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BEHAVIOR OF CHILDREN WITH DOWN'S SYNDROME.

The Ohio State University, Ph.D., 1972
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DIETARY ADEQUACY, FEEDING PRACTICES AND EATING
BEHAVIOR OF CHILDREN WITH DOWN'S SYNDROME

DISSERTATION

Presented in Partial Fulfillment of the Requirements
for the Degree Doctor of Philosophy in the
Graduate School of The Ohio State University

by

Susan Davies Calvert, B.S., M.S.

* * * * *

The Ohio State University

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CHAPTER I

INTRODUCTION

National attention is currently focused on nutrition, particularly the dietary adequacy, feeding practices and eating behavior of children. Results reported in longitudinal and Cross Sectional studies have provided selected information concerning what children of various ages eat, as well as possible influences on dietary patterns. From such research, information useful in designing and implementing nutrition education programs has been attained. Although this information is available for so-called "normal" children, few studies have been concerned with dietary adequacy, feeding practices and eating behavior of children with developmental disabilities.

In the early 1960's recommendations from the President's Panel on Mental Retardation (Covert, 1965) stimulated interest and action in services and disciplines concerned with welfare of the retarded. Improved techniques and scientific advances have permitted the survival of many handicapped infants who in earlier years would have succumbed at birth. As a result, there is an increasing number of families who need guidance in managing and caring for their mentally retarded children.

Professional personnel in the medical, social and educational disciplines have been actively involved in research and service activities for children with mental retardation. Except for extensive research on children with phenylketonuria, there is a paucity of reported research concerned with nutrition of children with mental

retardation. There is substantial evidence from laboratory studies on animals and humans that malnutrition of the mother or the offspring in certain critical prenatal and neonatal periods impairs physical and mental development and may result in permanent mental retardation (Gordon, 1968; Winick, 1968; Craviato, 1966). Due to a multiplicity of handicaps these children frequently have difficulty mastering eating techniques and skills (Walker, 1955; Christopher, 1971). Little is known, however, about dietary adequacy, feeding practices or eating behavior of these children and even less is known about factors related to these practices and behavior.

A conservative estimate of persons with mental retardation in the United States approaches three per cent; 126,000 babies born each year will be retarded (Covert, 1965). There are numerous types of diseases and conditions known to produce damage to the brain and thus result in varying degrees of mental retardation. Each type of disability has unique handicaps which in turn may have different nutritional consequences for the child (Walker, 1955).

In the past, parents of infants with mental retardation were encouraged to place their child in an institution immediately after birth. Whenever possible, the current trend is to encourage parents to rear their child at home. Consequently, most institutional studies of the dietary adequacy and behavior of children with mental retardation have limited relevance for the increasing number of such children living at home with their families.

Heber (1970) estimated that one child out of every six or seven hundred children born in the United States suffers from a congenital defect known as Down's syndrome (mongolism). In addition he reported that this condition accounts for five to six per cent of all persons with mental retardation in the nation and ten per cent of those living in institutions. Because of the high incidence of this disability, mentally retarded children with Down's syndrome have been selected for the herein described study.

Statement of the Problem, Objectives and Hypotheses

This study was an investigation of selected factors which influence the dietary adequacy, feeding practices and eating behavior of children with Down's syndrome. The purpose of this research was to determine the effect of the following independent variables: physical limitations of the child, selected aspects of the child's adaptive behavior, selected social characteristics of the family, parental nutrition knowledge and attitudes and sources of maternal nutrition information.

1. An evaluation of the approximate nutrient (protein, carbohydrate, fat, iron, calcium, vitamin A, vitamin D, ascorbic acid and thiamine) and caloric intake of children with Down's syndrome.
2. The identification of feeding practices and eating behavior of children with Down's syndrome.

3. An assessment of the effect of selected independent variables on the dietary adequacy of children with Down's syndrome.
4. An assessment of the effect of dietary adequacy on height, weight and head circumference measurements of children with Down's syndrome.
5. Provision of information helpful in designing nutrition education programs for children with Down's syndrome.

The hypotheses for this research included:

1. The dietary adequacy of children with Down's syndrome will be influenced by the selected independent variables: physical limitations of the child, selected aspects of the child's adaptive behavior, selected characteristics of the family, parental nutrition knowledge and attitudes and sources of nutrition information.
2. Children with Down's syndrome who demonstrate higher levels of adaptive behavior have higher dietary adequacy scores.
3. Children with Down's syndrome whose parents have higher scores on nutrition knowledge and attitude tests have higher dietary adequacy scores.
4. Children with Down's syndrome whose mothers have received any type of nutrition information have higher dietary adequacy scores.
5. Children with Down's syndrome who have high dietary adequacy scores more closely approximate predicted norms for height,

weight and head circumference.

Importance of the Study

Information derived from this investigation has implications for both theoretical and practical issues concerning clinical treatment of children with Down's syndrome. The information derived from this study has implication for interrelating the effect of mental, physical and social variables on dietary adequacy of children with Down's syndrome. The findings obtained are important in interrelating the effects of the mental and physical limitations of the child, selected social characteristics of the family and parental nutrition knowledge and attitudes on the dietary adequacy, feeding practices and eating behavior of children with Down's syndrome. In the past decade nutrition researchers have investigated the influence of nutrition on mental development in children (Winick, 1968; Craviato, 1966; Gordon, 1968). In the present study the opposite relationship, that is, the influence of mental retardation on nutrition has been investigated.

The information obtained will aid in understanding the relationships between dietary variables and specific types of physical impairments such as increased susceptibility to infections, flaccid muscle development and abnormal patterns of growth. Thus the information obtained has potential value for the design and implementation of nutrition education programs directed to families of children with mental retardation. Application of parental nutrition knowledge is affected by the child's difficulties in chewing,

swallowing and physical manipulation involved in the process of eating. Because these children are considerably below normal in their mental abilities, special problems such as the reduced ability to communicate and to understand directions greatly complicates the instruction and guidance of the child.

This study will assist in identifying any dietary inadequacies, specific problems related to feeding practices and eating behavior of these children, as well as indicating needs for modifying teaching techniques. Reported research pertinent to these facets of the nutrition of children with Down's syndrome have not been found in the literature.

An investigation of father's influence on the dietary adequacy, feeding practices and eating behavior of the child is one important dimension in this study. Information from both parents provided comparative data on their respective influence on dietary practices and eating behaviors of these children. The information obtained has value for the design and implementation of nutrition education programs directed to families of children with mental retardation. Reeves and Hille (1964) and Phillips (1969) have stressed the needs for nutritionists to become involved in helping children with mental retardation and their families solve problems which impede the attaining an adequate diet.

Definition of Terms

For the purposes of this study, major terms employed have been defined as follows:

1. Mental retardation is sub-average intellectual functioning which manifests itself during the developmental period and is characterized by inadequacy in adaptive behavior (Leland et al., 1967).
2. Down's syndrome (mongolism) is a form of mental retardation due to an abnormality in either the number of structure or chromosomes.
3. Family is considered a mother and father living in the same home with at least one child manifesting Down's syndrome.
4. Dietary adequacy is nutrient and caloric intake rating derived by comparison with the 1968 Recommended Dietary Allowances based on sex and chronological age.
5. Feeding practices include those customary performances related to environment at meal time, family meal patterns and the use of food to control behavior.
6. Eating behavior includes maternal ratings of the child's eating habits and eating problems.
7. Adaptive behavior refers to the effectiveness of the individual in coping with the natural and social demands of his environment. In this study the following aspects of a child's behavior were examined: eating skills, motor development, language development, performance of kitchen duties, persistence, planning and use of time and socialization.
8. Physical impairments are physical defects associated with Down's syndrome which are recognized by the mothers as impairments.

CHAPTER II

REVIEW OF THE LITERATURE

Although Down's syndrome was recognized in the nineteenth century, it was not until 1959 that the cellular defect of this syndrome was identified as alterations in either the number or structures of chromosomes (Lejeune, 1963). Three basic types of chromosomal aberrations may occur: nondisjunction, translocation and mosaic. The most common type of chromosome abnormality in Down's syndrome is nondisjunction, or an extra chromosome. The cells of these patients have 47 chromosomes instead of the usual 46. The extra chromosome is found in chromosome pair 21 and is thus related to the descriptive term trisomy 21. In animal studies, it has been demonstrated that such trisomies develop as a failure of homologous chromosomes to separate during the stages of cell division (Bridges, 1916).

Shortly after the discovery of trisomy 21 it became evident that not all cases of mongolism were characterized by nondisjunction. Polani, et al., (1960) observed a mongol girl with only 46 chromosomes. They postulated that a break occurred in one of the chromosomes and the broken part was transferred and fused to a chromosome of another group. This chromosomal aberration was labeled translocation and accounts for only two to three per cent of all cases of Down's syndrome. This type of aberration is inherited; the translocated chromosomes are carried by a seemingly normal person and passed through several generations.

In a child with mosaic mongolism some cells contain an extra chromosome while the remaining cells contain the normal number. This child will exhibit only some of the characteristics of mongolism. Approximately two per cent of the cases of Down's syndrome are classified as chromosomal mosaics (Cowie, 1966; Penrose and Smith, 1966: 33)

While the pathology is known, exact etiology for the chromosomal aberration in Down's syndrome is still in question. Although the incidence of Down's syndrome in the general population is approximately one in six to seven hundred (Penrose and Smith, 1966: 130; Lillienfeld, 1969: 15; Heber, 1970: 74), the increasing incidence with increasing maternal age is probably the most striking epidemiological characteristic of this condition. Several hypotheses have been offered to explain this phenomenon. One hypothesis supports the view that the uterus becomes less selective with increasing maternal age and is less likely to reject a trisomic ovum (Lillienfeld, 1969: 35). Another hypothesis to explain the increased incidence with maternal age includes the suggestion that the defect in the ovum, which leads to nondisjunction, depends upon a succession of chromosomal accidents. Following an accumulation of "accidents" the meiotic division becomes irregular (Penrose and Smith, 1966).

Physical Impairments

Physical impairments characteristic of Down's syndrome have been described by numerous investigators. Abnormalities of the oral cavity, tongue, teeth, fingers, heart and muscles have been described. The mouth is described as small, the palate high and narrow. The majority

habitually hold their mouths open because of the narrow nasopharynx, enlarged tonsils and adenoids, and protrusion of the enlarged tongue (Penrose and Smith, 1966: 13). Approximately ten per cent of Down's syndrome children have a cleft palate or harelip (McMillan and Kashgarian, 1961).

Other than size, the tongue is considered normal at birth. At approximately two years of age hypertrophy of the vallate papillae and deep fissures begin to develop (Thomson, 1907; Penrose and Smith, 1966: 12). There is some disagreement as to the exact age at which these defects begin to develop and whether these defects cause any abnormality in the sense of taste (Penrose and Smith, 1966: 54).

Early shedding of the deciduous teeth and absence of certain permanent teeth is common in children with Down's syndrome. (Ingalls and Butler, 1953; Barkla, 1963). The deciduous or temporary teeth are late in erupting with completion when the child is approximately four or five years of age. Compared with normal children the pattern of eruption is reported to be irregular with molars appearing before eruption of the incisors (Brown and Cunningham, 1961; Penrose and Smith, 1966: 13).

The permanent teeth tend to appear in a regular pattern. However, eruption is often delayed until nine years of age instead of the normal six years. The teeth of these children have been described as "pegged" shaped or microdontic in structure (Penrose and Smith, 1966: 13). In addition, malocclusion due to the tongue pushing against the lower teeth is common, particularly in children over eleven years of age

(Gosman, 1951; Brown and Cunningham, 1961).

Periodontal disease which destroys the surrounding and supporting tissues of the teeth is characteristic of children with Down's syndrome. Brown and Cunningham (1961) observed this condition in early preschool years and reported this increases in severity with increasing age. While the etiology of the periodontal disease is not established, anoxia, poor hygiene, nutritional factors and susceptibility to infection have been suggested as possible causes (Penrose and Smith, 1966: 14).

Deformities of the hands are frequently observed in children with Down's syndrome. The hands are typically broad and stumpy with the little finger abnormally small and incurved (West, 1901). Hyperextensibility of the finger joints has also been reported in over half of the children with Down's syndrome (Penrose and Smith, 1966: 44). Investigations of the effect of this impairment on the manipulation of eating utensils have not been found in the literature.

Children with Down's syndrome are reported to have a higher incidence of colds and respiratory disease than children in the general population. Nasal mucosa tends to accumulate and present breathing difficulties for these children (Penrose and Smith, 1966: 15, 155). Kaveggia (1969) suggests an increased susceptibility to respiratory infections can be attributed to the anatomy of the nasal passages and to the poor muscle tone exhibited by children with Down's syndrome. In addition, these children apparently do not develop immunity to infection to the same degree as normal children. Kaveggia (1969) also points

out that these children are likely to have gastro-intestinal disorders resulting in either constipation or diarrhea. What impact these disorders may have on dietary adequacy has not been explored.

The presence of heart disease is common in children with Down's syndrome. The incidence of cardiac abnormalities appears to be between 40 and 60 per cent (Penrose and Smith, 1966: 27). Modern cardiac surgery has undoubtedly saved and prolonged the lives of infants who once would have died during the early years (Esen, 1957; Berg, 1960; Rowe and Uchida, 1961). No studies have been conducted on the effects of cardiac disease on the nutrient or caloric intake of children with Down's syndrome.

Generalized hypotonia is characteristic of young children with Down's syndrome. Flabbiness, poor muscle response and lack of muscle tone causes delayed ability to sit, stand and walk. With increasing age of the child hypotonia becomes less severe but is often still observed. In older children and adults this condition results in slow, clumsy and uncoordinated movements (Penrose and Smith, 1966:46; Kaveggia, 1969). Although the cause of hypotonia is not known, Baselon, et al., (1967) suggested the administration of 5-hydroxytryptophan, the metabolic precursor of serotonin, helps correct this disorder.

Kaveggia (1969) has suggested that generalized hypotonia may create nutritional problems for the child with Down's syndrome. Dybwad (1966) reported that parents of these children have difficulty getting their children to chew and swallow. The oral muscles of these children appear to be flaccid. It is his opinion these children are kept on a soft diet far too long, limiting activity of jaw and

mouth muscles which are crucial to the development of language.

In summary, the described physical impairments of the oral cavity, tongue, teeth, hands, and muscles could affect the dietary adequacy, feeding practices and eating behavior of children with Down's syndrome. Furthermore, it is possible susceptibility to infections, and cardiac abnormalities could have nutrition related consequences for the child.

Behavioral Characteristics

Members of the American Association of Mental Deficiency (1961) have urged those practitioners who work with patients exhibiting mental handicaps to diagnose mental retardation on the basis of behavioral criteria, rather than intelligence ratings. Although the scores derived through various tests of intelligence have some value in assessing the academic performance of normal children, behavior descriptions or adaptive behavior ratings are believed to provide a more vivid description of the abilities of a child with mental retardation (Leland, et al., 1967).

In the last decade numerous attempts to measure dimensions of adaptive behavior, that is, the manner in which the individual copes with the natural and social demands of his environment, have been reported. Leland, et al. (1967) reviewed this literature and described the various instruments employed in assessment of adaptive behavior. These researchers reported disagreement concerning domains representative of adaptive behavior. However, the aspects represented by most of the rating scales included some measurement of eating skills, communication skills, self-help and occupational skills, socialization, and

self-direction abilities. These researchers agreed that these aspects should be included in any behavioral rating of children with mental retardation.

Various psychologists have measured adaptive behavior characteristics of children with Down's syndrome. Mein (1961) studied institutionalized children with mental retardation and reported greater noun usage, less usage of complete sentences and a lower level of verbal functioning in children with Down's syndrome compared with children with other types of mental retardation. Numerous other researchers (Murphy, 1956; Lyle, 1959, 1960; Clausen, 1968) have confirmed the observations that children with Down's syndrome are significantly inferior in language ability and communication skills.

Levinson, et al. (1955) studied the developmental patterns of 50 children with Down's syndrome and concluded that the level of language development depended on the individual child. Some children used words at one year whereas others did not develop the skill until six years of age. These investigators concluded that children with Down's syndrome rated lower, began later and progressed more slowly in verbal ability compared to other children studied. Penrose and Smith (1966: 56) observed similar developmental patterns of language.

In a recent conference devoted to the feeding of handicapped children, the relationship between nutrition and language development was discussed (Henderson, 1971). It was concluded that accomplishment of basic feeding skills (sucking, chewing, swallowing) is a prerequisite to adequate speech. However, the impact of language development and

adequate speech on dietary adequacy, feeding practices and eating behavior is unknown.

A child's ability to perform basic eating related skills is considered an important aspect of adaptive behavior. In older children, simple meal preparation is measured as important aspect of adaptive behavior (Nihira et al., 1967; Leland et al., 1967; Gunzburg, 1965). Although most researchers report ratings on self-help skills, eating skills are not reported an entity separate from other skills.

Various scales are used to measure adaptive behavior. For example, the Vineland Social Maturity Scale and the Peterson Behavior Rating Schedule measure similar kinds of self-help skills. Children with Down's syndrome score higher in self-help skills on these two scales than other types of children with mental retardation (Polotzky and Gregg, 1942; Domino et al., 1964). There is disparity between the ratings of children with Down's syndrome on these scales and scales which measure overall intellectual functioning.

Physical, social and psychological factors influence the child's ability to perform those skills assessed by various tests and scales (Christopher, 1971). Results of various studies have shown children with Down's syndrome reared at home become independent and relatively self-sufficient whereas institutionalization adversely affects the development of desirable behavior traits (Stimson et al., 1968; Shotwell, 1964; Centerwall and Centerwall, 1960; Kugel and Reque, 1961).

Socialization patterns and self-direction abilities are other aspects of the child's behavior characteristics. The few researchers who concentrated on these facets of behavior appear to be in general agreement that Down's syndrome children display a stereotyped pattern. Down, for whom this syndrome is named, originally described these children in the following manner:

. . . They have a strong sense of the ridiculous; this is indicated by their humorous remarks and the laughter with which they hail accidental falls, even of those to whom they are most attached. Another feature is their great obstinacy -- they can only be guided by consummate tact. No amount of coercion will induce them to do what which they have made up their minds not to do. Sometimes they initiate a struggle for mastery and the day previous will determine what they will or will not do. Often they will talk to themselves, and they may be heard rehearsing the disputes which they think will be the future of the following day. . . Whether it be the question of going to church, to school, or for a walk discretion will often be the better part of valour, by not giving orders which will run counter to the intended disobedience, and thus maintaining the appearance of authority. They are always amiable both to their companions and to animals. . .
(Penrose and Smith, 1966: 54).

This description of the happy, cheerful, good-tempered, easily amused, well-adjusted, but obstinate Down's syndrome child has been reassessed and confirmed in recent research studies (Domino, 1965; Domino, Goldsmith and Kaplan, 1964; Silverstein, 1964).

Domino, et al., (1964) investigated socialization aspects of behavior of institutionalized children with Down's syndrome and reported the children rated higher on the "general adjustment" factor than children with other forms of mental retardation. These children also rated higher on variables related to responsibility, cooperation, cheerfulness and gregariousness. The researchers described these

children as affectionate, friendly, warm, sociable, open, playful and relaxed.

A higher rating on socialization may depend on a number of factors. For example, children reared in the home were found to be socially superior to institutionalized children (Shotwell and Shipe, 1964; Centerwall and Centerwall, 1960; Menolasion, 1965). Gibson and Pozsonyi (1965) found temperament and socialization characteristics to differ with the chromosome subtype of the child; the translocation child was more often rated passive, cooperative and introverted while the trisomy child was more often rated aggressive, obstinate and extroverted.

The effects of level of socialization rating of a child on dietary adequacy, feeding practices and eating behavior have not been previously investigated. Coffey (1971) has suggested, however, that characteristics such as cooperation and consideration are important influences on a child's feeding patterns.

In summary, behavioral characteristics of children with Down's syndrome appear to vary with the specific trait being measured. A low rating in verbal ability is generally observed. Although performance on self-help and occupational skills depends on the age and environmental stimulation received, children with Down's syndrome appear to rate high on these behavioral domains. Various nutrition researchers have stressed the importance of considering behavioral characteristics of individuals in relationship to nutritional variables (Lund and Burke, 1969; Aldrich, 1965; Eppright, et al., 1969). Other researchers have

advocated the inclusion of this important dimension in studies of children with mental retardation (Dybwad, 1966; Walker, 1955; Abel, 1950).

Selected Social Characteristics of the Family

Multiple factors influence dietary adequacy, feeding practices and eating behavior of all members of the family. Factors which have been studied include level of income, amount of formal education, occupation and regional-cultural influence. A survey of the food intake of a representative sample of 14,500 men, women and children in the United States in the Spring of 1965 showed that low income had an effect on dietary adequacy. Researchers found that 36 per cent of the families with incomes under \$3,000.00 had poor dietary ratings while only nine per cent of families with incomes of \$10,000 and over had poor ratings (USDA, 1965). Furthermore, average values for intake of food energy and three nutrients were generally lower when compared with the recommended allowances in the Southern region of the United States.

Owen and Kram (1969) assessed the nutritional status of preschool children in Mississippi. The effect of income was studied by comparing the dietary intake of preschool children whose families were in the lowest income category (less than \$500 per person per year) with preschool children whose families had incomes above this level. Intakes of calcium, ascorbic acid, vitamin A, and protein appeared inadequate for children in the low income group.

A study of the nutritional status of 40 children, of which half were from families classified as middle and upper middle class and half from families receiving public assistance (Kerrey, et al., 1968). Although diets were generally adequate at both income levels, dietary intake as well as nutritional status were rated higher for children from families of higher social class. Also, children in upper economic levels scored higher on height and other anthropometric measures.

The relationship between mothers' education level and dietary adequacy of their children has been examined in a few studies. In a study of more than 4,000 six-month old infants, Filer and Martinez (1964) reported higher nutrient intake with the exception of calcium and vitamins C and D, if the mothers had graduated from high school. Similarly, Futrell, et al., (1971), in their survey of Negro preschool children, found dietary intake and nutritional status paralleled the mothers' educational attainments. Intake of calories and ascorbic acid was significantly greater when mothers' education was above the eighth grade.

A comprehensive study in which the nutrient quality of the diet, food practices and physical growth of a representative sample of 3,444 preschool children in the North Central region of the United States has added new data concerning the effect of socioeconomic factors on nutritional well-being. These researchers showed that the amount of money these mothers spent for food was more highly correlated with energy value and nutrient content of the diet than were family income, number in household or education of the mother. The only

nutrient consistently and significantly associated with income was ascorbic acid. With increasing education of the mother the intakes of calcium, iron, thiamine, riboflavin increased significantly. Thus, in general, the better educated mothers apparently emphasized foods high in vitamins and minerals more than those high in energy (Eppright et al., 1970). Other socioeconomic factors such as urbanization, mobility of the family and number and ordinal position of children in the family influence consumption of various nutrients (Handel et al., 1965; Morgan, 1965; Lund and Burke, 1969).

Current nutrition research appears to be concentrated predominately with children of low socioeconomic status. Although this research includes some children with defined health problems, no studies with primary emphasis on effect of socioeconomic factors on nutrition of children with Down's syndrome have been conducted.

Nutrition Knowledge, Attitudes and Sources of Nutrition Information

In addition to studies in which the effects of family socioeconomic factors on dietary adequacy have been examined, there have been a few attempts to expand the understanding of behavior related to food through investigations of the nutrition knowledge and attitudes of mothers.

The first such study reported was an investigation of the nutrition knowledge of homemakers in Virginia (USDA: 1948). Researchers found homemakers who had some knowledge of nutrition were likely to serve "an adequate daily menu" to family members. To gain additional

information on nutritional knowledge of homemakers, Young, Berresford and Greer (1956) conducted a similar study in two urban New York cities. The adequacy of diets planned for the family appeared to be related to the homemakers' nutrition knowledge.

A more detailed study relating nutrition knowledge and attitudes to dietary adequacy and feeding practices has been reported by Eppright et al., (1970). These reserachers assessed the nutrition knowledge of 2,000 mothers in the North Central Region of the United States. They reported that mothers of children whose diets were classified in the lowest ten per cent with respect to nutritional quality had a relatively low level of nutrition knowledge. In several other studies involving specific age groups of children or different ethnic groups as subjects, a positive correlation between increased knowledge of nutrition and better dietary practices has been demonstrated (Cornely, Bigmond, Watts, 1963; Wilson, 1971; Dwyer, Feldmond and Mayer, 1970). Criteria used in defining and assessing nutrition knowledge differ among these studies; therefore, direct comparisons cannot be made except in terms of general trends.

Also of significance is the suggestion of the relationship between attitudinal factors and nutrient quality of the child's diet. Eppright, et al., (1970) found children whose mothers expressed permissive attitudes about feeding children were less likely to have an adequate diet. Highest food energy intakes, on the other hand, were associated with a high degree of permissiveness, suggesting that diets high in calories may have resulted from unrestricted use of the "empty calorie"

foods. Most of the mothers in this study expressed favorable attitudes toward nutrition, that is, they felt nutrition was important. However, these attitudes were without influence on the nutritional quality of the child's diet.

Lund and Burke (1969) also measured the effects of nutritional knowledge and attitudes on the dietary intake of vitamin A and ascorbic acid. They reported that mothers' knowledge about nutrition appeared to influence the child's intake of vitamin A and ascorbic acid. However, the mothers' attitudes toward specific foods rich in vitamin A and ascorbic acid had greater influence on the children's intakes than nutrition knowledge related to the nutrients as such.

Information which provides both the sources and relative importance of delineated sources is important in designing nutrition education programs. Young, Beeresford and Greer (1956) studied 635 homemakers and found one-third of these women reported they had received some type of nutrition education. The most frequently mentioned sources of information on food and nutrition were magazines and newspapers.

Reflecting, perhaps, the increased support of nutrition education programs, Fox, et al., (1970) and Lund and Burke (1969) reported that approximately three-fourths of the mothers in their studies had obtained some formal type of nutrition education. However, in both studies mothers relied mainly on lay sources of information for feeding their families; mother, relatives and physician were listed as persons from whom they obtained nutrition information. Magazines, newspapers and books particularly cook books, were rated the most used sources for

reference materials related to nutrition.

The influence of fathers on the eating patterns of the child has also been studied (Eppright, et al., 1969; Bryan and Lowenberg, 1958). Emphasis in these investigations was directed primarily to fathers' influence on the food preferences of children. Nutrition knowledge and attitudes of the fathers were not assessed. In families in which a specific health-related problem exists, the influence of the father on dietary adequacy and eating behavior may be of different importance than in families with healthy children.

Dietary Adequacy and Physical Growth

The importance of nutrition to physical growth has long been appreciated. Although there are many recognized causes of retarded growth, inadequate diet and inability to eat have been classified as two major factors (Graham, 1967; Komrower, 1964; Bullard, et al., 1967). Many children with mental retardation do not attain the growth norm expected for the general population (Marshall, 1968; O'Connell, Feldt, Stickler, 1965; Posonyl and Lobb, 1967; Pryor and Thelander, 1967).

Specific evidence that children with Down's syndrome are shorter in height and heavier in weight for height than children representing other populations has been reported. Pozsonyi, Gibson and Zarfas (1964) studied the skeletal maturation of 100 mongols between two weeks and fifteen years of age. They found delayed skeletal maturation was present until eight years of age; after this age growth rate approximated predicted rates for normal children. In a later report,

Posonyl and Lobb (1967) investigated the linear and skeletal development of 958 children with and without mental retardation. They reported that children with mental retardation were more apt to exhibit growth delay than normal children. They also reported that children with Down's syndrome were more markedly stunted in linear growth and skeletal development than children with other types of mental retardation.

Pryor and Thelander (1967) studied 678 handicapped children between one and fifteen years of age. They reported that children with Down's syndrome and children with multihandicaps displayed the most marked retardation in height and weight. However, "sitting" heights were reported close to the normal range for each age and sex group. These researchers concluded that shortness of stature or "stocky" build of children with Down's syndrome was due to failure of growth in bones of the legs.

In a similar study Mosier, Grossman and Dingman (1965) investigated ten growth parameters of 2,472 institutionalized children with mental retardation. They found the greatest stunting to occur in children with Down's syndrome with particular retardation evident in the shortness of the lower extremities. Most of these children were below the third percentile for height and tended to be slightly heavy for weight compared with values for the normal population.

Although it is generally agreed that growth retardation is characteristic of children with Down's syndrome, there are indications that normal development does occur in some children (Dutton, 1959; Oster, 1953). A few cases of advanced growth for age have even been

reported (Bullard, et al., 1911; Pozsonyi, Gibson and Zarfes, 1964).

Inadequate diet also has a marked effect on head growth (Graham, 1967; Winick, 1968; Craviato, Lecardee and Birch, 1966). In several studies a relationship between low head circumference measurement and the incidence of malnutrition has been reported. Graham (1967) conducted longitudinal studies of malnourished children and reported head circumference measurement was the most reliable parameter for assessing the effect of dietary inadequacies. Measurements of head circumference and height of children with mental retardation have been noted to follow similar trends and are often two standard deviations below the mean values for the general population (O'Connell, Feldt and Stukler, 1966).

During infancy head circumference measurements of Down's syndrome children are reported within a normal range (Penrose and Smith, 1966; Roche, Seward and Sunderland, 1961a). After two years of age, head growth slows down and remains two standard deviations below the mean for normal children (Roche, Seward and Sunderland, 1961b). Etiology of this particular growth pattern has not been determined. There is no apparent correlation between skeletal maturation rate and the following factors: birth weight, neonatal illness, sex or intellectual level (Pozsonyi, Gibson and Zarfes, 1964; Hall, 1966; Naeye, 1967; Shipe and Reisman, 1968). Pozsonyi, Gibson and Zarfes, (1964) have suggested that there is an endogenous early aging process in children with Down's syndrome which causes growth to cease by age fifteen. Stedman, and Eickorn (1964) compared the growth rates of

groups of children with Down's syndrome living at home and in institutions. They presented the hypothesis that children reared at home more nearly approximated the growth norms for the general population.

One obvious factor related to physical stature is the adequacy of dietary intake. Culley, et al., (1965) studied twenty-three Down's syndrome children who were between five and eleven years of age and reported that mean daily calorie intake was 1,814 kilocalories for boys and 1,550 for girls. These children did not usually meet the recommended allowance for calories. However, these researchers described many of these children as overweight and therefore concluded that these children required fewer calories than normal children. They suggested that recommended calorie intake be based on height of the child rather than chronological age.

Hammar and Barnard (1966) studied institutionalized adolescents of which a few were children with Down's syndrome, and presented evidence that the diets of this group were high in carbohydrate but low in iron and ascorbic acid. The researchers made no attempt to relate nutritional intake and parameters of growth.

In a recent conference concerned with feeding handicapped children a prominent nutritionist stated:

"Research as yet has shown no evidence of a higher need or different requirement for those retarded in growth and development, except where there are nborn errors of a type that can be influenced by diet".
(Todhunter, 1971: 19).

However, Garn (1971) has suggested that the RDA may not be an appropriate guide for children with Down's syndrome.

Children with Down's syndrome have specific eating problems related to the feeding process itself (Barsch, 1969). Dybwad (1966) identified one problem as parental difficulty in teaching their children to chew and swallow foods. He suggested that because oral muscles of these children are often flaccid and need training the children are kept on a soft diet far too long. He made a plea for nutritionists to give practical information to parents which would help with problems of dietary management. Penrose and Smith (1966: 54) report from their observations of children with Down's syndrome that sense of smell seems to be reduced and that preferences for sweet foods 's evident.

In several publications the need for those caring for the Down's syndrome child to be aware of chewing and self-feeding difficulties was stressed. Parents were urged to implement a feeding program based on the child's individual needs and abilities (Walker, 1955; Kram, 1964; Dybwad, 1966). Procedures to follow in feeding children with Down's syndrome, requirements for self-feeding and equipment to aid in development of feeding skills were detailed (Children's Bureau, 1966; Coffey and Crawford, 1971; Zinkur, 1971). However, there is a paucity of research documenting specific feeding problems and their relationships to dietary adequacy, feeding practices and eating behavior.

CHAPTER III

METHODOLOGY

In this chapter the methods and procedures used in the investigation of this research problem are presented. The discussion begins with a description of the sample and how it was selected. The research instrument, a questionnaire, is explained in terms of how it measures each major variable. The chapter is concluded with an account of how the research instrument was administered and the data prepared for analyses.

The Sample

The potential research sample consisted of families with a child diagnosed as Down's syndrome who resided in Franklin County, Ohio. Names of families known to have such a child were drawn from records of children being served by the Nisonger Center for Mental Retardation of The Ohio State University and the Franklin County Program for the Mentally Retarded. Families included in this research study were drawn from the potential sample on the basis of the following criteria:

1. Parents were willing to participate in study
2. The family included one child between six months and 14 years of age diagnosed by a physician as having Down's syndrome.
3. The child lived in the same residence as parents.
4. The child with Down's syndrome was registered with the Nisonger Center for Mental Retardation of The Ohio State University or the Franklin County Program for the Mentally Retarded.

The Nisonger Center, one of twenty University Affiliated Center Programs in the United States provides a full-range of medical, social, and educational services for children with mental retardation and their parents. These centers provide interdisciplinary training, service, and research opportunities for students and practitioners serving the mentally retarded.

At the time of this study 21 families who had a child with Down's syndrome were listed in files of the Nisonger Center. These families were sent a letter soliciting cooperation and explaining the purpose of the study (Appendix A). This letter was signed by both the researcher and a staff member of the Nisonger Center familiar with the family. The researcher then telephoned these parents to arrange a convenient time for the interview.

The Franklin County Program for the Mentally Retarded has service as its major focus. This program provides educational facilities and home counseling services for families with mentally retarded children. The primary goal of this agency is to serve the needs of the community, in contrast to the training and research orientation of the Nisonger Center. At the time of this study, June and July, 1971, the names of 135 children with Down's syndrome were contained in the files of the agency administering this program.

The sampling procedure at the Franklin County Program differed somewhat from that of the Nisonger Center. The director of the agency requested agency staff to submit names of potentially cooperative parents meeting the criteria of the study. The names of 48 families were compiled in this manner. The director then sent letters to these

families describing the study and asking them to participate (Appendix A). These parents were asked to sign an enclosed form giving permission to include their family in the research project (Appendix A). Families returning these permission forms to the agency were subsequently telephoned by the researcher to arrange an appointment. In addition, some families were personally asked by agency staff to participate in the study. A total of 67 families were selected by the sampling procedures described. Ten families, or seven per cent of the original sample, refused to participate; nine of these ten refusals were names of parents selected from the files of the Franklin County Program. Eight of these families had recently participated in other research projects and were unwilling to do so again at the time of this study. One father in a participating family was an alcoholic and unavailable for interviewing. Another father from the Nisonger Center had hostile feelings toward such research projects and refused to be interviewed. Therefore, 40 mothers, 38 fathers and 40 children comprised the sample studied in this research.

The Research Instrument

An interview schedule was developed for purposes of this research (Appendix B). The questions were read to the participants by the interviewers who recorded the answers. The measures of independent and dependent variables including the items from the interview schedule are listed in Appendix C.

The independent variables were separated into the following categories for analyses: physical impairments of the child, aspects

of adaptive behavior of the child, selected social characteristics of the family, nutrition knowledge and attitudes of each parent and sources of maternal nutrition information. Data related to physical impairments, adaptive behavior, nutrition knowledge and attitudes and sources of nutrition information were solicited from the mothers. Demographic information pertinent to the family and nutrition knowledge and attitudes were obtained from the father.

Physical impairments of the child with Down's syndrome were identified by the mother by use of a "yes/no" response to a list of physical impairments. The number and type of impairments were recorded by the interviewer.

For the purposes of this study the child's level of adaptive behavior was determined by the maternal assessment of the child's skills in various behavior domains considered important to maintaining personal independence in daily living. Selected portions of an Adaptive Behavior Scale¹ were used for this purpose. The more advanced the level of adaptive behavior, the higher the numerical score assigned each scale item (Appendix C). Scores on the items composing each scale were added to obtain total score for each behavior domain. Not all questions were pertinent for children under five years of age. These items are identified in the research instrument (Appendix B).

¹
Kazuo Nihura, et al., Adaptive Behavior Scales, (American Association of Mental Deficiency, 1970).

Questions related to the selected social characteristics of the family were answered by the fathers (Appendix C). Based on responses to these questions, families were classified by social class levels according to the Social Class Index of Hollingshead.² This index is based on the father's occupation and level of formal education. Each of these two factors are assigned a numerical rating ranging from one to seven. The two factors are combined by multiplying the occupational ranking by the factor weight of seven, multiplying the educational ranking by the factor weight of four, and adding these two products. Higher scores indicate lower social class standing, based on low level of occupational status and education.

Parental nutrition knowledge and attitudes were measured by results of nutrition knowledge and attitude tests originally developed for use in the North Central Regional Research conducted in 1965.³ Test statements were reworded so as to be appropriate for both mothers and fathers. Twenty items were selected from the nutrition knowledge portion of the original test to measure the respondent's basic understanding of nutrition. Items in the attitude tests were reworded to be applicable to families of children with Down's syndrome, thus measuring parental permissiveness regarding child eating habits and the importance of child nutrition.

2

August B. Hollingshead, Two Factor Index of Social Position, (Yale Station, New Haven, Connecticut, 1965).

3

Ercel Eppright, Tests of Nutrition Knowledge and Attitudes, (Iowa Agriculture and Home Economics Experiment Station, Project No. 665-H).

These tests of nutrition knowledge and attitudes were composed of true-false or agree-disagree items. For each item respondents also indicated how certain they were of their response. This was referred to as "degree of certainty". Scores on this scale were determined by both the answer given by the respondent and his degree of certainty regarding that answer. The degree of certainty factor provided a measure of the personal meaning of the respondent's answer, how strongly he feels about it, and whether or not his answer was mainly guesswork. The respondent's answers were combined with his degree of certainty to obtain a total score (Appendix D).

The last independent variable measured in this research was the Identification of the sources of nutrition information received by the mother. Sources were identified from a prepared list of potential sources.

The four sets of dependent variables measured included dietary adequacy, feeding practices, eating behavior and selected growth parameters of the child (Appendix C).

The first dependent variable, dietary adequacy, was assessed from analyses of the nutrient and food energy supplied by foods listed on a two day food record (Appendix B). Mothers were asked to record all food eaten by the child for two days in the week following the initial interview. Mothers were requested to choose one day, Monday through Friday, and one day, Saturday or Sunday. Measurements of food consumed were recorded in terms of common household units. The brand name of any vitamin-mineral supplement was also recorded and vitamin D fortified

foods were also reported. A return appointment was arranged for collection of the record. At this time the record was examined for completeness and accuracy and any necessary information solicited.

Nutrient intake of the recorded food was calculated from information in the nutrient data bank developed by members of The Ohio State University Hospital Dietetics Department. This computer program contains the analyses of the kilocalorie and nutrient content of individual foods commonly consumed by people in Ohio. The mean daily dietary intake of kilocalories, protein, fat, carbohydrate, ascorbic acid, vitamin A, calcium, iron, and thiamine was determined in this manner. The vitamin D content of the foods was not included in the computer program. Therefore, the vitamin D content was estimated from published values (Davenport, 1964) as was the nutrient content of the vitamin-mineral supplements.

An evaluation of the dietary adequacy of the child was made by comparison of the identified intake of food energy and nutrients with the amounts designated appropriate for the child in the 1968 Recommended Dietary Allowances (RDA).⁴

A system of numerical scoring was developed on the basis of the percentage of the RDA for food energy and the analyzed nutrients provided in the child's food intake. For food energy and each nutrient, the children were classified into groups on the following basis: "poor"

⁴

National Research Council, Recommended Dietary Allowances (National Academy of Sciences, Rev. 1968).

was consumption of less than 50 per cent of the RDA, "fair" was 50-67 per cent of the RDA and "good" was 68-100 of the RDA.

The scoring procedure for the measurement of total dietary adequacy involved assigning the following numerical scores to each classification of dietary adequacy for kilocalories and individual nutrients: "poor" received a score of 1; "fair" received a score of 2; "good" received a score of 3. In this way, children were given a numerical score reflecting the adequacy of kilocalories and specific nutrients in terms of RDA standards. The scores for each nutrient and kilocalories were added to determine a total dietary adequacy score or dietary index rating the theoretical range of the total dietary adequacy score extended from 8 to 24. The total scores were divided by 8, the total number of individual scores. The overall score of dietary adequacy had a range of zero to three and provided a composite measure of the levels of adequacy for all measured nutrients and kilocalories. This score of dietary adequacy simplified and facilitated description and analyses of the data by giving a single measure of a complex and extensive quantity of raw data (Kerlinger; 1964: 616).

The second group of dependent variables was concerned with feeding practices of the family in regard to the child (Appendix C). Parents provided answers to questions about meal patterns, the use of food to control the child's behavior, and the importance of food to the family.

The third set of dependent variables was concerned with the eating behavior of the Down's syndrome child. His eating behavior was measured by "yes" or "no" responses of parents to items which

could describe the child's eating habits and feeding problems (Appendix C). Parents were also asked to evaluate the quality of their child's dietary intake. Mothers were asked to respond to questions measuring eating behavior. Fathers were asked to respond to selected aspects of these dependent variables.

The fourth set of dependent variables concerned selected growth parameters of the child with Down's syndrome. Height, weight, and head circumference measurements were taken by the female interviewer. Head circumference was measured by a standard cloth tape, and height by a steel measuring tape. A portable bathroom scale was used to assess the weight of the child. This scale was frequently checked for accuracy by comparison with a standard laboratory scale.

Height and weight measurements of each child were plotted on the Boston Anthropometric Chart.⁵ This chart provides standards of reference for these measurements by age and sex. Based on the number of standard deviations from the 50th percentile, the child was classified as average, heavy, or light in weight and average, short, or tall for height. If the child were within one standard deviation above or below the 50th percentile marking, he was considered average in weight and height. If the child were two or more standard deviations below the mean he was considered short in height or light in weight.

5

Harold C. Stuart, et al., Boston Anthropometric Chart (The Childrens' Medical Center, Boston, 1959).

Head circumference measures were plotted on the Nellhaus Head Circumference Chart⁶ which provides a standard of reference for males and female by age. As for height and weight, the number of standard deviations from the 50th percentile were used to determine the child's classification as average, above average, or below average in head circumference measurements.

Data Collection and Preparation

The interview schedule consisted primarily of fixed alternative questions (Appendix B). This research instrument was pretested with five families from the Nisonger Center. All these families had a child with mental retardation although none was classified as Down's syndrome. Several revisions were made in the instrument as a result of these pretest interviews; most changes involved editing the instrument to shorten the interviewing time. The parents interviewed in the pretest responded favorably to the instrument and the method of conducting the study. The following procedure was employed in collecting the data. Respondents were contacted by telephone and an appointment convenient for the interview was made. Families were simultaneously interviewed in their home by the female researcher and a male interviewer. The male interviewed the fathers while the female interviewed the mother in the family. With few exceptions, interviews were conducted in separate rooms of the home.

6

G. Nellhaus, Nellhaus Head Circumference Chart (University of Colorado Medical Center, 1968).

The average length of the interview was seventy-five minutes for mothers and fifty minutes for fathers. After completion of the interview schedule, height, weight, and head circumference measurements of the Down's syndrome children were taken by the researcher. Mothers were then instructed on techniques of measuring and recording the food to be listed on a two-day dietary record. A return appointment was arranged for the researcher to collect the dietary record.

Data from the interview schedules were coded by the researcher. To verify validity of the coding, various items were double coded. All cards were key punched and machine verified for accuracy. Another check on key punching error was made by comparing card print-outs, code sheets, and questionnaires to ascertain if any coding disagreements were present.

Tabulation and statistical analysis of the data were made by means of the Statistical Package for the Social Sciences.⁷ This system provided the user with a comprehensive set of procedures for data transformation and file manipulation and offers a number of statistical routines.

Percentage figures are used in reporting most of the data in this study for three major reasons: 1) to enhance the readability of findings; 2) to facilitate the perceptibility of numerical relationships by translating them into a common base of 100, making it easier to compare groups and categories of different sizes; and 3) for

7

Norman Nie, D. Bent and C. Hull, Statistical Package for the Social Sciences, (McGraw Hill, 1970).

primarily descriptive, rather than explanatory purposes. As long as increases or decreases in percentages are not meant to suggest, either implicitly or explicitly, the underlying causes of these percentage variations, the use of percentages is clearly justified (Zeisel, 1968: 3-14).

Kruskal's Gamma was used to measure the level of association between independent and dependent variables. This statistical measure was deemed most appropriate for the ordinal level of measurement of most variables in the study. This measure is particularly suited for the "Likert-type" questions used in many of the scales; for example, respondents were frequently asked to express one of several degrees of agreement or disagreement with an item (Seltiz, et. al., 1959:366).

Champion (1970) identifies a number of advantages of this non-parametric statistical test:

. . . gamma is very useful in that it is designed to fit tables of any size. No corrections need be made for ties . . . the simplicity in the computation of gamma for both tied and untied sets of ranks is a strong advantage over other measures of association suited for data of the ordinal level. Compared to other measures of association . . . gamma is a most flexible and useful statistical technique. Gamma readily reflects both positive and negative associations between variables and is directly interpretable. Gamma may also handle small cell frequencies, whereas these provide a restriction for other measures (Champion, 1970: 223).

The actual numerical value of the computed gamma is interpreted in the same manner as any measure of correlation; the gamma coefficients vary in value from -1.00 to +1.00, with minus values indicating negative relationships, and positive values a positive association between variables. In addition to its use as a measure

of association, Z scores derived from gamma values provide a test of the statistical significance of the association between variables. This test of statistical significance is used in considering the role of chance factors in assessing the relationship between independent and dependent variables.

CHAPTER IV

RESULTS AND DISCUSSION

Description of the Sample

The sample population in this study consisted of 40 families residing in Franklin County, Ohio who had a child with Down's syndrome living in the family environment. Thirty-eight fathers and 40 mothers participated in this study.

Twenty-three of the 40 children with Down's syndrome represented in the research findings were males and 17 were females. The youngest child was six months and the oldest child was 14 years of age. Over half, or 24 of 40 children, were preschoolers under six years of age. Only seven of the 40 children were over 10 years of age. The median age of the children was 4.5 years and the modal age was two years.

Most of the parents, approximately 70 per cent, were between 30 and 50 years of age. Eight mothers and six fathers were less than 30 years of age. Four mothers and six fathers were between 50 and 59 years of age. The mean age of fathers was 39.5 and that of the mothers 38.5.

The size of the families in this sample was typical of the average size of families in the continental United States (Christenson and Jonsen, 1971). Over half, or 22 of the 40 families, included two parents and one or two children. The rest of the families were larger in size with 14 families having four or five children. Four families were unusually large, having eight or more family members.

The average size of families in the sample was slightly more than five (5.3); the modal family size was smaller, with four members the most frequent size of the immediate family unit.

The parents as a whole were well educated (Table 1). Only four mothers and two fathers had less than a high school education. Fathers had more years of formal education than mothers. Over half the fathers but only a third of the mothers had college or graduate school level of formal education.

Although the sample included a few families with extremely low and high incomes, the median monthly income level for families in the study was \$750.00 after taxes and other deductions (Table 2). In fact, 36 of the 40 families have incomes of \$600 a month or greater after deductions. Twelve of the families reported monthly incomes of \$1,000.00 or greater. Only one wife worked outside the home; eight others worked in part-time jobs.

Families were rated into social class levels according to the Social Class Index devised by Hollingshead (Table 3). This index is based on scores assigned to the level of occupation and level of formal education of fathers. Higher scores indicate lower social class rating. The majority of families in this study were in the three middle social class index ratings. Approximately one-fifth of the families were classified in the highest social class. About one-third were in the two lowest social classes.

Fathers were also classified by occupation alone in the manner described by Hollingshead (Table 4). Fathers were rather evenly

TABLE 1
Formal Education Level of Parents

Level of Education	Mothers		Fathers	
	Number	Percentage	Number	Percentage
Elementary	4	10	2	5
High School	20	50	15	38
Technical School	2	5	0	0
College	12	30	15	38
Graduate School	2	5	8	19

TABLE 2
Total Monthly Family Income^a

Families	Monthly Income in Dollars			
	300-500	600-900	1,000-1,400	1,500 or more
Number	4	24	9	3
Percentage	10	60	23	7

^a Based on fathers estimate of income after taxes and other deductions.

TABLE 3
Social Class Index Of The Family

Index	Number of Families	Percentage of Families
I	8	20
II	3	7
III	16	40
IV	11	28
V	2	5

TABLE 4
Occupational Classification of Fathers

Occupational Classification	Fathers	
	Number	Percentage
Professionals	13	32
Owners, Managers and Officials	10	25
Clerical, Sales and Skilled Workers	12	30
Semi- and Unskilled Workers	5	13

distributed by occupational classification; a third as professionals and a fourth as owners, managers or officials. Approximately 30 per cent worked in clerical, sales or other skilled jobs, and 5 fathers were classified as either semi- or unskilled workers. Apparently, social class index was not indicative of family income. Furthermore, money available for food purchases should not have been a factor affecting dietary adequacy of the child.

Food Energy and Nutrient Intake

One major objective of this study was to evaluate the dietary adequacy of the food intake of children with Down's syndrome. A comparison of the extent to which nutrient and food energy intakes of these children were above, below or equaled RDA for their sex and respective age levels is presented in Tables 5 and 6. These evaluations are based on food intake alone and exclude any nutrient supplements that may have been taken by the child.

The same comparisons are made with respect to the children divided into two age groups; the 24 children under six and the 16 children over six years of age (Tables 7 and 8).

Approximately 58 per cent of these children received less than 100 per cent of the RDA for food energy intake (kilocalories) regardless of age grouping (Table 5). About 43 per cent of the children received more than one hundred per cent of the RDA for calories. The same approximate percentage of children not meeting the RDA for calories was observed for each of the two age groups (Table 7).

TABLE 5

Comparison of Daily Dietary Intake of Food
Energy, Protein, Iron and Calcium
With the RDA

Percentage of RDA	Kilocalories and Nutrients ^a							
	Food Energy		Protein		Iron		Calcium	
	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Below 50	3	8	0	0	8	20	5	13
50-67	4	10	1	3	5	13	9	23
68-99	16	40	1	3	15	38	14	35
100-149	14	35	17	43	10	25	10	25
150-199	2	5	10	25	1	3	1	3
200 or more	1 ^b	3	11	28	1	3	1	3

^a

Nutrient analysis of diets without vitamin-mineral supplements.

TABLE 6

Comparison of Daily Dietary Intake of
Vitamin A, Vitamin D, Thiamine,
and Ascorbic Acid With the RDA

Percentage of RDA	Nutrients ^a							
	Vitamin A		Vitamin D		Thiamine		Ascorbic Acid	
	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Below 50	9	23	16	40	2	5	4	10
50-67	4	10	13	33	10	25	5	13
68-99	8	20	6	15	12	30	2	5
100-149	7	18	5	13	8	20	6	15
150-199	3	8	0	0	5	13	8	20
200 or more	9	23	0	0	3	8	15	38

^a

Nutrient analyses of diets without vitamin-mineral supplements.

TABLE 7

Comparison of Daily Dietary Intake of
Food Energy, Protein, Calcium and
Iron With the RDA by Age^a

Food Energy and Nutrients	Percentage of RDA						Total
						200 or More	
	Below 50	50-67	68-99	100-150	151-199		
Kilocalories							
Under 6 Years							
Per Cent	13	4	42	33	4	4	100
Number	3	1	10	8	1	1	24
Over 6 Years							
Per Cent	0	19	38	38	6	0	100
Number	0	3	6	6	1	0	16
Protein							
Under 6 Years							
Per Cent	0	4	4	25	29	38	100
Number	0	1	1	6	7	8	24
6-14 Years							
Per Cent	0	0	0	69	19	13	100
Number	0	0	0	11	3	2	16
Calcium							
Under 6 Years							
Per Cent	13	8	42	29	4	4	100
Number	3	2	10	7	1	1	24
6-14 Years							
Per Cent	13	44	25	19	0	0	100
Number	2	7	4	3	0	0	16
Iron							
Under 6 Years							
Per Cent	29	13	33	21	4	0	100
Number	7	3	8	5	1	0	24
6-14 Years							
Per Cent	6	13	44	31	0	6	100
Number	1	2	7	5	0	1	16

^aNutrient analyses of diets without vitamin or mineral supplements.

TABLE 8

Comparison of Daily Dietary Intake of
Vitamins A and D, Thiamine and
Ascorbic Acid With the RDA by Age

Nutrients	Percentage of RDA						Total
	Below 50	50-67	68-99	100-150	151-199	200 or More	
Vitamin A							
Under 6 Years							
Per Cent	8	4	21	21	8	38	100
Number	2	1	5	5	2	9	24
6-14 Years							
Per Cent	44	19	19	13	6	0	100
Number	7	3	3	2	1	0	16
Vitamin D							
Under 6 Years							
Per Cent	33	33	21	13	0	0	100
Number	8	8	5	3	0	0	24
6-14 Years							
Per Cent	50	31	6	13	0	0	100
Number	8	5	1	2	0	0	16
Thiamine							
Under 6 Years							
Per Cent	4	4	29	33	21	8	100
Number	1	1	7	8	5	2	24
6-14 Years							
Per Cent	6	56	31	0	0	6	100
Number	1	9	5	0	0	1	16
Ascorbic Acid							
Under 6 Years							
Per Cent	17	13	4	8	21	38	100
Number	4	3	1	2	5	9	24
6-14 Years							
Per Cent	0	13	6	25	19	38	100
Number	0	2	1	4	3	6	16

Culley et al. (1965) reported that all 23 of the five to eleven year old institutionalized children they studied consumed food providing less calories than the RDA. In addition, they reported the majority of the children were overweight. Perhaps the availability of food in the home environment and parental consideration of the child's food preferences accounts for the number of children in the present study who exceed the RDA for kilocalories. In the present study, 70 per cent of the children in the age category four to six years of age were not overweight for height. Although levels of activities were not assessed in either study, differences in energy expenditure probably accounted for difference in body weight. Another factor which might influence the utilization of calories is the distribution of the three food nutrients supplying energy. The food provided children in institutions might contain a greater proportion of carbohydrate and less protein than found in the foods eaten by children in the present study.

Protein consumption of all these children exceeded the RDA with the exception of two children under six years of age (Tables 5 and 7). These high levels of protein intake are in agreement for children in the North Central Region; approximately 90 per cent of these children exceeded the RDA in their protein intakes (Eppright et al., 1972).

About one-third of these children with Down's syndrome consumed foods supplying less than two-thirds of the RDA for iron and calcium (Table 5 and 7). Approximately 30 per cent of the children exceeded the RDA for intakes of these minerals. In the study of children in the

North Central Region calcium intakes compared favorably with the RDA and generally paralleled milk intake for the first six years of age. Iron intakes, however, were reported below the RDA. When the data for calcium and iron intake of children with Down's syndrome were evaluated for children below six years of age, results were similar to the intakes reported for preschool children in the North Central Region (Table 7). About 20 per cent of the children over six years of age received less than two-thirds of the RDA for calcium. However, 63 per cent of these children may have been deficient in iron inasmuch as they obtained less than the RDA for this nutrient. Biochemical studies related to iron status would have helped in the interpretation of these results.

Approximately half of the children with Down's syndrome exceeded the RDA for vitamin A. However, about 33 per cent of these children received less than two-thirds of the RDA for this nutrient (Table 6). When the vitamin A intake of these children was evaluated in relationship to the two age categories, interesting differences were observed (Table 8). Approximately, 82 per cent of the children over six years of age received less than the RDA for this vitamin compared with 33 per cent of the children under six. Likewise, 82 per cent of the children over six received less than the RDA for calcium. These differences in vitamin A and calcium intakes probably reflect the decreased consumption of milk by older children.

Parents of these children should be encouraged to include more foods high in vitamin A in the diets of their children. On the other hand, about 23 per cent of these children received more than twice the

RDA for vitamin A. If these children also receive a vitamin supplement extremely high in vitamin A, the possibility of adverse effects which could be produced by high levels of this vitamin should be considered.

In general, the estimated intake of vitamin D of children with Down's syndrome was judged to be low. About 73 per cent of these children received less than two-thirds of the RDA for this nutrient. Because 63 per cent of the children under six years of age and 44 per cent of the children over six years of age received two-thirds or more of the RDA for calcium, which would indicate a liberal intake of milk, there may be an error in the reporting of the use of milk fortified with vitamin D. Evaluation of vitamin D intake was not included in many studies (Eppright et al., 1972; Owen and Kram, 1969; USDA, 1969). The vitamin D level of ordinary foods is generally low and a recommendation for a dietary requirement for this nutrient is complicated by the undetermined amount of the vitamin converted from the precursor in human skin. Therefore, the dietary intake of vitamin D for children is usually fulfilled by fortification of milk and other foods or by ingestion in a vitamin supplement. Further investigation of the intake of vitamin D of children with Down's syndrome is recommended.

About 41 per cent of the children with Down's syndrome exceeded the RDA for thiamine. Approximately 30 per cent of these children received less than two-thirds of the RDA for this nutrient. When the intake of thiamine was evaluated for children over six years of age, the percentage receiving less than the RDA was 93 per cent.

This difference probably reflects the inclusion of larger amounts of fortified cereals in the diets of younger children. A more thorough study of the particular foods contributing to this difference in intake between the two age groups is recommended.

The RDA for ascorbic acid was exceeded by 63 per cent of children in this study. Only 23 per cent reported intakes that would provide less than two-thirds of the RDA for this nutrient. Many families reported a high intake of fruit juices, including orange, by these children. This intake may reflect increased consumption of fluid intake in summer months. This intake may also reflect parental or child preference for foods requiring little mastication. This large intake of fruit juices may also explain the differences in intake of vitamin C between the two age groups. About 34 per cent of children under six years of age received less than the RDA for ascorbic acid in comparison with 19 per cent of the children over six.

The nutrients most often reported to be below the RDA in studies of normal children include iron, vitamin A and ascorbic acid (Lund and Burke, 1969; Owen and Kram, 1969; USDA, 1969; and Fryer, et al., 1971). The diets of adults are also reported to be low in calcium (USDA, 1969). In this study of children with Down's syndrome more than half of the children received less than the RDA for food energy, calcium, iron, vitamin A, vitamin D and thiamine from food. Over three-fourths of these children exceeded the RDA for protein and ascorbic acid. When dietary intake for these nutrients and food energy was evaluated separately for each of the two age groups only two major differences

were noted. More than half of the children under six years of age exceeded the RDA for vitamin A and thiamine intake from food.

For more than half the children with Down's syndrome the nutritional quality of their diets was improved by the addition of some form of supplement (Table 9). Twenty-four of the 40 children received some type of vitamin supplement. One child received a supplement containing only ascorbic acid and the other 23 were given a supplement containing a mixture of nutrients. Only seven of the children taking a supplement received one with iron included. With the addition of supplements of vitamins A, C and thiamine the dietary intake of these nutrients for five of the children were increased from less than the RDA to equal or slightly exceeding (100-149%) the RDA.

Approximately half of the children taking supplements which included these nutrients, doubled or tripled their intakes as compared with the RDA. For vitamin A and ascorbic acid, intakes of five of the children exceeded the RDA 400 or more percent. This intake of thiamine exceeded the RDA by 400 or more per cent for four children receiving thiamine in their supplements. For the 23 children receiving vitamin D in their supplements, the total intake of D was equaled or exceeded the RDA for this nutrient. Of the 17 children who did not receive a supplement only five had intakes which were equal to the RDA for this nutrient. The importance of supplementing the diets of children with vitamin D in order to provide the RDA for this nutrient is verified by these results.

Intakes of several nutrients were increased to a recommended

TABLE 9
Increase In Intake Of Selected Nutrients
Compared With The RDA By The
Addition of Supplements

Nutrient	Increase in RDA							
	100-149%		200-300%		400 or more%		Total ^b	
	Number	%	Number	%	Number	%	Number	%
Vitamin A	5	22	13	56	5	22	23	100
Vitamin D	19	83	4	17	0	0	23	100
Ascorbic Acid	5	21	14	58	5	21	24	100
Thiamine	5	22	14	61	4	17	23	100
Iron	3	43	4	57	0	0	7	100

^a

Only includes children taking nutrient supplements

^b

N varies because children took various types of supplements

level of intake by supplementation. The value derived from vitamin and mineral supplements is a controversial issue (Foman, 1967).

Proponents of this practice stress the need to insure adequate intakes of vitamins and minerals inasmuch as recommended intakes are not always obtained from foods consumed. Opponents of supplementation express concern about the possibility of adverse effects resulting from excess of fat soluble vitamins in particular. In this study five children exceeded the RDA for vitamin A by 400 or more per cent.

No RDA has been established for either dietary fat or carbohydrate. Various researchers have reported that approximately 35 to 45 per cent of the total daily calories in diets of adults are supplied from dietary fats and approximately 45 to 50 per cent from dietary carbohydrate (USDA, 1969). Approximately comparable percentages have been reported in studies of infants (Foman, 1967).

The percentage of calories supplied by fat and carbohydrate is presented in Table 10 according to the child's age. Fifty per cent of children six years of age or older derived 41 to 57 per cent of their calories from dietary fat. If a reduction in fat intake is desirable for individuals with symptoms of cardiovascular heart disease, an effort must be made to alter the diets of the children with Down's syndrome who have a high incidence of cardiac impairments. In the same context of the relationship of diet to heart disease, information concerning the amount of polyunsaturated fatty acids and sucrose would be of interest.

An overall index of dietary adequacy was developed that incorporated all of the comparisons of total intake of food energy and selected nutrients with the RDA. This index has a theoretical range extending

TABLE 10

Percentage of Daily Calories Supplied By
Fat and Carbohydrates by Age Groups

Children	Percentage of Daily Calories Supplied by Fats		
	10-25	26-40	51-57
Under 6 Years			
Per Cent	25	46	29
Number	6	11	7
6-14 Years			
Per Cent	0	50	50
Number	0	8	8
Percentage of Daily Calories Supplied by Carbohydrate			
	26-40	41-55	56-69
Under 6 Years			
Per Cent	29	46	25
Number	7	11	6
6-14 Years			
Per Cent	31	63	6
Number	5	10	1

from zero to three and is computed to no decimal point. Scores from 0 to 1.0 were assigned the rating poor, 1.1 to 2.0 were fair and 2.1 to 3.0 were good. However, the empirical distribution of the derived scores did not permit the use of these theoretical scale ranges because all index scores were clustered between 2.1 to 3.0. In order to proceed with the analyses of the data, it was necessary to divide index scores into two categories--higher and lower levels of general dietary adequacy. Consequently, the median of the empirical distribution of index scores was used to establish fair (2.1-2.5) and good (2.6-3.) ratings of overall dietary adequacy. Because of the small sample size, these ratings must be used if the cells in the tables are to be sufficiently filled to permit a meaningful analysis of the data.

Exactly half of the children in each age and sex category received the dietary index rating of fair (Table 11). Likewise, half of the children received the rating of good. Differences observed in any age or sex category were minor because of the small sample size.

Growth Parameters

Growth of children is related to general health and nutrition. Predicted norms in terms of means have been established for the parameters of height, weight and head circumference. These three measurements were obtained for the children in the present study. Comparison with the established means permitted an assessment of the growth pattern of the children with Down's syndrome with children in the general population (Table 12).

Only one child was above the mean for height, six children were

Table 11
Dietary Index Ratings by Sex and Age

Dietary Index Rating	Age			Sex	
	6 months-3 years	4 - 6 years	7 years or older	Male	Female
Fair					
Per Cent	41	60	54	43	59
Number	7	6	7	10	10
Good					
Per Cent	59	40	46	57	41
Number	10	4	6	13	7
TOTAL	100	100	100	100	100
	17	10	13	23	17

TABLE 12
A Comparison of Three Growth Measurements
With Established Means

Growth Parameters	Standard Deviations from Established Means						Average ^c Standard From the Mean
	Below Mean			Above Mean			
	3	2	1	1	2	3	
Height ^a							
Per Cent	58	13	28	0	0	3	1.8
Number	23	5	11	0	0	1	
Weight ^a							
Per Cent	40	15	30	3	8	5	2.4
Number	16	6	12	1	3	2	
Head Circumference							
Per Cent	33	35	25	8	0	0	2.1
Number	13	14	10	3	0	0	

^a Means taken from the Boston Anthropometric Charts

^b Means taken from the Nellhaus Head Circumference Charts

^c All average standard deviations were below the mean

above the mean for weight and three children were above the mean for head circumference. Thus for the parameter of height and head circumference approximately 90 per cent of the children were below the mean. In fact, 58 per cent of the children were three standard deviations below the mean for height and 33 per cent for head circumference. Seventy-five per cent of the children were below the mean for weight and 40 per cent were reported three standard deviations below the mean.

The growth pattern of children in this study was slightly different than that described by other researchers. In general, children with Down's syndrome are reported to be shorter in height and heavier in weight for height than children representing the normal population (Pozoni, et al., 1964; Pryor and Thelander, 1967). Measurements of head circumference of children with Down's syndrome are reported to be two standard deviations below mean values for the general population (Penrose and Smith, 1966; O'Connel, 1966).

When these physical growth parameters were converted from standard deviations into the descriptive terminology of short, average, tall for height and light, average, heavy for weight, the poor physical growth of the children was more evident (Table 13). Differences in any of the three parameters were not related to sex. These children were below the mean in height and head circumference at all ages. However, differences in weight were observed in relationship to age. None of the children under three years of age were described as heavy. The percentage of children described as light decreased in the older age groupings. This trend has been observed by other researchers; children with Down's syndrome are apt to be overweight in the pre-adolescent years (Garn and Weir, 1971).

TABLE 13

Descriptive Classification of Growth Measurements
By Sex and Age

Growth Measurements	Age			Sex	
	6 Months -3 Years	4-6 Years	7 Years & Older	Male	Female
Height					
Short					
Per Cent	82	70	77	74	82
Number	14	8	10	17	14
Average					
Per Cent	12	30	23	22	18
Number	2	3	3	5	3
Tall					
Per Cent	6	0	0	4	0
Number	1	0	0	1	0
Weight					
Light					
Per Cent	82	60	31	65	53
Number	14	6	4	15	9
Average					
Per Cent	18	10	46	22	29
Number	3	1	6	5	5
Heavy					
Per Cent	0	30	23	13	18
Number	0	3	3	3	3
Head Circumference					
Below Average					
Per Cent	59	100	69	78	65
Number	10	10	9	18	11
Average ^a					
Per Cent	41	0	31	22	35
Number	7	0	4	5	6

^a

No children were above average in head circumference.

The relationship between general dietary index rating and physical growth was examined (Table 14). The dietary index rating was significantly related to height ($G = .6579$ $p < .10$) but not to weight or head circumference descriptions. In studies involving large numbers of normal children dietary adequacy is reported to affect both height and weight (Fox, et al., 1971; Owen and Kram, 1969; Schaefer, 1969). In the present study there is some tendency for weight and overall dietary adequacy to be related ($G = .2647$).

Skull size has been related to dietary adequacy in both prenatal and neonatal periods of development. Winick (1968) has reported that cell number and size are reduced in severe protein deficiency. Although no data related to maternal diets were obtained in this study of children with Down's syndrome, the protein intakes of 22 of the 24 children under six years of age exceeded the RDA for this nutrient (Table 7). Furthermore, only three of these younger children received less than one-half of the RDA for calories which may be interpreted to mean that the protein supplied in the diet was available for tissue protein synthesis.

The hypothesis, children with Down's syndrome who have high dietary adequacy scores more closely approximate predicted norms for height, weight and head circumference was rejected because head circumference and weight measurements were not significantly related to dietary adequacy scores. There was, however, a direct relationship between height and dietary adequacy scores.

Feeding Practices and Eating Behavior

Data concerning the feeding practices and eating behavior of children with Down's syndrome were obtained from the parents. Parents were asked

TABLE 14

Relationship of Dietary Index Rating
and Growth Description

Growth Description	Dietary Index Rating	
	Fair	Good
Height ^a		
Short		
Per Cent	90	65
Number	18	13
Average		
Per Cent	10	35
Number	2	7
Weight ^b		
Light		
Per Cent	65	55
Number	13	11
Average		
Per Cent	20	30
Number	4	6
Heavy		
Per Cent	15	15
Number	3	3
Head Circumference ^c		
Below Average		
Per Cent	70	75
Number	14	15
Average		
Per Cent	30	25
Number	6	5
TOTAL	100	100
	20	20

^aG= .6579; Z_G= 1.7026; p < .10; one child rated as "tall" was grouped with the average category for purposes of computation.

^bG= .2647; Z_G= .6494; not significant

^cG= -.1250; Z_G= .2520; not significant

to classify the eating behavior of their children (Table 15). Approximately one-third of the parents reported their children ate well (never eats poorly). More fathers evaluated their child's eating behavior in this manner than mothers. Only eight per cent of the parents reported that their child ate poorly all of the time.

Information concerning food dislikes was also obtained from the parents. (Table 16). A large majority of the children were reported to have "some" dislikes, with few parents reporting their children as having "many" or "no" food dislikes. For this evaluation mothers and fathers showed extremely close agreement.

Specific eating habits and eating problems of the children with Down's syndrome were identified by the mothers (Table 17). Approximately 43 per cent of the mothers reported their children ate a limited variety of food in general and 53 per cent indicated specifically they ate too little fruits and vegetables. Inasmuch as approximately 50 per cent of the children consumed foods providing less than the RDA for many of the measured nutrients, this appears to be a valid evaluation. Approximately one-third of the mothers classified their children as taking too much time to eat. This characteristic is undoubtedly related to the more than 30 per cent of mothers who reported their children had difficulties in using eating utensils, eating foods served to the family or chewing food. Only six mothers listed drinking from a cup, sucking or regurgitation as common eating problems of their children. These results are in agreement with the eating problems of children with Down's syndrome described in the literature (Walker, 1955; Kram, 1964; Dybwad, 1966). Apparently two-thirds of these mothers had

TABLE 15

Parental Evaluation of Eating Behavior of Children
With Down's Syndrome

Parent	Eating Behavior		
	Never Eats Poorly	Eats Poorly Some of the Time	Eats Poorly All of the Time
Mothers			
Per Cent	30	63	8
Number	12	25	3
Fathers			
Per Cent	43	50	8
Number	16	19	3

TABLE 16

Parental Evaluation of Food Dislikes of Children
With Down's Syndrome

Parent	Food Dislikes		
	No Dislikes	Some Dislikes	Many Dislikes
Mothers			
Per Cent	10	75	15
Number	4	30	6
Fathers			
Per Cent	11	73	16
Number	4	28	6

TABLE 17
Eating Habits and Problems of Children

Eating Habits ^a			Eating Problems ^a		
Chooses a limited variety of food	Per Cent	43	Difficulty using knife or fork	Per Cent	45
	Number	17		Number	18
Eats too little fruits and vegetables	Per Cent	53	Difficulty eating foods served rest of family	Per Cent	30
	Number	21		Number	12
Takes too much time to eat	Per Cent	33	Difficulty eating meat	Per Cent	30
	Number	13		Number	12
Is always hungry	Per Cent ^b	30	Difficulty chewing foods	Per Cent	35
	Number	12		Number	14
Other habits	Per Cent	15	Other problems	Per Cent	15
	Number	6		Number	6

^a

Percentages equal more than 100 because children had more than one type of eating habit and problems.

successfully coped with these specific aspects of eating behavior.

The number of meals which are shared by the total family and comments concerning the food are assumed to have a direct influence on the amount of food the child with Down's syndrome will consume. On weekdays very few families ate the breakfast and noon meals together (Table 18). Approximately 90 per cent of the families were able to eat the evening meal together more than half of the time. Consequently, the evening meal was the most frequent occasion for total family interaction.

In half of the families, mealtime conversation was primarily about the quality of foods being served (Table 19). More specifically, approximately one-third of the families reported that critical remarks were made about the food served, and an equal number praised the food served. In addition, approximately one-third of the families (39 per cent) reported they disciplined their child during meals. The observation that at least one-half of the families made general comments about the food served during meals was reflected in the importance attached to food in these families. Only 21 per cent of the parents considered that food was less important to their family than to other families.

The techniques parents used to prevent consumption of food they deemed undesirable for the child were elicited from the parents. In general, five techniques were employed (Table 20). Half the parents reported they never had to withhold food from their children. In families in which food was withheld most fathers and mothers allowed the child to have just a "taste" of the food and then the food was

TABLE 18
Number and Percentage of Meals Family Eats Together

Meal	Weekdays	Weekends
Breakfast		
Less than half		
Per Cent	83	42
Number	33	17
More than half		
Per Cent	17	58
Number	7	23
Noon		
Less than half		
Per Cent	83	63
Number	33	25
More than half		
Per Cent	17	27
Number	7	15
Evening		
Less than half		
Per Cent	12	10
Number	5	4
More than half		
Per Cent	88	90
Number	35	36

TABLE 19
Topic Of Conversation During Meals

Topic	Families	
	Number	Percentage
Food Served	20	50
Praise of food	13	33
Criticism of food	13	33
General Comments	11	28
Discipline of Child's Manners	14	35

TABLE 20

Techniques Used by Parents to Withhold
Food Deemed Undesirable

Parent	Techniques		
	Used	Not Used	Not Applicable
Let "Taste"			
Mothers			
Per Cent	15	28	57
Number	6	11	23
Fathers			
Per Cent	18	32	50
Number	7	12	19
Distract Child			
Mothers			
Per Cent	30	13	57
Number	12	5	23
Fathers			
Per Cent	21	29	57
Number	8	11	19
Offer Substitute			
Mothers			
Per Cent	35	10	55
Number	14	4	22
Fathers			
Per Cent	26	24	50
Number	10	9	19
Move Child			
Mothers			
Per Cent	23	20	57
Number	9	8	23
Fathers			
Per Cent	24	26	50
Number	9	10	19
Discipline Child			
Mothers			
Per Cent	23	25	52
Number	9	10	21
Fathers			
Per Cent	21	26	53
Number	9	10	20

removed. Two alternatives, trying to distract the child and offering a substitute food, were used more frequently by mothers than fathers. Approximately equal proportions of mothers and fathers either moved the child away from the food, or disciplined the child in this situation.

Parents were also questioned about their use of food to control the child's behavior. Attention has recently been directed to the use of food as a technique to modify behavior of children with mental retardation. In this study only three mothers and three fathers admitted they "often" used food as a reward for good behavior. The choice of food used as a reward was likely to be dessert. Only two mothers in the study reported they "often" withheld food in order to discipline their child. Food was more oftenly used as a technique "to keep the child quiet": six mothers and six fathers reported that they "often" used food in this manner. In general, however, mothers or fathers in this study did not regularly use food to discipline, reward, or pacify their children.

Physical Impairments

In this study, physical impairment is statistically treated as an independent variable affecting dietary adequacy. Children with Down's syndrome have been observed to have numerous physical impairments which can affect their dietary intakes (Walker, 1955; Dybwad, 1966). The most frequent physical impairments listed by the mothers of the children in this sample were speech defects or difficulty in speaking, respiratory infection and sight defects (Table 21). Eight of the children had

TABLE 21

Number and Percentage of Children Possessing
Types of Physical Impairment

Type of Impairment	Presence of Impairment			
	Yes		No	
	Number	Percentage	Number	Percentage
Deafness or trouble hearing	2	5	38	95
Speech defect or difficulty speaking	19	48	21	53
Sight defect or trouble seeing	14	35	26	65
Difficulty using hands, fingers, or arms	4	10	36	90
Difficulty coordin- ating movements	8	20	32	80
Heart trouble	8	20	32	80
Frequent stomach upsets	4	10	36	90
Frequent respiratory infections	17	43	23	57

difficulty coordinating hand movements and eight had cardiac impairments. Few of the children were reported to have more than two physical impairments.

The impact of the number of physical impairments on dietary index rating was measured (Table 22). Sixty-seven per cent of the children with no or one physical impairment had good dietary index ratings. In contrast, only 36 per cent of those children with two or more physical impairments had good dietary index ratings. Increasing number of physical impairments were associated with lower dietary index ratings. This result is not surprising inasmuch as physical impairments may impede both the desire and ability to eat. Therefore, the hypothesis that the selected independent variable, physical impairment, influences the dietary adequacy of the child was accepted because the greater the number of physical impairments, the higher the dietary adequacy rating of the child.

Adaptive Behavior

The assumption was made that the higher the score received for selected domains of adaptive behavior the higher the index rating for dietary adequacy. No statistically significant relationship was observed between the dietary index rating and any of the following behavior ratings: eating skills, kitchen duties, planning activities, motor development, persistence or socialization (Table 23 and 24). Even though eight of the children were rated low in eating skills this deficiency was not apparently reflected in the dietary adequacy rating of the 19 children for whom such information was relevant.

TABLE 22

Relationship of Physical Impairments and
Dietary Index Rating

Dietary Index	Number of Physical Impairments ^a	
	None or 1	2 or More
Fair		
Per Cent	33	64
Number	6	14
Good		
Per Cent	57	36
Number	12	8
TOTAL	100	100
	22	22

^aG = -.5556; $Z_G = 1.55$; $p < .20$

TABLE 23

Adaptive Behavior Level of Children in Eating Skills
Kitchen Duties and Planning By Dietary Index Rating

Index Rating	Adaptive Behavior Scales ^a					
	Eating Skills ^b		Kitchen Duties ^c		Planning ^c	
	Low	High	Low	High	Low	High
Fair	5	6	2	7	3	7
Good	3	6	3	3	3	2
Total	8	11	5	10	6	9

^aThe Eating Skills Scale excluded children under five, and the Kitchen Duties and Planning Scales excluded children under six, since these aspects of adaptive behavior were not applicable to these age levels; Ns vary due to not ascertained data.

^bG = .1458; $Z_G = .0256$; not significant.

^cG = .5556; $Z_G = .8964$; $p < .40$.

TABLE 24

Adaptive Behavior Level Of Children In Motor Development, Language
Persistence and Socialization by Dietary Index Rating

Dietary Index Rating	Adaptive Behavior Scales ^a							
	Motor Development ^b		Language ^c		Persistence ^d		Socialization ^e	
	Low	High	Low	High	Low	High	Low	High
Fair	5	8	8	5	5	8	6	7
Good	3	6	3	6	3	5	5	4
Total	8	14	11	11	8	13	11	11

^a Excludes children under four years, due to the lack of scales measuring the adaptive behavior of children in this age level; Ns very due to not ascertained data.

^b $G = .1111$; $Z_G = .1751$; not significant

^c $G = .5238$; $Z_G = 1.0405$; $p < .30$

^d $G = .0204$; $Z_G = .0312$; not significant

^e $G = .1864$; $Z_G = .30571$; not significant

The Kitchen Duty Scale measured the child's behavior in table setting, cooking, and clearing the table of breakable dishes. A negative relationship between a child's ability to perform kitchen related duties and dietary rating was observed. Only 2 of the 5 children with low scale scores had fair dietary index ratings but 7 of the 10 children with high scale scores had diets rated as fair. The Gamma correlation for this relationship is $-.5556$ but is considerably affected by chance factors ($p < .40$).

Similarly the same statistical evaluation applied to the relationship between scores of the Planning (own activities) Scale and dietary adequacy; a negative relationship was observed between dietary index rating and rating on the Planning Scale. Thus, the 7 children in the study over 5 years of age who plan and organize their own leisure time activities did not appear to have better dietary rating as a consequence.

One domain of adaptive behavior, language ability, was significantly correlated with the dietary index rating (Table 24). The interrelationship of level of language ability and the ability to chew and swallow food in children with Down's syndrome has been previously reported (Dybawd, 1966). The muscles required for chewing and swallowing food are those muscles which are utilized in speaking. The hypothesis that children with Down's syndrome who demonstrate higher levels of adaptive behavior have higher dietary adequacy scores was rejected. Four of the five behavior domains were not significantly correlated with dietary adequacy scores.

Selected Social Characteristics of the Family

Selected social characteristics of the families of the children with Down's syndrome were expected to affect the dietary adequacy, feeding practices and eating behavior of the children (Eppright et al., 1970; Lund and Burke, 1969). The level of father's education and occupation were used to classify the families into social class index ratings. Social class is a multidimensional concept that encompasses many qualities in life style potentially affecting the nutrition of all family members. Factors related to dietary intake of the children were correlated with the social class index.

No significant relationship was observed between the social class index and the dietary adequacy rating of the children (Table 25). Therefore, total family income as a separate factor was examined in relation to the dietary adequacy rating (Table 25). A slightly higher percentage of families with monthly incomes of 900 dollars or more after taxes and deductions had good dietary ratings (59 per cent) than those children whose parents who earned less than that amount (43 per cent). However, this difference was not statistically significant ($G = .3000$). Fox et al. (1971) have suggested the amount of money the family spends for food is more closely related to dietary adequacy. The small sample size, the high monthly income levels and the lack of any "poor" dietary index ratings may account for weak association between these variables.

The frequency with which families ate meals together varied by social class levels (Tables 26 and 27). The social class level of the family appeared to have little effect on the frequency family eats

TABLE 25

Relationship of Social Class Index, Family Monthly Income
With Dietary Adequacy Rating

Dietary Adequacy	Social Class ^a			Total Monthly Family Income ^b	
	Upper (I & II)	Middle (III)	Lower (IV & V)	\$300-800	\$900 or More
Fair					
Per Cent	45	44	62	57	41
Number	5	7	8	13	7
Good					
Per Cent	55	56	38	43	59
Number	6	9	5	10	10
Total					
Per Cent	100	100	100	100	100
Number	11	16	13	23	17

^aG = -.2135; $Z_G = .5645$; not significant^bG = .3000; $Z_G = .7032$; not significant

TABLE 26

Relationship of Social Class and Frequency of Breakfast
and Noon Meals Family Eats Together

Frequency of Meals Family Eats Together	Weekdays			Weekends		
	Upper Class	Middle Class	Lower Class	Upper Class	Middle Class	Lower Class
Breakfast^a						
Less than half the time						
Per Cent	82	69	100	36	37	54
Number	9	11	13	4	6	7
More than half the time						
Per Cent	12	31	0	64	63	46
Number	2	5	0	7	10	6
Noon^b						
Less than half the time						
Per Cent	64	87	92	45	63	77
Number	7	14	12	5	10	10
More than half the time						
Per Cent	36	13	8	55	37	23
Number	4	2	1	6	6	3

^a

Weekdays: $G = -.0110$; $Z_G = .0264$; not significant; lower and middle class added for computation purposes;

Weekends: $G = .3377$; $Z_G = .6542$; not significant.

^b

Weekdays: $G = -.5706$; $Z_G = 1.4027$; $p = .20$

Weekends: $G = -.4118$; $Z_G = 1.3028$; $p = .20$

TABLE 27
Relationship of Social Class and
Frequency of Evening Meals
Family Eats Together

Frequency of Evening Family Eats Together	Weekdays			Weekends		
	Upper Class	Middle Class	Lower Class	Upper Class	Middle Class	Lower Class
Evening ^a						
Less than half the time						
Per Cent	0	6	31	0	6	23
Number	0	1	4	0	1	3
More than half the time						
Per Cent	100	94	69	100	94	77
Number	11	15	9	11	15	10

^a

Weekdays: $G = -.8407$; $Z_G = 2.6663$; $p < .05$;

Weekends: $G = -.7727$; $Z_G = 1.8058$; $p < .10$; upper and middle
classes combined for computation purposes for both weekdays and
weekends.

breakfast together. More upper class families than lower class families ate noon and evening meals together as a family unit.

The number of siblings in the family was not significantly related to the parental rating of the eating behavior of children with Down's syndrome. Likewise, no relationship was observed between the number of siblings and number of foods disliked by the child (Table 29).

The birth order or ordinal position in the family of the child with Down's syndrome was not correlated with either the dietary adequacy rating or the eating behavior. Twenty-five of the 40 children were the youngest children in families with two or more children, eight were either the "only" or the first child in a family with two children and seven children were "middle" children. Because of this distribution no statistical relationship was expected. The hypothesis, the dietary adequacy of children with Down's syndrome will be influenced by the independent variable, selected social characteristics of the family, was rejected. Social class of the family, number of siblings, income and ordinal position of the child were not significantly related to the child's dietary adequacy scores as hypothesized.

Sources of Nutrition Information, Nutrition Knowledge and Attitudes

Of the 40 mothers participating in this study 23 had received, from a professional, some type of nutrition advice specifically related to feeding a child with Down's syndrome (Table 30). Seventeen mothers reported they had received no specific nutrition help. About half of the children of each group of mothers had dietary adequacy ratings of good and half had ratings of fair. Apparently the special nutrition

TABLE 28

Relationship of Number of Siblings and Eating Behavior of
Children With Down's Syndrome

Eating Behavior ^a	Number of Siblings		
	None	1-2	3 or more
Eats Poorly all of the time			
Per Cent	20	11	0
Number	1	2	0
Eats Poorly Some of the time			
Per Cent	20	65	72
Number	1	11	13
Never Eats Poorly			
Per Cent	60	24	28
Number	3	4	5

^aG = -.2176; $Z_G = .5163$; not significant; "all" and "some" categories combined for purposes of computation.

TABLE 29

Relationship of Number of Siblings and Food Dislikes of
Children With Down's Syndrome

Food Dislikes	Number of Siblings		
	None	1-2	3 or more
Many Dislikes			
Per Cent	20	24	6
Number	1	4	1
Some Dislikes			
Per Cent	80	65	83
Number	4	11	15
No Dislikes			
Per Cent	0	11	11
Number	0	2	2

^aG = .4962; $Z_G = 1.03$; $p < .30$; "some" and "none" categories combined for purposes of computation.

TABLE 30

Relationship of Professional Nutrition Advice
Given to the Mother and The Child's
Dietary Adequacy Rating

Dietary Adequacy	Mother Received Professional Nutrition Advice ^a	
	Yes	No
Fair		
Per Cent	57	41
Number	13	7
Good		
Per Cent	43	59
Number	10	10
Total	100	100
	23	17

^a
G = .3000; $Z_G = .7032$; not significant

advice given to the mother was not reflected in the dietary adequacy of the child. Therefore, the hypothesis that children with Down's syndrome whose mothers have received any type of nutrition information have higher dietary adequacy scores was rejected.

The source of the mothers' nutrition advice was obtained. Fourteen mothers listed the physician as the primary source and nine listed the social worker. The majority of these social workers, also called "home trainers", received their education in areas in home economics. Only seven mothers listed the nutritionist (dietitian) as their source of advice.

The need for the inclusion of more nutrition courses in the educational programs of physicians and home training consultants is essential if these professionals are to provide effective nutritional help to these families. In addition, more nutritionists should be available to provide nutrition services to these families.

A test of nutrition knowledge was administered to both parents in order to ascertain their basic understanding of nutrition. The degree of certainty of the answer for each item in the test was incorporated into a total scoring system.

Approximately 70 per cent of the mothers and 55 per cent of the fathers scored high on nutrition knowledge (Table 31). This difference between parents was not a significant difference ($G = -3077$). This finding was surprising because mothers are traditionally expected to have more exposure to nutrition information.

The relationship of the extent of parental nutrition knowledge

TABLE 31
Parental Nutrition Knowledge Scores

Parents	Nutrition Knowledge Score ^a	
	Low (3-5)	High (6-8)
Mothers		
Per Cent	30	70
Number	12	28
Fathers		
Per Cent	45	55
Number	17	21

^aG = -.3077; $Z_G = 1.9903$; $p < .05$.

TABLE 32
Parental Nutrition Knowledge Scores and
Dietary Index Rating

Index Rating	Mothers ^a		Fathers ^b	
Fair				
Per Cent	67	43	41	57
Number	8	12	7	13
Good				
Per Cent	33	57	59	43
Number	4	16	10	10

^aG = .5000; $Z_G = 1.21$; $p < .20$

^bG = .3000; $Z_G = .7032$; not significant

was significantly correlated with the dietary adequacy; the higher the level of the mother's knowledge the higher the child's dietary index ($G = .5000$ $p < .20$). This relationship has been confirmed in other studies (Young, et al., 1956; Cornely, et al., 1963; Eppright, et al., 1971). Although other researchers have suggested that the level of nutrition knowledge of the father influences dietary adequacy of children, this influence was not significant in this study.

The effects of parental nutrition knowledge on the child's eating problems are presented in Table 33. No significant difference was found in the number of eating problems of children whose parents had high scores on nutrition knowledge than in children whose parents received low scores on this test.

Several researchers have suggested that parents of children with mental retardation are likely to be permissive with respect to their child's eating habits (Dybwad, 1968; Coffy, 1971). This was not demonstrated for parents in this sample (Table 34). About two-thirds of the mothers and fathers scored low, not high on the permissiveness scale. Furthermore, no statistically significant difference was observed in levels of the permissiveness between mothers and fathers.

Studies on normal children also report parental permissiveness to be negatively correlated with dietary adequacy of the child. (Eppright, et al., 1970). This relationship does not appear to be substantiated in the present study. Approximately equal proportions of children whose mothers and fathers rated low in permissiveness have good and half had fair ratings (Table 35).

TABLE 33
Parental Nutrition Knowledge Scores and
Child's Eating Problems

Eating Problems	Nutrition Knowledge Scale			
	Low (3-5)	High (6-8)	Low (3-5)	High (6-8)
	Mothers ^a		Fathers ^b	
None or 1				
Per Cent	50	36	41	33
Number	6	10	7	7
Two or More				
Per Cent	50	64	59	67
Number	6	18	10	14

^aG = .2857; Z_G = .6109; not significant

^bG = .1667; Z_G = .3410; not significant

TABLE 34
Level of Parental Permissiveness

Parents	Nutritional Permissiveness Scale ^a	
	Low (1-3)	High (4-8)
Mothers		
Per Cent	63	37
Number	25	15
Fathers		
Per Cent	61	39
Number	23	15

^aG = .0417; Z_G = .2576; not significant

Approximately equal proportions of mothers and fathers stressed the importance of nutrition in general (Table 36). Again, no differences occurred between the nutritional views of mothers and fathers when tabulated as individual groups.

A negative impact of parental attitudes stressing the importance of nutrition on the child's dietary adequacy rating was observed (Table 35). The more importance the fathers, and mothers in particular placed on nutrition, the lower the dietary adequacy of the child. Although the correlation was not especially high, it was unlikely to be due to chance factors. This association may be explained by the fact that there are factors connected to attitudes of nutrition importance among these parents that may interfere with the type of amount of food consumed by the child. Parents' beliefs about the importance of nutrition may not necessarily influence the dietary adequacy of their child.

The hypothesis that children with Down's syndrome whose parents have higher scores on nutrition knowledge and attitude tests have higher dietary adequacy scores was rejected. Parental attitudes of permissiveness were without influence on the dietary adequacy scores of the child, while attitudes of importance were associated with dietary adequacy scores in the opposite direction to that hypothesized. Nutrition knowledge of the mother was positively correlated with higher dietary adequacy scores; however, the relationship between fathers' levels of nutrition knowledge and the child's dietary scores was not significant.

TABLE 35
 Level of Parental Permissiveness
 and Child's Dietary
 Index Rating

Dietary Adequacy	Nutritional Permissiveness Scale			
	Low (1-3)	High (4-8)	Low (1-3)	High (4-8)
	Mothers ^a		Fathers ^b	
Fair				
Per Cent	44	60	48	53
Number	11	9	11	8
Good				
Per Cent	56	40	52	47
Number	14	6	12	7
Total	100	100	100	100
	25	15	23	15

^a
 $G = -.3125$; $Z_G = .7207$; not significant

^b
 $G = -.1098$; $Z_G = .2357$; not significant

TABLE 36
Parental Attitudes of Importance of Nutrition

Parents	Nutrition Importance Scale ^a	
	Low (4-6)	High (7-8)
Mother		
Per Cent	40	60
Number	16	24
Father		
Per Cent	43	57
Number	17	21

^a
G = -.0968; $Z_G = .5946$; not significant

TABLE 37
Relationship of Parental Attitudes of Importance
of Nutrition and Dietary Adequacy Rating

Dietary Adequacy Rating	Nutrition Importance Scale			
	Low (4-6)	High (7-8)	Low (4-6)	High (7-8)
	Mothers ^a		Fathers ^b	
Fair				
Per Cent	31	63	35	54
Number	5	15	6	13
Good				
Per Cent	69	37	65	46
Number	11	9	11	8

^a
G = -.5714; $Z_G = 1.5952$; $p < .20$.

^b
G = -.6643; $Z_G = 1.9900$; $p < .05$.

Recommendations

The following recommendations were evolved from evaluation of the findings of this study:

1. Nutrition education programs should be designed which include the instruction pertinent to the inclusion of foods in the diets of children with Down's syndrome. These programs should provide information to the parents so that the selection of food will provide the RDA for food energy and selected nutrients. Estimates of the amounts of food energy, protein, fat, carbohydrate, vitamin A, vitamin D, ascorbic acid, iron, calcium and thiamine in the foods consumed by the child should be derived from a food intake record. If food energy or any nutrient is below the RDA, parents should be instructed to include the specific foods rich in these nutrients in the diets of their children. If adequate amounts of these foods cannot be provided for or consumed by the child, an appropriate nutrient supplement should be recommended.

2. Nutrition education is particularly needed for parents of children with Down's syndrome who have several physical impairments and low levels of adaptive behavior. Children with severe speech and language impairments should be of particular concern to nutritionists working with children with Down's syndrome. In this study children with more than one impairment and rated as low in language ability received significantly lower dietary adequacy scores.

3. Nutrition education should be provided for all professional members of the team working with children with Down's syndrome, especially

the physician and home training consultant. These professionals should be encouraged to study nutrition in order to provide better nutrition advice to families with a child with Down's syndrome. These professionals should also be encouraged to recognize and solicit the services of the nutritionist.

4. The need for more multidisciplinary approaches in the service and education of families with children with Down's syndrome were reinforced by the results of this study.

Dietary adequacy, feeding problems and rating behavior are interrelated factors in the total spectrum of the treatment and development of a child with Down's syndrome.

CHAPTER V

SUMMARY

A study was conducted to evaluate the dietary adequacy, measure the effect of selected independent variables on dietary intake and identify feeding practices and eating behavior of children with Down's syndrome. Physical limitations of the child, selected aspects of the child's adaptive behavior, selected social characteristics of the family, parental nutrition knowledge and attitudes and the sources of nutrition information utilized by the mother were the independent variables examined. The dependent variables included the measurements of height, weight and head circumference of the child.

All data for the study were obtained by use of an interview schedule which consisted of fixed alternative questions. Members of forty families residing in Franklin County, Ohio who had one child between six months and 14 years of age diagnosed as having Down's syndrome were interviewed in their homes.

The amounts of food energy, protein, carbohydrate, fat, vitamin A, vitamin D, thiamine, ascorbic acid, iron and calcium available to the child were determined from foods listed on a two-day dietary record prepared by the mother.

Scores were derived from the following: social class, aspects of adaptive behavior, parental nutrition knowledge and attitudes and overall dietary adequacy. Kruskal's Gamma statistical test was used to measure the level of association between variables and dietary adequacy.

More than half of the children with Down's syndrome obtained less than the RDA for food energy, calcium, iron, vitamin A, thiamine and vitamin D from foods in their daily diets. Over three-fourths of these children exceeded the RDA for protein and ascorbic acid. When dietary adequacy was analyzed by age, the only differences were related to the dietary intake of thiamine and vitamin A. More than half of the children under six obtained more than the RDA for vitamin A and thiamine but the 93 per cent of children over six received less than the RDA for thiamine and 82 per cent less than the RDA for vitamin A.

Over 50 per cent of all children were given a vitamin-mineral supplement. Therefore, the overall total intakes of vitamin A, ascorbic acid and thiamine greatly exceeded the RDA for these nutrients for more than half the children. Over half of the children six years of age or older derived 41 to 57 per cent of their food energy from dietary fat.

Regardless of age, children were rated below the predicted norm for height and head circumference. Seventy-five per cent of the children were below the predicted norm for weight; 40 per cent were three standard deviations below the norm. However, with increasing age there was a trend for the children to exceed the norm for weight. When these measurements were converted into descriptive categories, these children were evaluated as short in height, light in weight and below average in head circumference. Although the correlation between dietary adequacy and height was significant, no significant correlations were found for the other growth parameters.

Information related to eating behavior of the children was reported. Only three children were related as eating poorly all of the time. Approximately one-third of the parents reported their children ate well. About three-fourths of the children were described by their parents as having "some" food dislikes, with few children having "many" or "no" dislikes. Approximately 43 per cent of the mothers reported their children ate a limited variety of food in general and 53 per cent indicated specifically they ate too little fruits and vegetables. The most frequent eating problems were reported as difficulties in "using a knife or fork", "eating food served the rest of the family" and "chewing".

Feeding practices of the family unit were also reported. Few families ate either the breakfast or noon meal together on weekdays, but most families ate the evening meal together seven days a week. During the meal, conversation in half the families included comments about the food being served, although for one-third of the families meal conversation was concerned with disciplining the manners of the child with Down's syndrome.

Approximately half of the parents reported it was necessary at times to withhold food desired by the child. These parents reported the kinds of strategies they employed to withhold food desired by the child. Equal proportions of mothers and fathers, about 20 per cent, reported they moved the child from the food or disciplined the child in this situation; a higher proportion of mothers than fathers tried to distract the child or offer a substitute food. The use of food to reward, discipline, or keep the child quiet was seldom reported.

The most frequent physical impairments reported for children in this study were speech defects, respiratory infections and sight defects. The number of physical impairments influenced the dietary adequacy of the child. The greater the number of the child's physical impairments, the lower the dietary adequacy score.

The direction and strength of association between selected aspects of adaptive behavior and dietary adequacy of the child was explored. A strong negative correlation was found between adaptive behavior in "kitchen duties and planning" and dietary adequacy. However, a positive correlation was observed between language ability and the dietary adequacy rating. None of the other selected aspects of adaptive behavior were correlated with the overall dietary adequacy.

Selected social characteristics of the families of the children with Down's syndrome were analyzed with respect to effect on the dietary adequacy rating and eating behavior of the children. No significant correlations were observed between dietary adequacy and eating behavior and the variables of social class, family income, ordinal position of the child in the family and number of siblings.

In general, nutrition knowledge did not appear to influence the dietary adequacy, feeding practices or eating behavior of the child with Down's syndrome. A low positive correlation between the mother's nutrition knowledge score and the child's dietary adequacy score was observed. Mothers and fathers received approximately the same scores on the test of nutrition knowledge.

Parental attitudes toward the importance of nutrition and permissiveness with respect to eating practices were tested as independent variables affecting the child's dietary adequacy. Parents scored low on tests of permissiveness and high on tests of importance of nutrition. No correlation was found between permissive attitudes of mothers or fathers and the child's dietary adequacy rating. A negative impact of parental attitudes stressing the importance of nutrition on the child's dietary adequacy rating was observed. The more importance the fathers and mothers in particular placed on nutrition, the lower the dietary adequacy of the child.

Approximately half of the mothers in this study received some type of nutrition advice from a professional. No differences were observed between dietary adequacy ratings of children whose mother had or had not received this specific advice related to nutrition.

Nutrition education programs need to be designed and implemented for parents of children with Down's syndrome. Information provided to the parents should include: food sources of particular nutrients, especially sources of calcium, thiamine, vitamins A and D and iron; food sources of energy and energy needed to ensure a proper weight for height; and aid in solving feeding problems.

APPENDIX A
Letters to Families

Dear Parents:

The Franklin County Program for the Mentally Retarded is cooperating with the School of Home Economics and the Nisonger Center for Mental Retardation of The Ohio State University in a study of the eating habits of children with Down's Syndrome. Results from this study will help in understanding what foods your child and others like him are eating, as well as why they eat particular foods. Good health in your child is important to all of us. The relationship of good eating habits to good health is a primary concern of this study.

Please return the enclosed consent form signed if you are willing to participate. If so, in the next few days, an interviewer representing this project will phone you to discuss this project. At this time, arrangements to come and talk with both of you about your child's eating habits will be made. Your joint participation in this study is greatly appreciated.

Sincerely,

Kenneth A. McBain
Administrator

KAB/ljr

June 15, 1971

Dear Parent:

The Nisonger Center for Mental Retardation of The Ohio State University is cooperating with the School of Home Economics in a study of the eating habits of children with Down's Syndrome. Results from this study will help in understanding what foods your child and others like him are eating, as well as why they eat particular foods. Good health in your child is important to all of us. The relationship of good eating habits to good health is a primary concern of this study.

In the next few days, an interviewer representing this project will phone you to discuss this project. At this time, arrangements to come and talk with both of you about your child's eating habits will be made. Your joint participation in this study is greatly appreciated.

Sincerely,

Mrs. Susan Calvert
Doctoral Candidate

Case Team Leader:

SC/ljr

FRANKLIN COUNTY PROGRAM FOR THE MENTALLY RETARDED

3234 Cleveland Avenue
Columbus, Ohio 43224

Permission is hereby granted to include _____ in
the Study of Eating Habits of Children in cooperation with the
School of Home Economics and the Nisonger Center for Mentally
Retarded and the Franklin County Program for the Mentally Retarded.
I will participate and provide an opportunity for interviews.

Date _____ Signed _____
Parent or Legal Guardian

APPENDIX B

Questionnaire and Dietary Record Form

Schedule No. _____
Interviewer _____
Date _____

TIME interview started: _____

We are interested in learning about the eating practices of children with Down's syndrome. This information will help to solve food problems of these children. Your responses will be kept in COMPLETE CONFIDENCE. Your participation in the study is MOST APPRECIATED.

To begin, we are interested in your opinions about nutrition and eating habits. THIS IS NOT A TEST. We are not looking for certain right, or wrong answers. We only want your own personal ideas.

After I read each of the following statements, indicate whether you AGREE or DISAGREE. (HAND CARD #1 TO RESPONDENT.) After you have stated your agreement or disagreement, indicate how CERTAIN you are about it. If you are VERY CONFIDENT of your opinion, say the number "one." If you are VERY DOUBTFUL of your belief, say the number "five." Use other numbers on the card to indicate degrees of certainty between these extremes.

These statements apply to Down's syndrome children in general, and _____ in particular.

	<u>DOC</u>
1. A parent should let a Down's syndrome child choose whatever he wants for meals.	A D ____
2. Foods have so many vitamins added that you don't have to bother about the diet of a Down's syndrome child.	A D ____
3. I feel _____'s nutrition now will be extremely important in later years.	A D ____
4. As long as _____ doesn't pick the same thing constantly, it is all right to let (him/her) select (his/her) own food.	A D ____
5. As long as _____ is not sick, we must be feeding him right.	A D ____
6. Special attention should be given to the diet of a Down's syndrome child.	A D ____

7. Even if I give vitamin pills, I should be concerned about _____'s diet. A D ____
8. If _____ wants a certain food for a meal, it should be served. A D ____
9. I feel that if _____ drinks milk, I don't have to worry about nutrition. A D ____
10. As long as the doctor doesn't say anything about _____'s nutrition, I don't worry about it. A D ____
11. As long as _____ is gaining weight, I don't have to worry about (his/her) nutrition. A D ____
12. I just don't have time to think much about _____'s nutrition. A D ____
13. Nutrition is not so important as long as _____ eats a lot. A D ____
14. I believe _____ should be allowed to choose what (he/she) wants to eat, even if it means a little more preparation. A D ____
15. I am concerned about getting _____ to eat the right foods. A D ____
16. Down's syndrome children should be allowed to eat whatever they want. A D ____
17. Nutrition is not so important if _____ has plenty of liquids. A D ____
18. The growth of a Down's syndrome child depends on the quality of (his/her) diet. A D ____
19. _____ should be allowed to eat whatever (he/she) wants. A D ____

Now I would like you to describe some of the ways _____ acts in different situations.

20. Does _____:
- 6 use knife and fork correctly and neatly
 - 5 use table knife for cutting or spreading
 - 4 feeds self with spoon and fork -- neatly
 - 3 feeds self with spoon and fork -- considerable spilling
 - 2 feeds self with spoon -- neatly
 - 1 feeds self with spoon -- considerable spilling
 - 0 feeds self with fingers or not at all

*If _____ is 4 years or younger, go to item 22.

21. Does _____: 3 order complete meals in restaurants
2 order simple meals like hamburgers or hotdogs
1 orders soft drinks at soda fountain or canteen
0 does not use public facilities at all

22. Does _____: 3 drink without spilling, holding glass in one hand
2 drink from cup or glass unassisted -- neatly
1 drink from cup or glass unassisted -- considerable
spilling
0 does not drink from cup or glass unassisted

23. Does _____ have acceptable table manners? NO YES
(GO TO ITEM 24)

- a. swallows food without chewing
- b. chews food with mouth open
- c. drops food on table for floor
- d. does not use napkin correctly
- e. talks with mouth full
- f. takes food off others' plates
- g. eats too fast
- h. plays in food with fingers
- i. other unacceptable table manners: _____

24. Can _____ walk and run without difficulty NO YES
(GO TO ITEM 25)

- a. cannot walk alone
- b. cannot walk up and down stairs alone
- c. cannot walk down stairs by alternating his feet
- d. cannot run without falling often
- e. is not able to hop and skip
- f. other running or walking difficulties: _____

25. Does _____ have good control of (his/her) hands? NO YES
(GO TO ITEM 26)

- a. cannot catch a ball
- b. cannot throw a ball overhand
- c. is not able to lift a cup
- d. cannot grasp with thumb and finger
- e. other problems of hand control: _____

26. Is _____ able to say at least a few words? NO YES
(GO TO ITEM 27)

- a. nods head or smiles to express happiness
- b. indicates hunger
- c. indicates wants by pointing or vocal noises
- d. chuckles or laughs when happy
- e. expresses pleasure or anger by vocal noises
- f. other word problems: _____

*IF RESPONDENT GIVES A "NO" ANSWER TO ABOVE ITEM, GO DIRECTLY TO ITEM 30.

27. Is _____'s speech generally clear and understandable? NO YES
(GO TO ITEM 28)

- a. speech is low, weak, whispered or difficult to hear
- b. speech is slowed, deliberate, or labored
- c. speech is hurried, accelerated, or pushed
- d. speaks with blocking, halting, or other irregular interruptions
- e. other speech problems _____

28. Does _____: 3 sometimes use complex sentences containing "because", "but", etc.
2 ask questions using words such as "why", "how", "what", etc.
1 speak in simple sentences of three words or more
0 speak in incomplete sentences or not at all

29. Does _____: 4 talk about action when describing pictures
3 names people or objects when describing pictures
2 uses names of familiar objects
1 ask for at least ten things by their appropriate names
0 is nearly non-verbal

30. Select ALL statements that apply to _____:

- a. can talk another child back into good humor
- b. listens and can be reasoned with verbally
- c. seems to enjoy being talked to
- d. can talk sensibly if asked
- e. enjoys books, newspapers, magazines
- f. repeats a story with little or no difficulty

*If _____ is 5 years or younger, GO TO ITEM 34

31. Does _____: 3 place all eating utensils, as well as napkins, salt, pepper, sugar, etc., in positions he has learned in table setting.
2 place plates, glasses, and utensils in positions he has learned in table setting
1 simply places silver, plates, cups, etc., on the table
0 does not set table

32. Does _____: 3 "cook" an adequate complete meal (may use canned and frozen food for this purpose)
2 mixes and cooks simple food, e.g., frying eggs, making pancakes, etc.
1 prepares simple foods requiring no mixing or cooking
0 does not prepare food at all

33. Does _____: 2 clear table of breakable dishes and glassware
 1 clear table of unbreakable dishes and silverware
 0 does not clear table at all

34. Will _____: 4 pay attention to a task for more than 15 minutes,
 e.g., cleaning up, putting things away
 3 pay attention to a task for at least 15 minutes
 2 pay attention to a task for at least 10 minutes
 1 pay attention to a task for at least 5 minutes
 0 not pay attention to a task, even if it requires
less than 5 minutes

35. Does _____ have persistence? NO YES
 (GO TO ITEM 36)

- a. has short attention span
- b. becomes easily discouraged
- c. fails to carry out tasks
- d. jumps from one activity to another and never finishes a task
- e. needs constant encouragement to complete a task
- f. other types of persistence _____

*If _____ is 5 years or younger, GO TO ITEM 37.

36. Does _____ organize (his/her) own leisure time activities? NO YES
 (GO TO ITEM 37)

- a. does not organize leisure time on a fairly complex level, e.g., playing billiards, fishing, etc.
- b. has no hobby, e.g., painting, embroidery, collecting stamps or coins
- c. does not organize leisure time adequately on a simple level, e.g., watching television, listening to phonograph, radio, etc.
- c. other aspects of leisure time organization _____

37. Is _____ cooperative? YES NO
 (GO TO ITEM 38)

- a. is willing to help if asked
- b. offers assistance to others
- c. does helpful things for others
- d. wishes to please others
- e. other aspects of cooperation _____

38. Is _____ considerate of others? YES NO
 (GO TO ITEM 39)

- a. shows interest in the affairs of others; is not indifferent
- b. takes care of others' belongings
- c. directs, or manages the affairs of others when needed
- d. seems considerate of others' feelings
- e. other aspects of consideration of others _____

39. Select ALL statements that apply to _____:

- a. recognizes own family
- b. recognizes faces of others, e.g., classmates, neighbors
- c. is well informed about others, e.g., neighbors
- d. knows the names of many people around him
- e. knows the names of many professional people, e.g., nurses, aides, teachers, etc.

40. Does _____: 3 play cooperatively or competitively with others in group games
 2 play with others for at least short periods of time, e.g., showing or offering toys, clothing or objects
 1 play with others imitatively with little interaction
 0 is completely unresponsive to others

41. Does _____: 3 initiate group activities (leader and organizer)
 2 participate in group activities spontaneously and eagerly (active participant)
 1 participants in group activities if encouraged to do so (passive participant)
 0 does not participate in group activities (an isolate)

42. Select ALL statements that apply to _____:

- a. refuses to take turns
- b. does not share with others
- c. gets mad if he does not get his way
- d. expects everyone to give in to his wishes
- e. interrupts aide or teacher who is helping another person
- f. other acts of selfishness: _____

43. Select ALL statements that apply to _____:

- a. is too familiar with strangers
- b. is afraid of strangers
- c. does anything to make friends
- d. is helpless and dependent on others
- e. likes to hold hands with everyone
- f. is at aide's or teacher's elbow constantly
- g. other immaturities in socialization: _____

Next, I would like to ask you some questions about _____'s eating patterns.

44. How would you rate _____'s diet in comparison to older brothers or sisters? Is it

BETTER SIMILAR POORER NA

45. How would you rate _____'s diet in comparison to younger brothers or sisters? Is it....

BETTER SIMILAR POORER NA

46. How would you best describe _____'s food pattern?

EATS POORLY ALL EATS POORLY SOME NEVER EATS
OF THE TIME OF THE TIME POORLY

47. How would you describe _____'s food dislikes?

MANY DISLIKES SOME DISLIKES NO DISLIKES

48. The food dislikes of _____ are most similar to which one of the following people:

MOTHER FATHER OLDER OLDER YOUNGER YOUNGER OTHER (_____)
 SISTER BROTHER SISTER BROTHER

49. Does _____ ever want food that you don't want (him/her) to have?

NO YES
(GO TO 52)

50. What do you do when _____ wants food that you don't want (him/her) to have?

51. If _____ wants food that you don't want (him/her) to have, do you:

- a. YES NO Let him take just a "taste"
- b. YES NO Try to distract the child
- c. YES NO Offer (him/her) a substitute
- d. YES NO Move the child out of the food area
- e. YES NO Discipline the child: How do you discipline the child?

52. When _____ doesn't want to eat when you want (him/her) to, what do you do?

53. Do you use food as a reward for _____'s good behavior?

OFTEN SELDOM NEVER
(GO TO 55)

54. Do you ever use desserts as a reward for _____'s good behavior?

OFTEN SELDOM NEVER

55. Do you ever withhold food in order to discipline _____?

OFTEN SELDOM NEVER

56. Do you use food to keep _____ quiet?

OFTEN SELDOM NEVER

57. How important is food to your family compared to other families you know?

MORE IMPORTANT SAME IMPORTANCE LESS IMPORTANT

58. At what age did you first suspect that _____ was a Down's syndrome child?

(Years of age)

59. Does _____ have any of the following physical impairments?

- a. YES NO Deafness or trouble hearing
- b. YES NO Speech defect or difficulty
- c. YES NO Sight defect or trouble seeing
- d. YES NO Difficulty coordinating movements
- e. YES NO Difficulty using hands, fingers, or arms
- f. YES NO Heart trouble
- g. YES NO Frequent stomach upsets
- h. YES NO Frequent colds
- i. YES NO Other (Specify: _____)

FOR CHILDREN UNDER SIX:

60. To what extent do any or all of these impairments limit _____'s daily play activities?

MANY LIMITS SOME LIMITS NO LIMITS

FOR CHILDREN OVER SIX:

61. To what extent do any or all of these impairments limit _____'s daily activities?

MANY LIMITS SOME LIMITS NO LIMITS

62. Does your child have any of the following problems?

- a. YES NO Difficulty sucking liquid through a straw
- b. YES NO Difficulty getting food off a spoon and into his mouth
- c. YES NO Difficulty swallowing food
- d. YES NO Difficulty chewing food
- e. YES NO Difficulty sitting without support
- f. YES NO Difficulty feeding himself
- g. YES NO Difficulty eating chopped foods
- h. YES NO Difficulty eating meat
- i. YES NO Difficulty eating foods served to the rest of the family
- j. YES NO Difficulty drinking from a cup
- k. YES NO Difficulty using a knife or fork
- l. YES NO Vomits or regurgitates food
- m. YES NO Difficulty in controlling or using the tongue
- n. YES NO Spits food out of mouth
- o. YES NO Drools
- p. YES NO Eats well alone but not with the rest of the family
- q. YES NO Eats most of his food with his fingers.
- r. YES NO Holds food in mouth a long time without swallowing
- s. YES NO OTHER: Specify _____

63. Do you think your child has any of the following eating habits?

- a. YES NO Eats too little food
- b. YES NO Eats too much food
- c. YES NO Chooses a limited variety of foods
- d. YES NO Eats too little fruits and vegetables
- e. YES NO Eats too little meat
- f. YES NO Drinks too little milk
- g. YES NO Drinks too much milk
- h. YES NO Eats too much bread
- i. YES NO Eats too many sweet foods
- j. YES NO Takes too much time to eat
- k. YES NO Has been eating strained foods too long
- l. YES NO Is overweight
- m. YES NO Is underweight
- n. YES NO Is overactive (i.e., is hyperactive)
- o. YES NO Is listless
- p. YES NO Is rarely hungry
- q. YES NO Is always hungry
- r. YES NO Has table manners that upset you
- s. YES NO OTHER: specify _____

64. How often does your family eat meals together? (HAND CARD # 2)

Almost Never	Less Than Half The Time	More Than Half The Time	Almost Always
-----------------	----------------------------	----------------------------	------------------

BREAKFAST

A. Monday thru
Friday

B. Saturday and
Sunday

NOON MEAL

A. Monday thru
Friday

B. Saturday and
Sunday

EVENING MEAL

A. Monday thru
Friday

B. Saturday and
Sunday

65. Does your child help you in the planning of meals? YES NO NA

66. Does your child help you in the preparation of meals? YES NO NA

67. In your normal family table conversation does your family discuss the food being served? YES NO

(GO TO ITEM 69)

68. Would you describe family comments related to foods being served as primarily:

- a. YES NO Complimentary praise (of food item)
- b. YES NO Critical (of food item)
- c. YES NO General information only ("How it is prepared.")
- d. YES NO Disciplinary comments relating to child's manners in eating food
- e. YES NO Other: Specify _____

69. Who decides which foods _____ eats at the following times?

Breakfast Noon Meal Evening Meal Snacks

Child himself

Mother

Father

Other

Specify

70. When in school did you learn about what foods to eat and how to prepare them? YES NO

(GO TO ITEM 72)

71. In what classes in school did you learn about food and nutrition?

- a. YES NO Elementary
- b. YES NO Junior High Home Economics
- c. YES NO Senior High Home Economics
- d. YES NO College Home Economics
- e. YES NO Health Education: grade taken _____
- f. YES NO Other school classes: _____;
grade taken _____.

72. As an adult, have you attended group activities in which you learned about foods to eat? YES NO

(GO TO ITEM 75)

73. In what group activities did you learn about food and nutrition?

- a. YES NO Extension courses
- b. YES NO Adult education classes
- c. YES NO 4-H, Girl Scouts, or other youth groups
- d. YES NO Women's clubs
- e. YES NO Courses in cooking
- f. YES NO Public health class or clinic
- g. YES NO Prenatal classes
- h. YES NO OTHER: specify _____

74. Which of the above classes or activities do you believe has been most helpful to you in feeding your child? _____

75. What does the word "NUTRITION" mean to you? (PROBE)

76. What does the word "NUTRIENT" mean to you? (PROBE)

77. Would you give an EXAMPLE of a NUTRIENT: _____

78. If you want information about the nutritional value of various foods, which of the following sources of information would you consult?

- a. YES NO Cookbook
- b. YES NO Bulletins and books
- c. YES NO Magazines and newspapers
- d. YES NO Television
- e. YES NO Radio
- f. YES NO Neighbor or friend
- g. YES NO Mother, or mother-in-law
- h. YES NO Family members
- i. YES NO Teacher
- j. YES NO Doctor
- k. YES NO Dentist
- l. YES NO Nurse
- m. YES NO Social worker
- n. YES NO Home economist
- o. YES NO Nutritionist or dietitian
- p. YES NO Health food store
- q. YES NO OTHER: specify _____

79. Which of these sources is the greatest help to you? _____

80. Which of these sources is the next greatest help to you? _____

81. Have you been given special advice about foods to feed or information about how to feed _____ ? YES NO

(GO TO ITEM 86)

82. Which of these persons gave this information to you?

- a. YES NO Doctor
- b. YES NO Dentist
- c. YES NO Nurse
- d. YES NO Home Economist
- e. YES NO Nutritionist/Dietitian
- f. YES NO Social worker
- g. YES NO Mother
- h. YES NO Neighbor or friend
- i. YES NO Other: specify _____

83. How valuable was this information to you in handling _____'s eating problems?

VERY HELPFUL SOMETIMES HELPFUL NOT HELPFUL

84. Why not? _____

85. Do you have fewer feeding problems since you have received this nutritional advice? YES NO

Now I would like to read some statements concerning NUTRITION IN GENERAL. (HAND CARD #3 TO RESPONDENT.) Please indicate whether you think a statement is TRUE or FALSE. Also, indicate HOW CERTAIN you are of your answer by stating the appropriate number on the card.

DOC

86. Protein rich foods, such as meat, milk, and eggs, provide liberal amounts of several nutrients needed for the growth of small children.	T	F	___
87. It is better <u>not</u> to include orange juice and milk in the same meal, because the orange juice causes the milk to curdle in the stomach.	T	F	___
88. By the end of the first year babies should have learned to eat a variety of foods besides milk.	T	F	___
89. School age children need multiple vitamin pills to ensure good health.	T	F	___
90. The term "well balanced," when applied to a day's diet, means that all of the food groups in a daily plan are included in amounts recommended.	T	F	___
91. When children have enough food to satisfy their appetites their diets are certain to be nutritionally adequate.	T	F	___
92. Healthy adults should take food supplements or vitamin pills to ensure having all the nutrients needed for good nutrition.	T	F	___
93. A good nutritional practice is to eat a wide variety of types of foods from day to day.	T	F	___
94. <u>Eggs</u> can completely replace <u>milk</u> in the diet so far as nutrients are concerned.	T	F	___
95. Carbonated beverages are a good food item in the diets of young children.	T	F	___
96. <u>Skim</u> milk contains about the same amounts of body building minerals and protein as <u>whole</u> milk.	T	F	___

- Last, we need some basic statistical facts about yourself and your family.

108. What is your occupation? _____

a. Elementary	4	5	6	7	8
b. High School		9	10	11	12
c. Technical School				13	14
d. College		15	16	17	18
e. Graduate School		19	20	21	22

110. What is your total monthly family income after taxes? _____
(Figure monthly income for respondents not paid on a monthly basis)
111. Are there any other persons living in the household? YES NO
(GO TO ITEM 113)
112. What is their relationship to your children? _____

113. a. Who is the oldest child in your family?
M F What is his/her age? _____
- b. Who is the second oldest child in your family?
M F What is his/her age? _____
- c. Who is the third oldest child in your family?
M F What is his/her age? _____
- d. Who is the fourth oldest child in your family?
M F What is his/her age? _____
- e. Who is the next oldest child in your family?
M F What is his/her age? _____
- f. Who is the next oldest child in your family?
M F What is his/her age? _____
- (CONTINUE FOR ALL CHILDREN)
114. * CIRCLE ORDINAL POSITION OF PARTICIPATING CHILD
115. What is your wife's birthdate? _____
Month Day Year
116. What is your wife's present occupation, other than housewife? (i.e., she works outside the home for pay.) _____
117. What is the last year of formal education she completed?
a. Elementary	4	5	6	7	8
b. High School		9	10	11	12
c. Technical School				13	14
d. College		15	16	17	18
e. Graduate School	19	20	21	22	

TIME Interview finished: _____

Date to collect dietary record _____

Date collected _____

Interviewer _____

MEASUREMENTS:

Height: _____
 Feet Inches

Weight: _____
 Pounds

Head Circumference: _____
 Inches

Thank Respondent!

RECORD OF FOOD EATEN BY THE CHILD

Day of the Week _____ Date _____

[illegible]

Vitamin, Mineral, or nutrient supplement given this child for this day:

Name of supplement

Amount given per dose _____

Number of times given

APPENDIX C

Study Variables and Measurement

Appendix C

THE STUDY VARIABLES AND MEASUREMENT

Variable	Item from Questionnaire	Measurement
<u>Independent Variable:</u>		
I. Physical impairments	59	Number, type
II. Aspects of adaptive behavior		
A. Eating skills	20-23	Selected items from Part I of Nihira, et al.
B. Motor development	24-25	Adaptive Behavior Scale; high score, higher level of behavioral adaptation
C. Language development	26-30	"
D. Performance of kitchen duties	31-33	"
E. Persistence	34-35	"
F. Planning and organization time	36	"
G. Socialization	37-43	"
III. Family background factors		
A. Parental Social Factors		
1. Occupation	108 & 116	Open-ended items
2. Education	109 & 117	Open-ended items

THE STUDY VARIABLES AND MEASUREMENT (continued)

Variable	Item from Questionnaire	Measurement
3. Age	107 & 115	Open-ended items
4. Income	110	Open-ended items
5. Social class rating		Hollingshead Index of Social Class; low score, higher social class
B. Family Structure		
1. Number of Siblings	113	Open-ended items
2. Size of house- hold	111 & 112	Open-ended items
3. Ordinal position of Down's syn- drome child	114	Open-ended items
IV. Parental Nutrition Knowledge Scale	96-106	Iowa modified test of nutrition knowledge; high score, greater knowledge of nutri- tion True/False and degree of certainty of ans- wers
V. Parental Nutrition Attitudes		Iowa modified test of nutrition attitudes; high score, greater permissiveness or importance of nutrition
A. Permissiveness	1,4,8,14,16,19	Agree/Disagree and degree of certainty of answers
B. Importance of Nutrition	2,3,5,6,7,9,10, 11,12,13,15,17, 18	
VI. Sources of Nutrition Information	81,82,83	Information inventory number, type and value

THE STUDY VARIABLES AND MEASUREMENT (continued)

Variable	Item from Questionnaire	Measurement
<u>Dependent Variable:</u>		
I. Dietary Adequacy	Appendix B	Score based on R.D.A. 2-day dietary record; high score equals better diet
II. Feeding Practices		
A. Meals		
1. No. of meals families eat together	64	Number, type and frequency of practices
2. Family table conversation	67-68	Type
B. Food		
1. Importance of food to family	65-66	Importance rating
2. Use of food to control behavior	49-57	Type
III. Eating Behavior		
A. Eating problems	62	Number and type
B. The types of eating habits	63	Number and type
IV. Growth Parameters	107-109	Score based on measurements of child
A. Height		Boston Anthropometric Chart: average, above or below average
B. Weight		"
C. Head circumference		Scored on Nellhouse Head Circumference Chart: average, above or below average

APPENDIX D
Scoring Systems for Nutrition Tests

Appendix D

SCORING SYSTEM OF NUTRITION KNOWLEDGE AND
ATTITUDES SCALES

Scale Key*	Response*	Degree of Certainty				
		Very Confident			Very Doubtful	
		1	2	3	4	5
Agree/ True	Agree/ True	9	8	7	6	5
	Disagree/ False	0	1	2	3	4
Disagree/ False	Disagree/ False	9	8	7	6	5
	Agree/ True	0	1	2	3	4

*Correspondence between Scale Key and response of subjects (i.e., scores 9-5) indicates a "correct" answer for the Knowledge Scale, and "greater permissives" or "greater Importance" for the Attitude Scales

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