadequate diets.

There seemed to be no association between the educational

TABLE III

EDUCATIONAL BACKGROUND OF RESPONDENTS AND ADEQUACY
OF CHILD'S DIET BY FREQUENCY AND PERCENTAGE

Educational Level	Children With Adequate Diets		Children With Inadequate Diets	
	No.	Percent	No.	Percent
High School	4	10.0	4	10.0
1-3 years of college	3	7.5	10	25.0
4 years of college	10	25.0	4	10.0
More than 4 years of college	<u>2</u>	<u>5.0</u>	<u>3</u>	<u>7.5</u>
Totals	19	47.5	21	52.5

N = 40

background of the mother and the adequacy of the youngest child's diet. However, the proportion of children's diets which were inadequate was greatest for the respondents who had completed one to three years of college. Those respondents who had completed four years of college had the greatest proportion of children with adequate diets.

Number of Children in the Family

The largest number of respondents, 21 (52.5 percent), had one child in the family. The data from these respondents identified

that 10 children (25 percent) had adequate diets and 12 children (30 percent) did not. The next largest number of respondents had two children in the family. Of these 17 families (42.5 percent), eight (20 percent) had children with adequate diets and nine (22.5 percent) with inadequate diets. There was one respondent who had three children in the family. The youngest child in this family had an adequate diet. See Table IV. There seemed to be no relationship between the number of children in the family and the adequacy of the youngest child's diet, based on this evidence.

TABLE IV
NUMBER OF CHILDREN AND ADEQUACY
OF CHILD'S DIETS BY FREQUENCY
AND PERCENTAGE

Number of children	Children With Adequate Diets		Children With Inadequate Diets	
	No.	Percent	No.	Percent
1	10	25.0	12	30.0
2	8	20.0	9	22.5
3	<u>1</u>	<u>2.5</u>	<u>0</u>	<u>0.0</u>
Totals	19	47.5	21	25.5

N = 40

Maternal Employment

Table V identifies maternal employment and the adequacy of the child's diet. Of the 40 respondents, 23 (57.5 percent) reported that they were not employed outside of the home. Ten (25 percent) of these respondents had children with adequate diets, and 13 children (32.5 percent) had inadequate diets. Seventeen respondents (42.5 percent) reported being presently employed outside of the home. Nine of these respondents (22.5 percent) had children with adequate diets and eight (20 percent) had children with inadequate diets. On the basis of these observations, there seemed to be no relationship between the adequacy of the child's diet and maternal employment.

TABLE V
MATERNAL EMPLOYMENT AND ADEQUACY OF CHILD'S
DIET BY FREQUENCY AND PERCENTAGE

Employment	Children With Adequate Diets		Children With Inadequate Diets	
	No.	Percent	No.	Percent
Not employed	10	25.0	13	32.5
Employed	<u>9</u>	<u>22.5</u>	<u>8</u>	<u>20.0</u>
Totals	19	47.5	21	52.5

N = 40

Age of the Mother

The age of the respondent and the adequacy of the children's diets were compared in five age groups. See Table VI.

TABLE VI
AGE OF MOTHER AND ADEQUACY OF CHILD'S
DIET BY FREQUENCY AND PERCENTAGE

Age of Mother	Children With Adequate Diets		Children With Inadequate Diets	
	No.	Percent	No.	Percent
Under 20 years	1	2.5	1	2.5
21 to 25 years	5	12.5	10	25.0
26 to 30 years	6	15.0	6	15.0
31 to 35 years	7	17.5	3	7.5
Over 36 years	<u>0</u>	<u>0.0</u>	<u>1</u>	<u>2.5</u>
Totals	19	47.5	21	52.5

N = 40

Of the 40 respondents, two (5 percent) reported their ages as being under 20 years. One respondent (2.5 percent) in this group had a child with an adequate diet and one respondent (2.5 percent) had a child whose diet was inadequate. In the 21 to 25 year age range there were 15 respondents (37.5 percent), five (12.5 percent) of whom had

children with adequate diets. There were 10 children (25 percent) who had inadequate diets. In the 26 to 30 year range there were 12 respondents (30 percent), six (15 percent) of the respondents had children whose diets were adequate. There were six respondents (15 percent) who had children with inadequate diets. In the 31 to 35 year age range there were 10 respondents (25 percent). Of these 10 respondents there were seven (17.5 percent) whose children had adequate diets. Three respondents (7.5 percent) had children with inadequate diets. In the age range of over 36 years of age, there was one respondent and that child's diet was inadequate. Thirty-seven of the respondents (92.5 percent) reported their age as being between the years of 21 and 35. On the basis of these observations, there seemed to be no relationship between the adequacy of the child's diet and the age of the mother.

Feeding and Eating Patterns

Food Dislikes of the Child

Whether or not the child had food dislikes was compared to the adequacy of the child's diet. See Table VII.

Of the respondents, 25 (62.5 percent) reported that their child had one or more food dislikes. Fourteen of these respondents (35 percent) had children whose diets were adequate. Eleven respondents (27.5 percent), who reported their child as having food dislikes, had children whose diets were inadequate. The 15 respondents (37.5 percent) who reported that their child did not have any food dislikes. Of these respondents, five (12.5 percent) had children with adequate diets. Ten (25 percent) of the respondents

TABLE VII
FOOD DISLIKES OF THE CHILD AND THE
ADEQUACY OF THE CHILD'S DIET

Food Dislikes	Children With Adequate Diets		Children With Inadequate Diets	
	No.	Percent	No.	Percent
No dislikes	5	12.5	10	25.0
Had dislikes	<u>14</u>	<u>35.0</u>	<u>11</u>	<u>27.5</u>
Totals	19	47.5	21	52.5

N = 40

had children with inadequate diets. The proportion of respondents who reported that their children had food dislikes had a greater proportion of children whose diets were adequate. Of the respondents who reported that their child had no food dislikes (37.5 percent), there were twice as many (10 respondents) who had children whose diets were inadequate as compared to those with adequate diets (5 respondents).

Another objective was to determine the relationship between adequacy of the child's diet and eating patterns. The eating patterns considered were: a special or modified diet, regularity of meals, regularity of snacks, and the ability of the child to feed himself. The r value identified positive or negative correlation between adequacy of the diet and selected variables. The level of significance was determined at the 0.05 level. See Table VIII.

TABLE VIII
PEARSON-PRODUCT MOMENT CORRELATION COEFFICIENTS

	Observed Significance (P)	Correlation (<u>r</u>)	Mean Value
Age of young child/ months	0.0001	0.6249	30.00
Morning meal/week	0.5527	0.1252	6.80
Noon meal/week	1.0000	0.0000	7.00
Evening meal/week	1.0000	0.0000	7.00
Mid-morning snack/ week	0.6776	-0.0685	4.15
Mid-afternoon snack/ week	0.1894	-0.2105	5.05

0.05 = significant level

The average age for the youngest child in this study was 2.5 years. A positive correlation ($\underline{r} = 0.6249$) was identified between the age of the child and the adequacy of the diet. This was significant at the 0.05 level. As the age of the child increased, the adequacy of the diet increased for the children in this study.

The mean number of times, per week, the children had a morning meal was 6.80. There was a positive correlation ($\underline{r} = 0.1252$) between number of morning meals eaten in a week and adequacy of the child's diet. This was not significant at the 0.05 level. The mean number of times, per week, noon and evening meals were consumed was 7.0. A

positive correlation ($r = 0.0000$) was identified between the number of noon and evening meals and the adequacy of the child's diet. This was not significant at the 0.05 level.

The average number of times, per week, the children had a mid-morning snack was 4.15 times. A negative correlation ($r = 0.2105$) was identified between the adequacy of the child's diet and the number of times, per week, the child had a mid-afternoon snack. This was significant at the 0.05 level.

Another objective was to determine the sources of information available to and used by the mother. The following question was read to the mother: "If you desired nutrition information, where would you seek it?" There were nine choices and the mother was instructed that she could make as many selections as appropriate to her situation.

Of the 40 mothers who responded, the most often selected choice was the family physician, with 33 mothers indicating this source of information. The responses of 20 mothers (50 percent) identified that the two sources they most often used were magazines and reading package labels. Fifteen mothers (37.5 percent) reported having attended a prenatal class at one time. Enrolling in either a course in nutrition or an extension course was listed as fifth, with 15 mothers (37.5 percent) reporting this source. Five mothers (12.5 percent) stated that they would seek nutrition information from either a family member or newspapers.

Nutrition books at the library were listed by four mothers (10.0 percent) and two mothers (5 percent) listed friends as a source of information. Only one mother (2.5 percent) indicated that she would seek information concerning nutrition from the television. See Table IX.

TABLE IX
SOURCES OF NUTRITION INFORMATION
USED BY THE MOTHER¹

Source	Number Selected	Percent
Family physician	33	82.5
Magazines	20	50.0
Reading package labels	20	50.0
Prenatal class	15	37.5
Course in nutrition	15	37.5
Family	5	12.5
Newspapers	5	12.5
Nutrition books at library	4	10.0
Friends	2	5.0
Television	1	2.5

¹The 40 respondents were asked by the interviewer to identify all resources which they would seek-out if they desired nutrition information. Most of the respondents indicated four or more resources which they would use for this information. Consequently, the total frequency of selections total more than 40.

Another objective was to determine if there was a relationship between the findings of this study and other studies dealing with factors which influence dietary adequacy of children. Background information of mother and child, eating patterns of the child, and adequacy of the child's diet of this study was compared to the findings of other studies (4), (13), (20), (34).

The study of Eppright (11), was conducted to determine the relationship between environmental characteristics and food habits. Eppright ascertained that the majority of mothers: were 25 to 35 years old, had an average of two children in the family, were not employed outside the home, had an annual income after taxes of \$5,000 to \$7,000, had obtained some formal nutrition education, but relied mostly on lay sources of information for feeding their families, and the physician was the principal source of information for offering nutritional guidance.

In comparison, the results of the study conducted by this researcher revealed that the majority of mothers: were 21 to 35 years old, had an average number of one child in the family, were not employed outside the home, had an annual income before taxes of under \$8,999, and relied most heavily on the family physician as a source of nutrition information. The major difference between the two studies was the size of sample.

However, in the studies by Eppright (14), they did find a significant correlation between adequacy of the diet and income, number in the household, and education of the mother. In order of importance, the variables were income, number in the household, money spent for food, and level of education of the mother.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to investigate the relationship between the adequacy of the preschool child's diet and selected variables. Analysis of the findings were used as a basis for making suggestions and recommendations for nutrition education. A review of the literature revealed the findings of nutritional status studies of children.

The selected variables included in this study were: household annual income, mother's educational background, child's medical problems, number of children in the family, employment of the mother, age of the youngest child, age of the mother, and the mother's marital status. The relationship between the adequacy of the child's diet and regularity of meals, regularity of snacks, food dislikes, and special or modified diet of each child was also determined. All of the information was obtained from mothers of the selected families.

A total of 40 families living in Stillwater, Oklahoma participated in the study. The mailed test instrument was pretested with 20 mothers also living in Stillwater, Oklahoma. The data were collected by personal interviews.

The responses of the mothers were analyzed to determine the results of the study using the Pearson Product-Moment Correlation Coefficient and by frequency and percentages. The 24-hour recalls

of the children's diets were analyzed by the computer in accordance with a program developed by the Food, Nutrition, and Institution Administration Department at Oklahoma State University to determine the adequacy of the diet. The amount of calories, protein, calcium, iron, vitamin A, and ascorbic acid intake for each child was evaluated by the 1974 RDA.

Summary of Findings

The results of the analysis of the 24 hour recall by the 1974 RDA identified that of the 40 children, 19 (47.5 percent) had adequate diets. Twenty-one children (52.5 percent) were found to have inadequate diets.

The majority of the mothers: were between the ages of 21 and 35, had completed four years of college, had one child in the family, were not employed outside of the home, were currently married, and reported an annual household income of under \$8,999.

In regard to the adequacy of the child's diet and household annual income the findings showed no relationship. However, the evidence suggests that as income decreases, the proportion of inadequate diets of the children are likely to increase. There seemed to be no association between the educational background of the mother and the adequacy of the child's diet. However, the proportion of children's diets which were adequate was greatest for the respondents who had completed four years of college. Those respondents who had completed four years of college had the greatest proportion of children with adequate diets. The evidence suggested that there seemed to be no relationship between the number of children in the

family and adequacy of the diet. The majority of the respondents had only one child in the family. There seemed to be no relationship between maternal employment and the adequacy of the child's diet. However, the evidence suggests that the proportion of mothers who were not employed outside of the home tended to have a greater proportion of children with adequate diets. In regard to age of the mother and adequacy of the child's diet, there seemed to be no association. Thirty-seven respondents (82.5 percent) reported their age as being between the years of 21 and 35.

There did seem to be a relationship between the adequacy of the child's diet and food dislikes. The proportion of respondents who reported that their child had food dislikes had a greater proportion of children whose diets were adequate. Of the respondents who reported that their child had no food dislikes (37.5 percent), there were 10 respondents (25 percent) who had children with inadequate diets and five respondents (12.5 percent) who had children with adequate diets.

According to the Pearson Product-Moment Correlation Coefficient, there was a positive correlation between the age of the child and the adequacy of the diet. As the age of the child increased, the adequacy of the diet increased. There were no children who had medical problems and all the mothers reported their marital status as married, so there was insufficient data to determine the relationship between the adequacy of the child's diet and these variables.

The regularity of meals and adequacy of the diet showed no correlation ($r = 0.0000$). In regard to snacking and adequacy of the diet, the mid-morning snack had no effect ($r = -0.0685$). However,

there was a significant negative correlation between the adequacy of the diet and mid-afternoon snacking ($r = -0.2105$). As the frequency of mid-afternoon snacking increased, the adequacy of the diet tended to decrease.

In regard to the sources of nutrition information most widely reported utilized by the mother, the family physician was first. The respondents reported magazines as the second most widely used sources. Reading package labels was the third source reported by the mothers, with prenatal classes and course in nutrition was reported as fourth in importance for seeking nutrition information.

In regard to the findings from other studies done in this area, the amount of money spent for food was more highly correlated with adequacy of the diet than were family income, number in the household, or education of the mother. In order of importance was income, number in the household, money spent for food, and level of mother's education.

Recommendations for Nutrition Education

On the basis of the findings and conclusions of the study, the following recommendations are proposed:

1. Pamphlets, handouts, and leaflets be placed in the physician's office for the mothers to encourage supplemental reading about nutrition.
2. More articles in the layman's magazines written by qualified nutritionists and dietitians.
3. Nutrition education should be a component of prenatal classes and the physician's encourage their patients to

- attend a prenatal class.
4. Focus of nutrition education for young mothers be directed toward meal planning for adequate inclusion of iron, vitamin A, ascorbic acid, and calcium for children.
 5. The findings suggest possible medias (physician, layman's magazines, and clarification of package labels for the consumer) which could be utilized for nutrition information and education.
 6. Focus of nutrition education for young mothers be directed toward prevention of obesity in the preschool child.

Recommendations for Further Study

On the basis of the findings and conclusions of this study, the recommendations proposed by the researcher are:

1. The interview be utilized in a wider geographical area.
2. The same methods and procedures be utilized with a larger sample and statistically analyzed to determine if the relationship between the selected variables and adequacy of the diet remains consistent with the findings of this study.
3. The results of the study indicate that further investigations in regard to snacking and adequacy of the child's diet would prove beneficial.
4. Further studies in the areas of age of the mother, income level, and adequacy of the child's diet would prove beneficial.
5. A study to determine which media would be most beneficial in providing nutrition education for mothers.

SELECTED BIBLIOGRAPHY

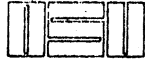
- (1) Babbie, E. R.: Survey Research Methods. Belmont, California: Wadsworth, Publishing Co., 1973.
- (2) Beal, V. A.: Nutritional studies during pregnancy. J. Am. Dietet. A. 58:321, 1971.
- (3) _____.: Breast- and formula-feeding of infants. J. Am. Dietet. A. 55:31, 1969.
- (4) _____.: Nutrition during infancy and early childhood. Nutrition News, Vol. 33, December, 1970.
- (5) Bowes, H. N. and Church, C. F.: Food values of portions commonly used. Philadelphia: J. B. Lippincott Co., 1970.
- (6) Brook, C. G.: Evidence for a sensitive period in adipose cell replication in man. Lancet 2:624, 1972.
- (7) Burman, D. Brit. J. Haemat. 20:243, 1971.
- (8) Christakis, G., editor. Nutritional Assessment in Health Programs. Based on Proceedings of the Conference on Nutritional Assessment, Washington, D. C., 1974.
- (9) Compton, N. H. and Hall, O. A.: Foundations of Home Economics Research. Minneapolis: Burgess Publishing Co., 1972.
- (10) Eid, E. E.: Follow-up study of physical growth of children who had excessive weight gain the first six months of life. Brit. Med. J. 2:74, 1970.
- (11) Eppright, E. S.: Eating behavior of preschool children. J. Nutr. Ed. 1:18, 1968.
- (12) Fomon, S. J.: Infant Nutrition. Philadelphia: W. B. Saunders Co., 1967.
- (13) Fox, H. M., Fryer, B. A., Lamkin, G. H., Vivian, V. M., and Eppright, E. S.: The North Central Regional Study of Diets of Preschool Children. 1. Family Environment. J. Home Econ. 62:241, 1970.
- (14) _____.: The North Central Regional Study of

- Diets of Preschool Children. 2. Nutrition Knowledge and Attitudes of Mothers. J. Home Econ. 62:327, 1970.
- (15) _____.: The North Central Regional Study of Diets of Preschool Children. 3. Frequency of eating. J. Home Econ. 62:407, 1970.
- (16) Gray, A. E.: Methods for determining the nutritional status of populations. M. S. thesis. Oklahoma State University, 1941.
- (17) Guyton, A. C.: Basic Human Physiology. Philadelphia: W. B. Saunders Co., 1971.
- (18) Hirsch, J. and Knittle, J. L.: Cellularity of obese and non-obese human adipose tissues. Fed. Proc. 29:1516, 1970.
- (19) Home and Garden Bulletin, Number 72. Nutritive Value of Foods. United States Department of Agriculture, Washington, D. C., 1971.
- (20) Huenemann, R. L.: Environmental factors associated with preschool obesity. J. Am. Dietet. A. 64:480, 1974.
- (21) Jenkins, D. D.: New legislation for child nutrition programs. Food and Nutrition. Vol. 6, No. 1, February, 1976.
- (22) Johnson, F. M.: Guiding students and families in a cooperative effort toward improved nutrition. M. S. thesis, Oklahoma State University, 1954.
- (23) Kelsay, J.: A compendium of nutritional status studies conducted in the U. S., 1957-67. J. Nutr. Supp. I, 1:99, 1969.
- (24) Krehl, W. A.: Interpretation of nutrition survey data. Amer. J. Clin. Nutr. 17:191, 1965.
- (25) National Dairy Council: Iron-deficiency anemia in infants and preschool children. Vol. 43, No. 1, Jan.-Feb. 1972.
- (26) Owen, G. M. and Kram, K. M.: Nutritional status of preschool children in Mississippi. J. Am. Dietet. A. 54:490, 1969.
- (27) _____., Filler, L., Maresh, M., and Fomon, S. J.: Sex related differences in body composition in infancy. Part II. Human Development. Philadelphia: W. B. Saunders Co., 1966.
- (28) _____., Kratt, K. M., Garry, P. J., Love, J. E., and Lubin, A. H.: A study of nutritional status of preschool children in the United States, 1968-70. Mimeo report.

- (29) Reiss, A. J., Duncan, O. D., Hatt, P. K., and North, C. G.: Occupations and Social Status, New York: Free Press of Glencoe, Inc., 1961.
- (30) Recommended Dietary Allowances, 1968. Food and Nutrition Board, National Academy of Sciences--National Research Council, Washington, D. C.
- (31) Recommended Dietary Allowances, 1974. Food and Nutrition Board, National Academy of Sciences--National Research Council, Washington, D. C.
- (32) Robinson, C. H.: Normal and Therapeutic Nutrition. New York: MacMillan Co., 1967.
- (33) Sanjur, D., and Scoma, A. D.: Food habits of low-income children in northern New York. J. Nutr. Educ. 2:85, 1971.
- (34) Steele, P. D. and Eagles, J. A.: Food and nutrient intake of children from birth to four years of age. Nutrition Program News. Sept.-Oct. 1971.
- (35) Steele, R. G. and Torrie, J. H.: Principles and Procedures of Statistics. New York: McGraw-Hill, 1960.
- (36) Stine, O. C., Saratsiotis, J. B. and Furno, O. F.: Appraising the health of culturally deprived children. Amer. J. Clin. Nutr. 20:1084, 1967.
- (37) Suter, C. B.: Development of an instrument for the assessment of food-related values of low-income mothers of preschool children. M. S. thesis, Oklahoma State University, 1971.
- (38) Taber, C. W.: Taber's Cyclopedic Medical Dictionary, 11th ed., F. A. Davis Co., Philadelphia, 1971.
- (39) Ten-State Nutrition Survey in the United States, 1968-1970, U. S. Dept. Health, Education, and Welfare. Preliminary Report to Congress, April, 1971.
- (40) Walker, M. A.: Consumer and Food Economics Institute., Nutritional Program News, May-June, 1975.
- (41) Williams, L. O.: The extent of malnutrition and the apparent causes among the children of preschool age of Stillwater, Oklahoma. M. S. thesis, Oklahoma State University, 1928.
- (42) Year One. Nutrition, Growth, Health. Ross Laboratories, Columbus, Ohio, 1975.

APPENDIX A

PRETEST CORRESPONDENCE



Oklahoma State University

Department of Food, Nutrition and Institution Administration

STILLWATER, OKLAHOMA 74074
(405) 372-6211, Exts. 6007, 6091

March 30, 1976

Dear

It is known nowadays that many nutrition related conditions and diseases in adulthood could be prevented by good food habits established early in life. It is on this information that I am developing a nutrition education research project.

I am working on my Master's degree in nutrition at Oklahoma State University. The data obtained from your response in this project will provide valuable information for planning future nutrition education programs in regard to feeding young children.

Your name has been obtained through the office of Dr. Edward Shissler. Families have been selected who have at least one child between the ages of one month and four years, as of November 1, 1975.

I will be giving you a call in the next few days to see if you would be willing to assist me with my project. Your participation would consist of a short personal interview, which would be scheduled at your convenience. All information obtained will be kept in strictest confidential, and no identification is required.

Please give this consideration as it is only through your cooperation and effort that the results can be of significance. Thank you for your assistance.

Sincerely,

A handwritten signature in cursive script that reads "Sallie Burrow".

Sallie Burrow

APPENDIX B

INSTRUMENT

PERSONAL DATA

Please check (X) the appropriate answer.

1. My age is:
 - under 20 years
 - 21 to 25 years
 - 26 to 30 years
 - 31 to 35 years
 - over 36 years
2. My marital status is:
 - single
 - married
 - separated
 - divorced
 - widowed
3. The number of children I have is _____.
4. Sex and age of each child: _____

5. I am presently employed outside my home
 yes no
6. If yes, I am employed
 part-time full-time
7. Which category best represents your hours working away from the home?
 - 8 am to 4 pm
 - 4 pm to midnight
 - midnight to 8 am
8. If employed, what kind of work do you do? _____

9. Check the highest level of education completed:
 - through grade school (grades 1-6)
 - through junior high (grades 7-9)
 - through high school (grades 10-12)
 - 1 year of college
 - 2 years of college
 - 3 years of college
 - 4 years or more (B.S. or B.A. degree)
 - Master's degree
 - Doctor's degree
 - other, specify _____
10. My approximate household annual income (including husband's income) before taxes is:
 - under \$7,000
 - \$7,000 to \$8,999
 - \$9,000 to \$10,999
 - \$11,000 to \$12,999
 - \$13,000 to \$14,999
 - over \$15,000
11. I am _____ (am not _____) pregnant at this time.
12. If you desired nutrition information where would you seek it?

<input type="checkbox"/> newspapers	<input type="checkbox"/> family physician
<input type="checkbox"/> television	<input type="checkbox"/> course in nutrition
<input type="checkbox"/> magazines	<input type="checkbox"/> extension course in nutrition
<input type="checkbox"/> friends	<input type="checkbox"/> prenatal course
<input type="checkbox"/> family	<input type="checkbox"/> reading package labels
	<input type="checkbox"/> other, specify _____
13. If you have ever had a course in nutrition, where and when was it?

FEEDING AND EATING PRACTICES

Please check (X) the appropriate blank. Remember, this is to be filled out for your youngest child.

1. Sex and age of child considered in this questionnaire: _____
2. Does your child eat at the same times each day?
 yes no
3. Does your child eat:
a morning meal yes no
a noon meal yes no
an evening meal yes no
4. How many times, per week, does your child eat:
a morning meal _____
a noon meal _____
an evening meal _____
5. Does your child eat:
mid-morning snack yes no Type of snack: _____
mid-afternoon snack yes no _____
bedtime snack yes no _____
6. How many times, per week, does your child eat:
 mid-morning snack
 mid-afternoon snack
 bedtime snack
7. Does your child regularly eat any meals away from home? (child care center, babysitter, pre-school, etc.)
 yes no
If yes, which meal (s) does your child eat away from home?
 breakfast
 lunch
 dinner
If yes, how many times, per week, does your child eat away from home?
_____ number of times, per week
8. Would you describe your child's appetite as:
 generally good
 generally fair
 generally poor
9. What time of day is your child usually the hungriest:
 morning
 noon
 evening
10. Does your child have any food dislikes:
 yes no
If yes, please list: _____
11. Is your child on a diet now?
 yes no
If yes, is the diet for any of the reasons listed below?
 weight reduction
 weight gaining
 diabetes
 ulcer
 kidney disease
 PKU
 hypertension
 allergy, specify _____
 other, specify _____
12. Can your child feed himself?
 yes no

13. If your child can feed himself, does he use:
 fingers
 spoon
 spoon and fork
 fingers and spoon
14. Can your child use a cup or glass alone?
 yes no
15. Does your child drink milk or formula from a bottle with a nipple?
 yes no
- If yes, how often, per day? _____
 If yes, what times of the day or night? _____
16. Are you breast feeding your child now?
 yes no
17. Did you breast feed your child?
 yes no
- If yes, for how long? _____
18. Is your child eating strained or chopped baby foods?
 yes no
- If yes, which ones:
 cereals egg
 formula vegetables
 fruit juices vegetable-meat combinations
 fruits desserts
 meats other, specify _____
19. Are you preparing strained or chopped baby food yourself?
 yes no
- If yes, which ones? _____
20. Is your child receiving vitamins, minerals, or multivitamins?
 yes no
- If yes, please specify: (example: Vitamin A, iron, etc.)

- If yes, were these prescribed by a physician?
 yes no
21. Is your child taking any other medications?
 yes no
- If yes, please list _____
22. Does your child receive a mid-morning and/or mid-afternoon snack
 (including a bottle)?
 yes no
- If yes, please specify all foods. _____

23. I give my child something to eat (other than regular meals)
 (example: candy, cookies, crackers, etc.):
 when the child has been good
 to pacify my child
 after a visit to the doctor
 if my child took a nap
 to stop the child's crying
 to show my love for the child
 to show the child approval
 other, specify _____
24. What kinds of food do you give your child at these times? Please
 list. _____

Please check the appropriate blank for the degree of general acceptance your youngest child has for any type of preparation of the foods listed below, and fill in the number of times, per week, the child eats the food.

Food	Times Eaten	Child's Acceptance		
		Poor	Fair	Good
MILK & MILK PRODUCTS:				
whole milk				
skim milk				
cottage cheese				
yellow cheese				
ice cream				
sherbet				
puddings				
custard				
MEAT, EGGS, FISH:				
bacon				
beef:				
ground				
other				
chicken				
lamb				
liver				
pork				
ham				
luncheon meat:				
bologna				
frankfurter				
vienna sausages				
fish				
VEGETABLES:				
raw:				
tomatoes				
lettuce				
celery				
carrots				
cooked:				
carrots				
green beans				
peas				
spinach				
corn				
beets				
broccoli				
asparagus				
Brussels sprouts				
potatoes:				
white				
sweet				
dried beans				
pork and beans				
FRUITS:				
fresh fruit				
canned fruit				
fruit juice				
raisins				
GRAIN PRODUCTS:				
biscuits				
french bread				
raisin bread				
white bread				
whole wheat bread				
rye bread				
cakes				
cookies				
corn muffins				
saltine crackers				
graham crackers				
doughnuts				
pie				
popcorn				
pretzels				
dinner rolls				
dry cereal				

Please record everything your child will eat and drink in a 24 hour period. This record is to be kept on your youngest child. Include snacks, meals away from the home, regular meals, and the amounts. This is to be recorded from when the child gets up in the morning to when he goes to bed at night. Be very descriptive of each food and the amount, describe how the food was prepared (the type of cooking such as baked, fried, broiled, etc.), the cooking method (waterless, pressure cooker, crock pot, etc.), and how it was served (with butter, cream sauce, gravy, cheese sauce, etc.).
 Example: Milk, skim with 2 T. chocolate syrup, 1 cup.

TIME	FOOD	AMOUNT	CODE
Breakfast			
Mid-morning			
Lunch			
Mid-afternoon			
Dinner			
Bedtime snack			

APPENDIX C

POST-SCRIPT TO PRETEST LETTER

As a post-script, I would like to thank you for taking the time to complete the questionnaire. It is essential that you answer all the questions and I would appreciate your comments to the following.

Were the instructions clear?

Were the questions clear?

Did all of the questions seem relevant?

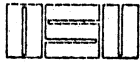
Would you make any changes, additions, deletions to the form?

Comments:

The amount of time it took to complete the questionnaire _____

APPENDIX D

LETTER SENT TO SAMPLE



Oklahoma State University

Department of Food, Nutrition and Institution Administration

STILLWATER, OKLAHOMA 74074
(405) 372-6211, Exts. 6007, 6091

Dear

It is known nowadays that many nutrition related conditions and diseases in adulthood could be prevented by good food habits established early in life. It is on this information that I am developing a nutrition education research project.

I am working on my Master's degree in nutrition at Oklahoma State University. Your response to this questionnaire will provide valuable information for planning future nutrition education programs in regard to feeding young children. It is through your cooperation and effort that the results can be of significance.

Your name has been obtained through the office of Dr. Edward Shissler. Families have been selected who have at least one child between the ages of one month and four years, as of November 1, 1975.

No identification is required on the questionnaire and all information will be kept confidential. The number on the form is only for the purpose of recording that your response has been received. Please return the questionnaire by March 22, 1976. A self-addressed, stamped envelope has been enclosed for your convenience. No postage is necessary.

Your response is essential to the success of the project. Thank you for your assistance.

Sincerely,

Sallie Burrow

APPENDIX E

NRC RECOMMENDED DAILY ALLOWANCES

NRC RECOMMENDED DAILY ALLOWANCES (1974)

	Calories (Kcal)	Protein (g)	Vitamin A (RE)	Vitamin C (mg)	Calcium (mg)	Iron (mg)
Infants 0.0-0.5	kgx117	kgx2.2	420	35	360	10
0.5-1.0	kgx108	kgx2.0	400	35	548	15
Children 1-3	1,300	23	400	40	800	15

VITA

Sallie Noble Burrow

Candidate for the Degree of

Master of Science

Thesis: THE RELATIONSHIP OF SELECTED VARIABLES TO THE NUTRITIONAL ADEQUACY OF THE PRESCHOOL CHILD'S DIET

Major Field: Food, Nutrition and Institution Administration

Biographical:

Personal Data: Born in Fort Worth, Texas, June 27, 1951, the daughter of Epsy and Edwin Burrow.

Education: Graduated from Muskogee Central High School, Muskogee, Oklahoma, in 1969; attended Christian College for Women, Columbia, Missouri and received a two year Associate Arts Degree; graduated from University of Arkansas, Fayetteville, Arkansas in 1974 with a Bachelor of Science degree in Home Economics with a major in Food, Nutrition, and Institution Administration; and completed the requirements for the Master of Science degree in July, 1976 from Oklahoma State University.

Professional Experience: In the summer of 1974 worked as a diet aide, assisting with modified diets, cafeteria, continuing care unit, and tray assembly; from July, 1974 to June, 1975 worked as a Dietitian's Assistant and Therapeutic Supervisor at the Oklahoma Osteopathic Hospital in Tulsa, Oklahoma, which consisted of instructing all patients with modified diets and liaison between patient and physician; from September, 1975 to January, 1976 worked as a Dietitian's Assistant at the Stillwater Municipal Hospital rewriting existing three week cycle regular menu and adapted the cycle to five types of modified diets.