To the Graduate Council:

I am submitting herewith a dissertation written by Wina Lee Nevling entitled "Influence of Feeding Practices of Adolescent and Adult Mothers on Infants' Weight." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Human Ecology.

Betty Ruth Carruth

Betty Ruth Carruth
Major Professor

We have read this dissertation
and recommend its acceptance:

Jennie Reed

Jean D. Skinner

Patricia Gentry Applemans

Accepted for the Council:

Lewminkel

Associate Vice Chancellor
and Dean of The Graduate School

Influence of Infant Feeding Practices of Adolescent and Adult Mothers on Infants' Weight

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee

Wina Lee Nevling

May 1994

ACKNOWLEDGEMENTS

The author wishes to express gratitude and appreciation to the many people who were instrumental in the completion of this work. I would like to thank my major professor, Dr. Betty Ruth Carruth, and the other members of my committee, Dr. Jean Skinner, Dr. Jeannie Sneed, and Dr. Patricia Droppleman, for their time, guidance, and support.

A special thanks goes to the graduate students who worked on the adolescent portion of this project with me,i.e. Janet Pope, Lisa Varner, Dena Goldberg, and Brenda Stephens, for their assistance, understanding, and friendship. Additionally, I would like to thank the coordinator of the Infant Feeding Practices Project, Kelly Houck, for her assistance and friendship.

I would like to thank the Department of Nutrition, the Agricultural Experiment Station, the American Dietetic Association, and the Gerber Products Company for the financial assistance I received. I also am grateful to John Schneider for sharing his time and statistical expertise.

I express loving appreciation to my family and friends for their encouragement and support. I am especially indebted to my husband, Jerry Haynes, for his understanding and his love.

ABSTRACT

The objective of this study was to determine if the infant feeding practices of adolescent mothers were different from adult mothers (ages 22-28 years) of similar socioeconomic status. If differences existed in feeding practices, then these practices were evaluated to determine their impact on the infant's weight at six and 12 months. Data were collected on 61 infants of adolescent mothers and 60 infants of adult mothers when their infants were six and 12 months of age. The study included assessment of a) infant feeding practices, b) infant growth and development, and c) infant health status.

Data showed that 20 percent of adolescent mothers breast fed compared to 35 percent of adult mothers. Maximum duration of breast feeding for adolescent mothers was 16 weeks compared to 52 weeks for adult mothers. Additionally, adolescent mothers added the first supplemental food,i.e. cereal, to infants' diets significantly earlier ($p \leq 0.05$) than did adult mothers. Illness index scores of infants of adolescent mothers (none of whom were breast fed at six and 12 months) were higher than the scores of adult mothers' infants; 10 mothers breast fed at six months and nine breast fed at 12 months. The difference in scores was significantly

higher ($p \leq 0.05$) at six months, but not at 12 months. The diets of infants of adolescent and adult mothers were greater than 200 percent of the Recommended Dietary Allowances for seven nutrients at six and 12 months.

The infants' mean weights at six and 12 months of age were related ($p \leq 0.05$) to birthweight, duration of breast feeding, and protein content of the diet. Infants' ages when supplemental foods were introduced, illness scores, and calorie and fat content of the diet were not significantly related to the infant's weight at six and 12 months.

TABLE OF CONTENTS

CHAPTER

I. INTRODUCTION....1
Justification....1
Overview of Study....5
Hypothesis....5
Measured Variables....6
Definition of Terms....8

II. ABBREVIATED REVIEW OF THE LITERATURE....10
Birth Weight/Weight Gain....10
Breast Feeding....11
Supplemental Foods....12
Other Factors That May Be Associated With The Infant's Weight....12
Summary....17

III. METHODOLOGY....19
Subjects....19
Research Approval and Consent of Subjects....22
Instrument Development....23
Data Collection....28
Coding and Statistical Analysis of Research Data....33

IV. RESULTS/DISCUSSION....40
Description of the Sample....40
Anthropometric Growth Patterns of Infants at Six and 12 Months....45
Physiological Development of Infants Reported at Six Months....49
Physiological Development of Infants Reported at 12 Months....54
Infants' Responses When Foods Were Added to the Diet....58
Infant Feeding Practices....63
Mothers' Reports of Infants' Health Care/ Health Status....91
Factors Influencing Weight of Infants at Six and 12 Months....98

V. CONCLUSIONS AND IMPLICATIONS....106

LIST OF REFERENCES....113

APPENDICES....126

A. Extended Review of the Literature....127

B. Recruitment Tools.....182
Adolescent Mothers.....182
Adult Mothers.....184

C. Recruitment Letters.....188
Adolescent Mothers.....188
Adult Mothers.....190

D. Other Correspondence.....193
Adolescent Mothers.....193
Adult Mothers.....198

E. Consent Forms.....200
Adolescent Mothers.....200
Adult Mothers.....202

F. Background and Information Forms.....203
Adolescent Mothers.....203
Adult Mothers.....204

G. 24-Hour Recall Form.....206

H. Instrument Development and Pilot Testing..208
Infant Feeding Practices
Questionnaire- Six Months.....208
Instrument Development.....208
Pilot Testing.....209
Original Questionnaire.....210
Revised Questionnaire.....213
Infant Feeding Practices
Questionnaire - 12 Months.....216
Instrument Development.....216
Pilot Testing.....216
Original Questionnaire.....218
Revised Questionnaire.....221
Instrument to Assess Developmental
Readiness to Feed at Six Months.....225
Infant Feeding Time Line
Six Months.....225
Instrument Development.....225
Pilot Testing.....225
Original Questionnaire.....227
Revised Questionnaire.....230
Instrument to Assess Physical
Growth and Acceptance of
Food Textures at 12 Months.....233
Infant Feeding Time Line
12 Months.....233
Instrument Development.....233
Pilot Testing.....233
Original Questionnaire.....235
Revised Questionnaire.....238

I. Infant Anthropometry Form.....242

J. Coding of Research Data Collected
From Adolescent and Adult Mothers.....243
Infant Feeding Practice
Questionnaire - Six Months 243
Infant Feeding Practice
Questionnaire - 12 Months.....248
Infant Feeding Time Line - Six Months.253
Infant Feeding Time Line - 12 Months..255
Coding of Other Research Data
Collected.....258
Demographic and Background
Information.....258
Anthropometric Data.....258

K. Infant Illness Index.....259

L. Sample Enrollment/Retention.....260
Adolescent Mothers.....260
Adult Mothers.....262

M. Infant Feeding Practice Data.....264
Adolescent Mothers at Six Month
Interviews.....264
Adult Mothers at Six Month
Interviews.....271
Adolescent Mothers at 12 Month
Interviews.....278
Adult Mothers at 12 Month
Interviews.....290

N. Mothers' Feelings about
the Way Infants Eat.....301
Adolescent Mothers.....301
Adult Mothers.....302

O. Mothers' Feelings about
Infants' Health.....303
Adolescent Mothers.....303
Adult Mothers.....304

VITA.....305

LIST OF TABLES

TABLE		PAGE
1.	Criteria for Subject Selection, Recruitment, Contact, and Incentives for Adolescent and Adult Mothers.....	20
2.	Description of Study Variables and Data Collection Instruments.....	24
3.	Data Collection at the Six and 12 Month Interviews for Adolescent and Adult Mothers.....	30
4.	Demographic and Background Characteristics of 61 Adolescent Mothers.....	42
5.	Demographic and Background Characteristics of 60 Adult Mothers.....	44
6.	A Comparison of Birth Characteristics, Gender, and Birth Order of Infants Born to Adolescent and Adult Mothers.....	46
7.	Anthropometric Growth Patterns of Infants Born to Adolescent and Adult Mothers at Six and 12 Months of Age.....	47
8.	Adolescent and Adult Mothers: Reports of Infants' Physiological Development At Six Months.....	51
9.	Adolescent and Adult Mothers: Reports of Infants' Physiological Development At 12 Months.....	55
10.	Adolescent and Adult Mothers' Six Month Reports of Infants' Responses When First Foods Were Added To The Diet.....	59
11.	Adolescent and Adult Mothers' 12 Month Reports of Infants' Responses When First Table Foods Were Added To The Diet.	64
12.	Addition of Supplemental Foods To Infants' Diets By Food Category and Month of Introduction: A Comparison of Adolescent and Adult Mothers.....	76

13. Addition of Table Foods To Infants' Diets By Food Category and Month of Introduction: A Comparison of Adolescent and Adult Mothers..... 80

14. Mean Dietary Intake and Percent of Recommended Dietary Allowances (RDA) for Infants At Six Months of Age: A Comparison of Infants Born to Adolescent and Adult Mothers..... 85

15. Mean Dietary Intake and Percent of Recommended Dietary Allowances (RDA) for Infants At 12 Months of Age: A Comparison of Infants Born to Adolescent and Adult Mothers..... 89

16. Adolescent Mothers' Reports of Health Care Resources Available to Infants..... 92

17. Adult Mothers' Reports of Health Care Resources Available to Infants..... 94

18. Adolescent and Adult Mothers' Reports of Infants' Health Care/Illnesses at Six and 12 Months..... 97

19. Description of Statistical Findings About the Factors Influencing Infants' Weight at Six and 12 Months: A Comparison of Adolescent and Adult Mothers..... 99

1A Summary of Breast Feeding Surveys of Population Subgroups..... 140

2A Summary of Supplemental Feeding Surveys of Population Subgroups..... 152

CHAPTER I

INTRODUCTION

Justification

The Surgeon General's Report on Nutrition and Health (United States Department of Health and Human Services, 1988) identified chronic diseases, i.e. coronary heart disease, certain types of cancers, strokes, diabetes mellitus, and atherosclerosis, that are associated with nutrition and obesity. One area of research and surveillance recommended in the Surgeon General's Report is identification of childhood dietary patterns that best prevent development of obesity.

The incidence of childhood obesity has increased over the last two decades. Gortmaker et al. (1987) analyzed data from (a) the National Health Examination Survey (NHES) cycle two that surveyed 7119 children, aged six to 11 years, and was conducted July 1963 through December 1965; (b) the NHES cycle three that surveyed 6710 children, aged 12 to 17 years, and was conducted March 1966 through March 1970; (c) the National Health and Nutrition Examination Survey (NHANES) I that examined subjects, aged six months to 74 years, and was conducted April 1971 to June 1974; and (d) the NHANES II that

surveyed the ages of six months to 74 years during February 1976 through February 1980. In this analysis, obesity was defined as triceps skinfolds greater than or equal to the 85th percentile of all children (Seltzer & Mayer, 1965; Garn & Clark, 1976). The prevalence of obesity in children, six to 11 years of age, increased 54 percent from 1963 to 1980, based on a comparison of the NHANES II data with NHES data. These data are limited because energy expenditure and food intake were not measured in either survey.

Obese children are considered at risk for hypertension (Rames et al., 1978), respiratory disease (Simpser et al., 1977), orthopedic conditions (Dietz et al., 1982), diabetes (Paulsen et al., 1968), and psychological dysfunction (Monello & Mayer, 1972). In the Gortmaker et al. (1987) study, based on four national surveys, hypertension was statistically associated with childhood obesity. From 1963 to 1965, 32 percent of the children with elevated systolic blood pressure greater than or equal to the 95th percentile for all children were obese, and this percent increased to 48 percent from 1976 to 1980.

An event early in life, the addition of supplemental foods, may have long-term effects on the infant's health (American Academy of Pediatrics Committee on Nutrition, 1980). The introduction of supplemental foods is

generally interrelated to the mother's role as a provider during the first year of life and throughout childhood (Himes, 1979). Therefore, maternal age may influence the degree of competency shown in the feeding role.

Mothers make major decisions about infant feeding practices during the first year of the child's life, particularly related to the timing and kinds of foods introduced (American Academy of Pediatrics Committee on Nutrition, 1980). Timing the addition of these supplemental foods to the diet to coincide with physical development is important. Mothers need to recognize their infants' developmental readiness to feed, i.e. controlling the head and neck, sitting with support, and leaning forward to receive food (American Academy of Pediatrics Committee on Nutrition, 1980). Similarly, the mothers' responses to refusal cues, i.e. continuing to feed the food, using an infant feeder, or adding the food to a bottle, may result in eating habits and excess weight gain that are related to the predisposition to chronic disease. In addition, mothers may not have access to credible information sources about infant feeding or prior successful experience with nurturing an infant (McLorg & Bryant, 1989).

Perhaps, the weight gain of infants born to adolescent mothers can be compromised due to the kind of foods and the inappropriate timing of introducing these

foods. Specifically, published information that is available about the introduction of supplemental foods is from population subgroup surveys. In general, these surveys did not examine large samples of adolescent mothers nor did the published analyses include tests for the effect of mother's age (adult vs. adolescent) or test for significant group differences in infants' weights at six and 12 months of age (Adair, 1983; Andrew et al., 1980; Berkelhamer et al., 1977; Bevan et al., 1984; Bowering et al., 1978; Brodwick et al., 1989; Brogan & Fox, 1984; Cole, 1977; Ferris et al., 1978; Guthrie, 1966; Guthrie & Guthrie, 1966; Kokinos & Dewey, 1986; McLorg & Bryant, 1989; Magnus & Galindo, 1980; Marlin et al., 1980; Maslansky et al., 1974; Morse et al., 1979; O'Malley et al., 1991; Parraga et al., 1988; Peters & Worthington-Roberts, 1982; Romero-Gwynn & Carias, 1989; Salber & Feinleib, 1966; Weller & Dungy, 1986; Wright et al., 1988; Yoos, 1985). The omission of the effect of mother's age in these studies is significant because in other areas of normal infant development, the adolescent mother's age has influenced the infant's social development and response to stimuli (McAnarney et al., 1984).

This study addresses the age effect and will add to existing empirical data about factors that potentially increase the incidence of overweight/obesity in infants

born to adolescent mothers compared to infants of adult mothers. Results of the study will provide health professionals information about what nutrition information adolescents need to know about their infants' developmental readiness to feed and what counseling approaches need to be used with both adolescent and adult mothers. If there is no age effect and the infant feeding practices of both groups are inappropriate, then nutrition education about appropriate infant feeding practices in the first year is needed by both groups.

Overview of the Study

The objective of this study was to determine if the infant feeding practices of adolescent mothers were different from those of adult mothers. If differences existed in infant feeding practices, then these practices were evaluated to determine their impact on the infant's weight at six and 12 months.

Hypothesis

Infants' weights at six and 12 months are related to age of the mothers.

Subhypotheses

The incidence of breast feeding is less and its duration is shorter for adolescent mothers than for adult mothers, resulting in introduction of supplemental foods to the infants' diets before 16 weeks of age; therefore, greater infant weight at six and 12 months will occur in infants born to adolescent mothers compared to infants born to adult mothers.

Illness index scores will be lower in breast fed infants compared to infants who are not breast fed, and thus the infants' weights will not be related to the illness index scores in breast fed infants, irrespective of mothers' ages.

The calorie and nutrient content of the diets of adolescent mothers' infants, who receive supplemental foods earlier than adult mothers' infants, will exceed recommended allowances for age and weight and will be related to weights of the infants at six and 12 months.

Measured Variables

Dependent Variable

Infants' weights at six and 12 months (ratio)

Independent Variables

1. Age of the mother (ratio)
2. Infants' ages when supplemental foods were added to the diet (ratio)
3. Duration of breast feeding (ratio)
4. Infants' illness index scores (ratio)
5. Birth weight (ratio)
6. Calorie and nutrient intake (ratio)

Covariates

Socio-economic status (Hollingshead Four Factor Index, Hollingshead, 1976)

Geographic location (rural vs. urban)

Descriptive Variables

Mothers' reports of:

- Infants' food consumption
- Developmental readiness to feed at six months
- Infants' motor development and feeding skills at 12 months
- Sources of information about infant feeding
- Health care practices
- Infants' health status

Medical record reviews:

- Infants' Apgar scores

Definition of Terms

For the purpose of this study, the following terms have been defined:

low birth weight infant-is a full-term infant weighing between 1500 and 2500 grams.

adolescent mother-is a mother under the age of 18 who conceived at 17 or younger.

adult mother-is a mother whose age falls between the ages of 22 to 28 years.

supplemental foods-are defined as single grain infant cereals, strained vegetables, strained fruits, fruit juices, strained meats, and as combinations of these foods.

sits with support-describes a stage of gross motor development that occurs by six months when the infant can sit up with slight support, such as sitting among pillows or in a walker or stroller. The American Academy of Pediatrics recommends that supplemental foods be added when this developmental stage occurs (American Academy of Pediatrics, 1980).

controls head and neck-identifies a stage of gross motor development that occurs at approximately five months when the infant can hold the head erect continuously. The American Academy of Pediatrics recommends that supplemental foods be added when this developmental stage occurs (American Academy of Pediatrics, 1980).

walks alone-is a gross motor skill that occurs after the infant can support his/her self when standing alone. This usually occurs when the infant is thirteen to fourteen months of age, but the actual age may vary as much as two to four months (Snow, 1989).

drinks alone from a trainer cup-describes a stage of feeding behavior that occurs when the infant is ten to twelve months of age (Snow, 1989).

holds spoon by self-specifies a fine motor movement that occurs at ten to twelve months of age (Snow, 1989).

takes bottle when sitting and tips bottle to receive formula-describes a feeding behavior that occurs by twelve months of age (Snow, 1989).

breast fed-refers to the provision of breast milk for any length of time during the first year of life.

formula fed-refers to the provision of infant formula for any length of time during the first year of life.

CHAPTER II

ABBREVIATED
REVIEW OF THE LITERATURE

The literature review examines current research about causes of obesity that may begin in infancy. These antecedents of obesity include the infant's weight at birth and during the first year of life, breast feeding or formula feeding modes, and the infant's age at introduction of supplemental foods. An extensive literature review of these topics is included in Appendix A.

Birth Weight/Weight Gain

Some researchers have found that birth weight is related to later obesity (Berkowitz et al., 1985; Binkin et al., 1988; Fisch et al., 1975; Huenemann, 1974; Mack & Ipsen, 1974). Investigators also have shown a relationship between infant's total weight gain during the first year of life and later obesity (Dine et al., 1979; Garn & LaVelle, 1985; Heald & Hollander, 1965; Huenemann, 1974; Mack & Ipsen, 1974). However, other researchers found no relationship between birth weight and infant weight gain in the first year and later

obesity (Heald & Hollander, 1965; Shapiro et al., 1984). These disparities in research findings may be partially explained by research design, small numbers of subjects, and retrospective vs. prospective collection of data.

Breast Feeding

The relationship between breast feeding and weight gain in infancy and childhood has been examined by several investigators. Huenemann (1974) and Dine et al. (1979) found that breast feeding or formula feeding was not related to the infant's weight gain. In studies by Fomon et al. (1971) and Neumann and Alpaugh (1976), consumption of infant formula was associated with greater weight gain during the first year than breast feeding. Thus, no conclusions about the effect of feeding mode on weight gain of infants during the first year can be made from the reported research.

Several researchers have found that the infant's weight is related to the caloric content of breast milk (Butte et al., 1990; Dewey & Lonnerdal 1983; Rueda-Williamson & Rose, 1962). However, the infant's age at which this relationship was found varied. For example, Dewey and Lonnerdal (1983) found a significant relationship between breast milk and infant's weight at one to two months. In contrast, Butte et al. (1990)

found a significant correlation between weight of the infant at four months of age and breast milk intake.

Supplemental Foods

The relationship between infant's age at introduction of supplemental foods and weight gain in the first year has been assessed in studies of population subgroups rather than in large surveys of the population (Huenemann, 1974; Lauver et al., 1981). In these studies, weight/obesity as a variable was measured differently, and the relationship was investigated at various ages of the infant. This information also has limited application to the population in general because of geographic location of the samples, small sample sizes, and non-randomized sample selection. Results indicate that weight at six months, 12 months, 24 months, and 36 months was not influenced by infant's age at introduction of supplemental food (Huenemann, 1974; Lauver et al., 1981).

Other Factors That May Be Associated With The Infant's Weight

Other factors in infancy that may be causal agents of obesity have not been clearly identified because of

research design problems. Some of the possible causes of obesity that may begin in infancy overlap and the effects are confusing (Hendershot, 1984). For instance, a mother's age, education, and income may be related to the introduction of supplemental foods to infants. Population and population subgroup surveys have shown that the incidence and duration of breast feeding are related to mother's age, education, income, and employment, but the introduction of supplemental foods has not been investigated (Baisch et al., 1989; Joffe & Radius, 1987; Neifert et al., 1988; Ryan et al., 1991; Yoos, 1985). Breast feeding incidence is lowest in women less than 20 years of age (Baisch et al., 1989; Joffe & Radius, 1987; Martinez & Krieger, 1985; Neifert et al., 1988; Ryan et al., 1991; Yoos, 1985). When family income alone is considered, the incidence of breast feeding is lowest at family incomes less than $7,000/year, and it gradually increases with rising income (Beigelson et al., 1986; Brogan & Fox, 1984; Martinez & Stahle, 1982; Ryan et al., 1991). Mothers without a college education breast feed less frequently than those with a college education (Cole, 1977; Martinez & Kreiger, 1985; Parraga et al., 1988; Switsky, 1979), and education covaries with income (Hendershot, 1984). Few researchers have measured these variables directly and statistically adjusted for them by stratification, matching, or multivariate

techniques. Also the mother's age, education, and income have not been related to the infant's weight in the first year.

Also, it is postulated that the incidence of infant illnesses may be less in infants who are breast fed compared to those receiving formula. Population studies have shown breast feeding to be protective against gastrointestinal illnesses, respiratory illnesses, and illnesses that require hospitalization (Cunningham, 1979; Duncan et al., 1993; Fallot et al., 1980; Larsen & Homer, 1978; Leventhal et al., 1986; Myers et al., 1984; Paine & Cobble, 1982). In contrast, other findings indicate that breast feeding resulted in little or no protection against illnesses (Abebonojo, 1972; Cushing & Anderson, 1982; Weinberg et al., 1984). None of these studies investigated the relationships among illnesses of breast fed infants, age at introduction of supplemental foods, and weight gain of infants in the first year of life. Conflicting results may be due to the researchers: (a) not specifically defining/describing what is meant by breast feeding and infectious disease, (b) not collecting data prospectively, and (c) not controlling for socioeconomic variables.

Researchers have shown that breast fed infants receive supplemental foods later than formula fed infants, but this finding was not explored with regard to

the infant's weight (Brogan & Fox, 1984; Marlin et al., 1980; Martinez et al., 1986; Peters & Worthington-Roberts, 1982; Sarett et al., 1984). Also, mother's age may influence when supplemental foods to the infants' diets. Breast feeding practices in these groups also may influence the age at introduction of supplemental foods and thus the infant's weight. In regard to introduction of supplemental foods, the influence of mother's age, income, education, and employment has received limited study, and results are available from several population subgroup surveys rather than from large population surveys (Auerbach & Guss, 1984; Berkelhamer et al., 1977; Brogan & Fox, 1984; Ferris et al., 1978). This information has limited application to the population in general because of geographic location of the sample, and non-randomized sample selection (Auerbach & Guss, 1984; Berkelhamer et al., 1977; Brogan & Fox, 1984; Ferris et al., 1978).

Investigators have reported the nutritional contribution of supplemental foods to total caloric intake and their contribution to food groups or the contribution of individual foods to calorie and nutrient intake. However, these findings were not related to the infant's weight (Andrew et al., 1980; Filer & Martinez, 1964; Maslansky et al., 1974; Stuff & Nichols, 1989).

A mother's inattention to cues of satiety/hunger,

when feeding supplemental foods, may be related to later obesity (American Academy of Pediatrics Committee on Nutrition, 1980; Fomon et al., 1979). Readiness cues to feed supplemental foods are associated with the development of motor skills and individual needs (American Academy of Pediatrics Committee on Nutrition, 1980; Harris, 1988; Kramer, 1983; Whitehead, 1985). Researchers have found that maternal feeding attitudes and mothers' responses to infants' cues are not significant determinants of infant obesity (Dubois et al., 1979; Kramer et al., 1985a; Kramer et al., 1985b). The relationship among the mother's recognition of physical readiness cues, the age of the infant when supplemental foods are given, and infant's weight gain has not been explored extensively.

The mother's decision to breast feed and to introduce supplemental foods is influenced by family members and health professionals. For example, adolescent mothers are influenced by family members (Adair, 1983; Joffe & Radius, 1987; Lipsman et al., 1985; McLorg & Bryant, 1989; Zuckerman et al., 1979). In contrast, the decision of an adult mother to breast feed is influenced by health professionals (Zuckerman et al., 1979). These studies, however, did not analyze the data and correlate their findings with the infant's weight at six and 12 months.

Summary

In summary, some researchers have shown that the infant's weight gain during the first year, breast feeding/formula feeding practices, and caloric intake are related to later obesity (Binkin et al., 1988; Berkowitz et al., 1985; Butte et al., 1984; Butte et al., 1990; Dewey & Lonnerdal, 1983; Fisch et al., 1975; Fomon et al., 1974; Huenemann, 1974; Mack and Ipsen, 1974; Neumann & Alpaugh, 1976; Rueda-Williamson & Rose, 1962). Other investigators have not reported a relationship (Dine et al., 1979; Heald & Hollander, 1965; Shapiro et al., 1984) among these factors. Also researchers have not found weight to be related to age of the infant at introduction of supplemental foods to the diet (Huenemann et al., 1974; Lauver at al., 1981).

Few investigators have explored relationships among the incidence of breast feeding, infant's age when supplemental foods are introduced, infant's illnesses, and mother's age, education, and income, and infant's weight gain in the first year of life. Further research is needed related to: a) the nutritional contribution of supplemental foods to the diet, b) the mother's recognition of developmental cues as readiness to add supplemental foods to the diet, c) the incidence of reported illnesses, and d) the influence of family and

health professionals on the mother's feeding decisions and weight gain of the infant.

CHAPTER III

METHODOLOGY

Subjects

In order to compare the infant feeding practices of adolescent and adult mothers, two groups were identified. Adult mothers, ages 22-28 years, were recruited to compare to an existing sample of adolescent mothers, ages 11-18 years, who conceived at 17 or younger. Information about selection criteria, recruitment activities, subject contacts, and incentives for participation for both groups is presented in Table 1. Because years of education may covary with mothers' ages, adult mothers were recruited who had similar years of education as the adolescent mothers. The mean education of adolescent mothers was 11 $\pm$ 1.0 years at the first interview when infants were four to six months old. Because some of the adult mothers had received Graduation Equivalent Diplomas (GEDs) after dropping out of high school, it was not possible to get an exact match on a subject to subject basis. Thus, adult mothers with no more than two years education beyond high school were selected for the study. Because geographic location may determine the health care resources available to mothers, the geographic location

Table 1: Criteria for Subject Selection, Recruitment, Contact, and Incentives for Adolescent and Adult Mothers

	Adolescent Mothers[a]	Adult Mothers[b]
Selection Criteria[c,d]	White Ages 11-18 28-35 weeks gestation 100 miles of Knoxville,TN	White Ages 22-28 Infant 4 to 6 months old Education $\leq$ 14 yrs Same region as the Adolescent Mothers
Recruitment	Private and public medical clinics Public schools Residential homes Special homes for pregnant adolescents Referrals from other subjects	Private and public medical clinics Newspaper birth announcements Referrals from other subjects
Contact		
Initial	28-35 weeks gestation	Infant 4 to 6 months old
2nd	Infant 4 to 6 months old	Infant 11 to 13 months old
3rd	Infant 11 to 13 months old	
Incentives for Participation	$5 Small baby gifts	$10 Small baby gifts

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

[b] Adult mothers recruited from same geographic region and similar socioeconomic status as the adolescent mothers.

[c] Criteria previously was established for AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy."

[d] Criteria established for the purpose of matching adult mothers to the same geographic region and similar socioeconomic status as the adolescent mothers.

of adult mothers was matched by rural/urban county in East Tennessee to that of the adolescent mothers.

The two groups of mothers also differed in that adolescent mothers were chosen antepartum and adult mothers postpartum. Both groups were recruited from private and public clinics; however, other methods of recruiting differed. For example, adolescent mothers were recruited from public school and special programs for pregnant adolescents, and adult mothers were recruited in writing or by telephone from birth announcements appearing in newspapers. Copies of recruitment tools and letters are available in Appendices B, C, and D, respectively.

The period of initial contact was different for each sample, but the timing of the six and 12 month interviews was the same for both groups. In an existing study of 115 pregnant adolescents interviewed in the last trimester of pregnancy, 61 subjects were seen at both six and 12 months. For purposes of this doctoral study, only those subjects who were seen initially, at six, and at 12 months constitute the group of adolescent mothers. Some of the initial 115 were seen at six or 12 months, but not both times; thus, they did not meet the criteria for inclusion. The adult mothers were not interviewed in the last trimester and were seen initially at the six month interview.

As an incentive for participation, adolescent and adult mothers received $5.00 and $10.00 per session, respectively, and small baby gifts,e.g. baby bibs. Monetary incentives for adult mothers were greater because they had fewer paid interview sessions than adolescent mothers. That is, the total monetary incentives paid to adolescent included $20 for a total of four interviews that were conducted during the third trimester of pregnancy, when infants were six and 12 months old, and a peer interview; adult mothers received $20 for a total of two interviews.

Research Approval and Consent of Subjects

The adolescent mothers were part of the larger study "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" (TN 860) and the comparison sample of adult mothers was not part of that study. The studies were approved separately by the Committee on Research Participation involving Human Subjects at the University of Tennessee, Knoxville. Both studies involved no invasive laboratory techniques and no known risk to the participants. Copies of consent forms are available in Appendix E.

Instrument Development

A summary of the study variables and data collection instruments used with the adolescent and adult mothers is presented in Table 2. The investigator interviewed all subjects using the same instruments and methodology. Two instruments that were developed for the TN 860 study were utilized for this study. The demographic and background information form for adolescents (Appendix F) was developed by a team of researchers (two faculty and three graduate students) and the dietary recall/record forms (Appendix G) were similar to those used in previous research studies conducted with adolescents residing in East Tennessee (Skinner et al., 1985, White & Skinner, 1988). The demographic and background information form used for TN860 was modified for use with adult mothers. For example, questions about employment were more specific and grade currently enrolled in school was deleted (Appendix F). However, the 24-hour recall/record form for adult mothers was not changed from earlier studies.

Two new instruments were developed to identify the mothers' infant feeding practices at the six and 12 month interviews. The Infant Feeding Practices Questionnaire for Six Months (IFPQ-6 Months) and the Infant Feeding Practices Questionnaire for 12 Months (IFPQ-12 Months)

Table 2: Description of Study Variables and Data Collection Instruments

Study Variables Measured	Data Collection Instruments
Demographic and Background Information	Demographic and Background Information Form (Appendix F)
<u>Six Month Infant Feeding Practices</u> ■ Breast feeding ■ Formula feeding ■ Typical serving size of beverages fed to infants and specific kinds of beverages consumed: milk, juices, Koolaide, soda pop ■ Typical serving size of foods fed to infants and specific kinds of food consumed: infant cereals, strained vegetables, strained fruits, table foods ■ Modification of table foods ■ Infant's health status ■ Health care practices	IFPQ-6 months[a] (Appendix H)
<u>12 Month Infant Feeding Practices</u> ■ Breast feeding ■ Formula feeding ■ Typical serving size and kind of beverages consumed: milk, juices, Koolaide, soda pop ■ Typical serving size and kind of cereal consumed: dry infant, strained infant, regular dry, regular cooked ■ What was added to cereal	IFPQ-12 months[b] (Appendix H)

Table 2: (continued)

Study Variables Measured	Data Collection Instruments
12 Month Infant Feeding Practices (continued) ■ Typical serving size and kind of fruits consumed: strained, junior, raw, cooked or canned ■ What was added to fruit ■ Typical serving size and kind of vegetables consumed: strained, junior, raw, cooked or canned ■ What was added to vegetables ■ Typical serving size and kind of meat consumed: strained, junior, table food ■ What was added to meat ■ Other foods eaten: custard, pudding, teething biscuits, ice cream, candy, potato chips, fries, other foods ■ Foods fed in restaurants ■ Foods fed in relatives' homes ■ Modification of table foods ■ Infants' health status ■ Health care practices	
Infants' Six Month Growth and Development ■ When specific foods were added to the diet: infant cereal, strained vegetables strained fruit, strained meat, table foods ■ Infants' responses when specific first foods fed	IFTL-6 months[C] (Appendix H)

Table 2: (continued)

Study Variables Measured	Data Collection Instruments
Infants' 12 Month Growth and Development ■ When specific foods were added to the diet: ready-to-eat cereal, cooked cereal, raw vegetables, canned vegetables, raw fruit, canned fruit, meat from the table, junior foods, strained foods ■ Infants' responses when specific first foods fed	IFTL-12 months[d] (Appendix H)
24-hour dietary recall	24-hour recall form (Appendix G)
Infants' Physical Growth Weight, length, and head circumference	Infant Anthropometry Form (Appendix I)

[a] IFPQ-6 = Infant Feeding Practices Questionnaire-Six Months.
[b] IFPQ-12= Infant Feeding Practices Questionnaire-12 Months.
[c] IFTL-6= Infant Feeding Time Line-Six Months.
[d] IFTL-12= Infant Feeding Time Line-12 Months.

were a modification of an existing screening questionnaire developed for infants from birth to one year of age (Fomon, 1977). Detailed information about the development of these questionnaires and the pilot study are available in Appendix H. The IFPQ-6 and IFPQ-12 month questionnaires were used to record information about the infant's consumption of formula, breast milk, strained foods, and table foods, and the infants' health status and health care.

Indicators of infant development, infant's age when supplemental foods were added, and infant's response when specific foods were added to the diet were assessed with the Infant Feeding Time Line for six month interviews (IFTL-6 Months, Appendix H). The IFTL-6 Months was developed using recommendations of the American Academy of Pediatrics (1980) and the W.I.C. Program (Department of Health and Human Services, 1982). The Infant Feeding Time Line (IFTL-12 Months) for the 12 month interviews was different than that used at the six month interviews. Differences in the interview protocols occurred because of the progression in physical growth and development of the infants and changes in textures of foods introduced by the mothers. Detailed information about the development of the IFTL-6 and IFTL-12 months and the pilot study is available in Appendix H.

An Anthropometric Form for recording measurements of

infant weight, length, and head circumference of the infants was developed and is presented in Appendix I.

Data Collection

Data were collected when infants were 4 1/2 to 6 1/2 and 11 to 13 months of age. Hereafter, these data points will be referred to as six and 12 month interviews. Personal interviews were conducted in the adult mothers' homes at a date and time convenient for them. For adolescents, the six month interviews were completed in the home, and the 12 month interviews were conducted in a mobile laboratory. This rented recreational vehicle (RV), complete with space for all interviews and activities, was available as part of the larger TN 860 study. Other researchers, who examined the impact of peers, changes in sensory perception on the dietary adequacy of adolescents (pre and post partum), and weight loss/retention, also conducted interviews when the infants of adolescent mothers were 12 months of age.

At the beginning of each interview a Statement of Informed Consent (Appendix E) was read and explained to the mother. At the six month interviews, adolescent mothers signed an amended consent form stating that the interviews could include questions about infant feeding practices and the health care of their babies, as well as

anthropometric assessment of their babies (Appendix E). According to Tennessee laws regarding confidentiality and rights of minors, parental consent was not required for pregnant adolescents and later interviews at 12 months postpartum.

Adult mothers also signed a Statement of Informed Consent (Appendix E) which described their responsibilities, the type of information needed, payment for participation, and risks involved. Confidentiality of information was assured, and the names and telephone numbers to be used in contacting the investigator were provided on the consent form. By signing the form, adult mothers indicated that they understood the nature of the project, and they agreed to participate when their infants were about six and 12 months of age (Appendix E).

Demographic and background information (Appendix F) included mothers' ages, birth data, marital status, living arrangements, education, and employment status. Also, the expected or confirmed delivery dates and location of delivery for the pregnant adolescents were collected during the initial interview.

Information about infant feeding practices and growth and development markers were collected using the forms listed in Table 3. To collect information about what foods the infants consumed, the 24-hour recall method of dietary data collection was employed.

Table 3: Data Collection at the Six and 12 Month Interviews for Adolescent and Adult Mothers

	Adolescent Mothers[a]	Adult Mothers[b]
Six month interviews		
Location	Subject's home	Subject's home
Data collected	Informed consent Demographic and background data IFPQ-6 months[c] IFTL-6 months[d] 24-hour recall of infant's food intake Anthropometric data (infant)	Informed consent Demographic and background data IFPQ-6 months[c] IFTL-6 months[d] 24-hour recall of infant's food intake Anthropometric data (infant)
12 month interviews		
Location	Mobile laboratory	Subject's home
Data collected	Demographic and background data IFPQ-12 months[e] IFTL-12 months[f] 24-hour recall of infant's food intake Anthropometric data (infant)	Demographic and background data IFPQ-12 months[e] IFTL-12 months[f] 24-hour recall of infant's food intake Anthropometric data (infant)

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

[b] Infants of adult mothers recruited from same geographic region and similar socioeconomic status as the adolescent mothers.

[c] IFPQ-6 = Infant Feeding Practices Questionnaire-Six Months.

[d] IFTL-6 = Infant Feeding Time Line-Six Months.

[e] IFPQ-12 = Infant Feeding Practices Questionnaire-12 Months.

[f] IFTL-12 = Infant Feeding Time Line-12 Months.

Adolescent and adult mothers were asked to indicate the amount and specific kinds of infant formula, beverages, and foods that their baby consumed during the 24 hours prior to the interview. In order to obtain quantities in ordinary measures or servings, the investigator used various sizes of baby food jars, infant formula bottles, typical household bowls, cups, and measuring spoons to assist the mothers' recall of amounts consumed by the infants.

Anthropometric Measurements

Weight. Infants were weighed nude on a balance beam scale with nondetachable weights (Detecto Doctor's Infant Scale Model 250). Three weights to the nearest 1/4 ounce were obtained when the infant was not moving and then recorded on the Infant Anthropometry Form (Appendix H). Consistency in weights over time was assured by measuring a two pound standard weight before each measurement session. This standard weight was developed by weighing two pounds of water in a closed container on a calibrated laboratory scale.

Recumbent Length. Recumbent length of the infant was measured using a standard infant board that was a prototype of those used in the clinics that the mothers attended. The wooden board was 40 3/4 inches long with

an inflexible head piece, sliding foot piece, and a 26 inch guide rule for obtaining the measurements in inches. Two persons were present to complete the measurement. One person held the infant's head in alignment with the body, with the line of vision straight up and applied gentle traction to bring the top of the head into contact with the fixed headboard. The other person held the child's right foot with toes straight up and pushed down at the knee with the leg fully extended. While holding the leg with one hand the other hand was used to bring the moveable footboard against the sole of the foot (Department of Health and Human Services, 1984; United States Department of Health Education and Welfare, 1979). Three measurements were taken to the nearest 1/8 inch and recorded on the Infant Anthropometry Form (Appendix H).

Head Circumference. The infant's head circumference was measured utilizing a narrow, millimeter, flexible, non-stretch tape. The tape was passed around the head with the infant in the supine position and held in place just above the bony ridges of the eyebrows and then passed around the back of the head covering the bony protrusion. Three measurements were taken to the nearest millimeter (Department of Health and Human Services, 1984; United States Department of Health Education and Welfare, 1979). The measurements were recorded on the

Infant Anthropometry Form (Appendix H).

Birth Data

Information about the infant's birth weight and length, Apgar score, and physical examination at birth, was derived retrospectively from medical records. Written consent from adolescent and adult mothers was obtained prior to the six month interviews (Appendix E).

Coding and Statistical Analysis of Research Data

Quantitative data were analyzed using SAS (SAS Institute, 1988). A significance level of ($p \leq 0.05$) was accepted as statistically significant. Data were coded using a detailed coding scheme that is presented in Appendix J. The coded data were entered into the microcomputer and then verified by rechecking the original data against computer print outs.

Demographic and Background Data

Descriptive statistics were computed for demographic and background information variables. Using the SAS PROC FREQ procedure (SAS Institute, 1988), frequency distributions were determined for mother's age, marital status, education, employment, and socioeconomic status.

Socioeconomic status was determined using the Hollingshead Four Factor Index of Social Status (Hollingshead, 1976). This method of estimating socioeconomic status uses the education and occupations of the primary wage-earners of the nuclear household. The Hollingshead method produces possible scores of 8 to 66, with 8 being the lowest and 66 the highest score. Hollingshead suggests dividing scores into five groups, which are rough estimates of social status. Scores between 8 and 19 are roughly indicative of lower socioeconomic status, scores of 20 to 29 of lower-middle, scores of 30 to 39 of middle, scores of 40 to 54 of upper-middle, and scores of 55 to 66 of upper socioeconomic status.

Birth Characteristics, Gender, and Birth Order

Using the SAS PROC FREQ procedure (SAS Institute, 1988), frequency distributions were determined for gender and birth order. Means and standard deviations for infants of adolescent mothers and adult mothers were separately computed for birth weight, birth length, and Apgar score. T-tests were used to determine statistical differences between infants of adolescent and adult mothers for these variables.

Anthropometric Growth at Six and 12 Months

Means and standard deviations for birth weight, birth length, and for weight, length, and head circumference at six and 12 months were determined by gender within each group. T-tests (SAS Institute, 1988) were used to determine statistical differences between the two genders within the groups and between the two genders by group.

Physiological Development Reported at Six Months

Using the SAS PROC FREQ procedure (SAS Institute, 1988), frequency distributions were determined for the age when reported physiological development occurred,i.e. controls head and neck, sits with support, sleeps through the night, and picks up and holds a spoon were determined. Means and standard deviations were determined for the same physical development markers listed above. T-tests (SAS Institute, 1988) were used to determine statistical differences between infants of adolescent and adult mothers.

Physiological Development Reported at 12 Months

Using the SAS PROC FREQ procedure (SAS Institute, 1988), frequency distributions were determined for the age when reported physiological development occurred,i.e. walks alone, drinks alone from a trainer cup, holds spoon

by self, and takes bottle when sitting and tips to receive formula. Means and standard deviations were determined for the above physical development markers. T-tests (SAS Institute, 1988) were used to determine statistical differences between infants of adolescent and adult mothers.

Infants' Responses When First Foods Were Added To The Diet At Six and 12 Months

Using the SAS PROC FREQ procedure (SAS Institute, 1988), frequency distributions were determined for the infants' responses when first foods were added to the diet at six and 12 months. The responses included the following statements: did not swallow, swallowed, choked, leaned back and turned away, and leaned forward to receive.

Infant Feeding Practices

Using the SAS PROC FREQ procedure (SAS Institute, 1988), frequency distributions were determined for the incidence and duration of breast feeding, the months when adolescent and adult mothers added specific supplemental foods to the infants' diets, typical servings of the supplemental foods, and specific kinds of foods provided by the mother. Means and standard deviations were computed for the amount of infant formula, milk, juice,

and/or Koolaide provided daily, and the total number of mothers that added cereal, fruit, vegetables, meat, and table foods. T-tests (SAS Institute, 1988) were used to determine the statistical differences between the two groups.

Dietary data from 24-hour recalls of foods reportedly eaten by the infant and collected at six and 12 month interviews were coded and analyzed using the Nutritionist III (5.0 version) data analysis package (North, 1989). Once the dietary data were coded and entered into the microcomputer, another graduate student or health professional checked the code numbers against the original food recalls. Means and standard deviations and comparisons to the Recommended Dietary Allowances/RDA (Food and Nutrition Board, 1989) were determined for dietary intakes of kilocalories, carbohydrate, protein, fat, thiamin, riboflavin, niacin, folate, ascorbic acid, vitamin A, vitamin D, calcium, iron, and zinc. T-tests (SAS Institute, 1988) were used to determine statistical differences between the two groups of infants.

Infants' Health Care/Status

Using the SAS PROC FREQ procedure (SAS Institute, 1988), frequency distributions were determined for method of payment for medical care, participation in the Women, Infants, and Children's Program (W.I.C.) during and after

pregnancy, sources of information received about infant feeding practices, and about the number of infant's illnesses/hospitalizations in the first year of life. Information about whether infants had experienced prolonged illnesses, and/or hospitalizations was utilized to complete the infant's illness index at six and 12 months. Illness categories that increased caloric needs and affected food intake were assigned points according to their severity (Appendix K). The range of illness scores was from zero to five. Each day of hospitalization received one point. Points were then totaled for an infant illness score for each infant. Means and standard deviations were computed for the number of physician visits in one year, and for the infants' illness scores at six and 12 months. T-tests (SAS Institute, 1988) were used to determine statistical differences between infants of adolescent and adult mothers. The infants were further divided into breast and formula fed groups, and t-tests were used to determine the statistical differences.

Factors Influencing Infants' Weights at Six and 12 Months

The influence of breast feeding, infant's age when supplemental foods were introduced, birth weight, and illnesses on infant weight at six and 12 months was explored within the groups and between the groups by the

Mixed procedure function (SAS Institute, 1993). This procedure was used to account for more than one source of random variation and repeated measures on the mothers. In the mixed model, a combination of fixed and random effects are related to independent variables and more than one random component. In this study, the class variables of mothers' age, education, and SES are considered as fixed effects. The mothers, however, were random. The dependent variables were infant weight at six and 12 months. Independent variables were birth weight, illness index, number of weeks breast fed, age of the infant (weeks) when supplemental foods were added to the diet, and the calorie, protein, and fat content of the infants' diets.

CHAPTER IV

RESULTS AND DISCUSSION

Description of Sample

Adolescent Mothers

Sixty-two percent (n=75) of 115 adolescent mothers who were originally recruited for AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" completed the six month interviews. The remaining adolescent mothers were not interviewed for a variety of reasons (Appendix L). Three infants also were excluded from the study because two were of low birth weight (<2501 gm) and one had a five minute Apgar score of six compared to a normal score of 8 to 10 (Snow, 1991).

Approximately 81.0 percent of the 75 adolescent mothers interviewed at six months also were interviewed at 12 months. Reasons for lack of follow-up included the researchers' inability to locate the adolescent mothers, the adolescent mothers' relocation outside the state of Tennessee or their refusal to continue in the study (Appendix L).

Adult Mothers

Of 401 adult mothers contacted, 66 completed six month interviews. The remaining contacts/referrals were not interviewed for a variety of reasons, which are summarized in Appendix L. Sixty-three percent were not interviewed because they did not meet study criteria, the age range of 22 to 28 years, and an educational level similar to the adolescent group. Thirty-three adult mothers who met the study criteria declined to participate in the study for various reasons,i.e. their husband did not want them to participate, they did not want the interviewer coming to their home without their husband being present, or for no stated reason. Approximately 91.0 percent of the adult mothers interviewed at six months postpartum also were interviewed at 12 months postpartum. The reason for lack of follow-up was the researcher's inability to locate the adult mothers, and two mothers declined to participate in the 12 months interview (Appendix L).

Demographic and Background Characteristics of Adolescent Mothers at Six and 12 Months Postpartum

Table 4 summarizes the demographic and background characteristics of the adolescent mothers seen at six and 12 months postpartum. Mothers' ages at the time of the six and 12 month interviews ranged from 14 to 19 years ($\bar{x}$

Table 4: Demographic and Background Characteristics of 61 Adolescent Mothers[a]

Characteristics	Participants (6 months)	Participants (12 months)
	Percent	Percent
Age (years)		
14	1.6	----
15	8.2	4.9
16	16.4	13.1
17	34.4	31.1
18	31.1	34.4
19	8.3	16.4
Education (years completed)[b]		
7	1.6	1.6
8	4.9	4.9
9	19.6	14.8
10	19.7	26.6
11	29.5	14.7
12	24.6	44.3
Marital status		
single	60.7	49.2
married	39.3	45.9
separated/divorced	----	4.9
Employment (%)		
full-time	1.6	8.2
part-time	14.8	11.5
unemployed	83.6	80.3
Occupation category[c]		
machine operators, semiskilled	1.7	3.3
menial service workers	14.8	16.4

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and were interviewed at six and 12 months.

[b] Adolescent mothers who completed nine years of education generally did not return to school after delivery of their infants.

[c] Occupation category determined by Hollingshead Four Factor Index of Social Status (1976). Scores ranged from 11 to 45.

= 17.0 ± 1.2 at six month interviews and $\bar{x}$ = 17.4 ± 1.1 at 12 months interviews). Level of education ranged from seven to 12 years ($\bar{x}$ = 10.5 ± 1.3 at six month interviews and $\bar{x}$ = 10.7 ± 1.4 at 12 month interviews). Fourteen adolescent mothers who were interviewed at six, but not at 12 months had more education ($\bar{x}$ = 11.5 ± 1.7 years), but were similar in age ($\bar{x}$ = 17.1 ± 1.2 years) to the 61 adolescent mothers who were interviewed at both six and 12 months.

Approximately 61.0 percent of the adolescents were not married at the time of the six month interview, but an additional 6.6 percent were married by the 12 month interviews. Almost three-fourths of the adolescent mothers were from lower and lower-middle socioeconomic strata. The mean socioeconomic score, as determined by the Hollingshead Four Factor Index of Social Status (Hollingshead, 1976), was 24.3 ± 7.3 at the six month interviews and 23.8 ± 8.6 at the 12 month interviews.

Demographic and Background Characteristics of Adult Mothers at Six and 12 Months Postpartum

Demographic and background characteristics of the adult mothers at six and 12 months postpartum are summarized in Table 5. Mothers' ages ranged from 22 to 29 years ($\bar{x}$ = 25.0 ± 2.0 at six months and 25.8 ± 2.1 at 12 months). Education levels ranged from nine to 14

Table 5: Demographic and Background Characteristics of 60 Adult Mothers[a]

Characteristics	Participants	
	(6 months)	(12 months)
	Percent	Percent
Age (years)		
22	1.7	5.0
23	11.7	11.7
24	18.3	15.0
25	16.7	15.0
26	13.3	13.3
27	10.0	13.3
28	18.3	18.3
29	----	8.3
Education (grade)		
9	5.0	5.0
10	8.3	8.3
11	8.3	8.3
12	51.7	51.7
13	15.0	15.0
14	11.7	11.7
Marital status		
single	6.7	6.7
married	91.7	91.7
separated	1.6	1.6
Employment		
full-time	20.0	23.3
part-time	10.0	13.3
umemployed	70.0	63.4
Occupation category[b]		
skilled manual labor	3.3	3.3
machine operator, semiskilled	18.3	23.3
unskilled workers, menial service workers	8.3	10.0

[a] Adult mothers recruited from same geographic region and similar socioeconomic status as the adolescent mothers.

[b] Occupation category determined by Hollingshead Four Factor Index of Social Status (1976). Scores ranged from 11 to 32.

years at six months ($\tilde{x}$ = 12.1 ± 1.0) and did not change by the 12 month interviews. Most of the adult mothers were married. The mean socioeconomic score, as determined by the Hollingshead Four Factor Index of Social Status (Hollingshead, 1976), was 25.2 ± 5.8 and no change occurred by 12 months. This indicates that the adult mothers also were from lower and lower-middle socioeconomic strata. The adult mothers' lives changed little related to education and marriage during the study.

Birth Characteristics, Gender, and Birth Order

Birth characteristics, gender, and birth order of the infants are summarized in Table 6. All infants were normal birth weight (>2501 gm) and had normal mean Apgar scores, i.e. eight to ten at five minutes (Snow, 1991). Gender make-up of the groups was the same. Birth order, however, was different. Most adolescent mothers were pregnant for the first time, and the adult mothers were pregnant for the first or second time.

Anthropometric Growth Patterns at Six and 12 Months

Anthropometric measurements taken at birth, six months, and 12 months are shown in Table 7. Weight differences were significant ($p \leq 0.05$) between male and

Table 6: A Comparison of Birth Characteristics, Gender, and Birth Order of Infants Born to Adolescent[a] (n=61) and Adult Mothers[b] (n=60)

Infants of Adolescent Mothers	[c]Mean±Std Dev./Percent
Birth weight	3342.6 ± 338.6 (gm)
Birth length	50.9 ± 2.1 (cm)
Five minute Apgar score	9.1 ± 0.5
Gender (% male)	47.5
Birth order (%)	
First	91.8
Second	8.2
Infants of Adult Mothers	
Birth weight	3435.0 ± 413.8 (gm)
Birth length	52.1 ± 2.1 (cm)
Five minute Apgar score	9.0 ± 0.2
Gender (% male)	47.6
Birth order (%)	
First	53.3
Second	36.7
Third	5.0
Fourth	5.0

[a] Infants of adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews (n=61).

[b] Infants of adult mothers (ages 22-28 years) recruited from same geographic region and similar socioeconomic status as the adolescent mothers (n=60).

[c] Means = males and females averaged together.

Table 7: Anthropometric Growth Patterns of Infants Born to Adolescent[a,b] (n=61) and Adult Mothers[c,d] (n=60) at Six and 12 Months of Age

Infant Age	Males (n=29)	Females (n=32)
	Mean ± Std Dev	Mean ± Std Dev
Adolescent Mothers		
Birth		
Weight(gm)	3394.8 ± 363.8	3295.4 ± 312.3
Length(cm)[e]	51.3 ± 2.0	50.6 ± 2.2
Six months		
Weight(gm)	7520.2 ± 1000.9[f]	7309.2 ± 720.1[g]
Length(cm)	66.9 ± 3.0[f]	65.9 ± 2.3[g]
Head circum.(cm)	43.5 ± 1.9	42.8 ± 1.0
Twelve months		
Weight(gm)	9672.8 ± 1116.7[f,h]	9491.7 ± 904.1[g,h]
Length(cm)	75.2 ± 3.2	74.9 ± 1.8
Head circum.(cm)[e]	46.8 ± 1.3	45.9 ± 1.0
Adult Mothers		
Birth		
Weight(gm)[i]	3501.2 + 398.9	3377.4 ± 312.2
Length(cm)	52.6 ± 2.3	51.8 ± 1.8
Six months		
Weight(gm)[i]	8157.9 ± 848.7	7591.7 ± 858.4
Length(cm)[i]	68.4 ± 2.8	67.2 ± 2.6
Head circum.(cm)[i]	44.1 ± 1.2	43.2 ± 1.0
Twelve Months		
Weight(gm)[i]	10238.6 ± 923.0[f]	9703.4 ± 888.6[g]
Length(cm)[i]	76.0 ± 2.2	74.4 ± 2.7
Head circum.(cm)[i]	47.5 ± 0.8	46.3 ± 1.0

[a] Infants of adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

[b] No adolescent mothers breast fed their infants at six or 12 months.

[c] Infants of adult mothers (ages 22-28 years) recruited from same geographic region and similar socioeconomic status as the adolescent mothers.

[d] Ten adult mothers continued to breast feed their infants at six months and nine at 12 months.

[e] Significantly different at $p \leq 0.05$ between male and female infants of adolescent mothers.

[f] Significantly different at $p \leq 0.05$ between male infants of adolescent and adult mothers.

[g] Significantly different at $p \leq 0.05$ between female infants of adolescent and adult mothers.

[h] Infants did not triple mean birth weight by 12 months.

[i] Significantly different at $p \leq 0.05$ between male and female infants of adult mothers.

female infants of adult mothers, but not between male and female infants of adolescent mothers. This absolute weight difference between males and females in both groups is expected because at birth the average male infant weighs 3.4 kg and the average female infant weighs 3.2 kg. The difference in weight by gender gradually increases throughout infancy (Tanner, 1978).

Healthy infants usually double their birth weight by four to five months of age and triple it by one year (Snow, 1991). Forty-six infants born to adolescent mothers doubled their birth weight by six months compared to 54 infants born to adult mothers (Table 7). Mean weights of male and female infants from both groups were near the 50th percentile at six months. The same number of infants in both groups tripled their birth weight at 12 months,i.e. 29 infants of adolescent mothers and 29 infants born to adult mothers. At 12 months the mean weight of the male infants of adolescent mothers was at the 25th percentile, and the mean weight of the other infants from both groups was at the 50th percentile.

Mean birth length of male infants was significantly greater ($p \leq 0.05$) than that of female infants of adolescent mothers. On average, the length of male and female infants in both groups was near the 50th percentile (50.8 cm) and increased approximately 45.0 percent by 12 months. This increase in length is less

than the 50.0 percent expected in the first year (Silver, 1984). Also male infants of adult mothers grew significantly more ($p.\leq 0.05$). Males generally remain 0.6 to 1.2 cm longer than females throughout infancy (Snow, 1991).

For both groups, mean head circumference of males and females was near the 50th percentile at six (43.2 cm) and 12 months (45.7 cm), indicating normal growth and development. The head circumference of males measured significantly more at 12 months ($p\leq 0.05$) in the infants who were born to adolescent mothers. In the adult group, mean head circumference of male infants was significantly greater ($p\leq 0.05$) than female infants at six and 12 months (Table 7). This is typical because males usually have a slightly larger head (0.6-1.2 cm) than female infants (Snow, 1991).

Physiological Development of Infants Reported at Six Months

Controls Head and Neck

Head control is the ability to hold the head in a vertical position and maneuver it at will. Newborn neck muscles are not strong enough to support the weight of the head for a few seconds. By age three weeks, 90.0 percent of infants begin raising their head and clearing

the chin from the surface. At 2 1/2 months of age, they can hold their head so that their face makes a 45 degree angle with a surface (Frankenburg et al., 1973). The average age when infants can hold their head in an upright position is approximately three months (White, 1990). In this study, mothers reported that infants could control the head and neck at various ages (Table 8). The mean infant age reported for head control was 2.0 $\pm$ 1.1 and 1.8 $\pm$ 1.0 months for infants of adolescent and adult mothers, respectively. The early reported age for head control probably represents the mothers' perceptions, which were diverse. The investigator demonstrated this motor skill at the six month interview; however, mothers were recalling an action retrospectively and may have erred on the side of an earlier behavioral age than is considered normal. Three mothers could not report this skill, because they did not observe it, or they could not remember when it occurred.

Sits With Support

Sitting alone is possible after an infant gains control over trunk muscles and the head and neck. Most infants can sit with support and hold their head steady at 2.9 months and sit alone momentarily with support at approximately five months (Bayley, 1969). Reports from mothers in this study indicated that, on the average,

Table 8: Adolescent[a] and Adult[b] Mothers: Reports of Infants' Physiological Development[c] at Six Months

Indicators of Physiological Development	Adolescent Mothers[a] (n=61)	Adult Mothers[b] (n=60)
	(Mean ± Std Dev) Percent of Infants	
Controls Head and Neck	(2.0 ± 1.1)	(1.8 ± 1.0)
00-01 months	34.4	38.3
01-02 months	29.5	31.6
02-03 months	18.0	23.4
03-04 months	14.8	1.7
04-05 months	----	3.3
not reported by mother[d]	3.3	1.7
Sits With Support	(4.0 ± 1.1)	(3.1 ± 0.8)
00-01 months	----	1.7
01-02 months	9.8	16.7
02-03 months	16.7	43.3
03-04 months	34.4	28.3
04-05 months	21.3	7.6
05-06 months	9.8	----
not reported by mother[d]	8.6	3.3
Sleeps Through The Night	(2.4 ± 1.6)	(2.0 ± 1.5)
00-01 months	26.2	28.3
01-02 months	18.0	38.3
02-03 months	18.0	5.0
03-04 months	8.2	5.0
04-05 months	4.9	1.7
05-06 months	4.9	3.3
not reported by mother[d]	19.8	16.7

Table 8: (continued)

Indicators of Physiological Development	Adolescent Mothers[a] (n=61)	Adult Mothers[b] (n=60)
	(Mean ± Std Dev) Percent of Infants	
Picks Up And Holds A Spoon	(4.6 ± 1.4)	(5.5 ± 0.7)
00-01 months	----	----
01-02 months	----	----
02-03 months	3.3	----
03-04 months	3.3	----
04-05 months	----	1.7
05-06 months	4.9	1.7
not reported by mother[d]	88.5	96.6

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

[b] Adult mothers (ages 22-28 years) recruited from same geographic region and similar socio-economic status as the adolescent mothers.

[c] Physiological development indicators based on the American Academy of Pediatrics' guidelines for an infant to be able to indicate desire or disinterest in food.

[d] When mothers were asked, they could not identify when the cue had occurred or the infant was not able to perform the skill or the researcher lacked confidence in the response.

infants could sit with support at 4.0 ± 1.1 months (adolescent mothers) and 3.1 ± 0.8 months (adult mothers), respectively. The means for adolescent mothers and adult mothers were not significantly different. Responses ranged from one to six months (Table 8). These responses may reflect the investigator's difficulty in describing this motor skill to the mother and that mothers were asked to retrospectively report this motor skill after it had occurred. Also infants are individual in the development of this skill. Seven mothers could not report this skill because they did not observe it or they could not remember when it had occurred.

Other Physiological Development Reported at Six Months

Sleeps Through The Night

Forty-nine adolescent and 58 adult mothers reported that their infants slept through the night (not waking up during the night) at various times. On an average adolescent mothers reported that their infants slept through the night at 2.4 ± 1.6 months and the adult mothers at 2.0 ± 1.5 months with a range from birth to six months. The means were not significantly different between the groups. This reported age of sleeping through the night is similar to that reported in other research studies. Researchers indicate that sleeping

through the night is a developmental and adaptive process that occurs at approximately two months of age (Beal, 1969; Gruwaldt et al., 1960; Guthrie, 1966; Parmelee et al., 1964; Salzarulo et al., 1980). The reports of adolescent and adult mothers in this study appear to be consistent with reported age (in months) in other studies.

Picks Up and Holds a Spoon

Infants can usually pick up and hold a spoon by nine to 12 months (VORT, 1988). Infants of 54 adolescent and 58 adult mothers could not pick up and hold a spoon at six months. Nine mothers (seven adolescent and two adult) did report observing this cue when their infants were three to six months old (Table 8). This disparity with the group finding may be explained by the fact that these infants may be advanced in feeding skills or that mothers may have erred in reporting that their infants held onto the spoon when being fed.

Physiological Development Reported at 12 Months

Walks Alone

Infants begin to walk without help at 11.5 to 15 months of age (VORT, 1988). As shown in Table 9, adolescent mothers were significantly different ($p \leq 0.05$)

Table 9: Adolescent[a] and Adult[b] Mothers: Reports of Infants' Physiological Development at 12 Months

Indicators of Physiological Development[c]	Adolescent Mothers (n=61)	Adult Mothers (n=60)
	(Mean ± Std Dev) Percent of Infants	
Walks Alone	(9.8 ± 1.6)	(10.8 ± 0.9)
08-09 months	26.2	3.3
09-10 months	27.9	26.7
10-11 months	14.8	30.0
11-12 months	8.2	21.7
had not occurred or could not identify	22.9	18.3
Drinks Alone From a Trainer Cup	(9.4 ± 1.3)[d]	(10.1 ± 1.4)
05-06 months	4.9	3.3
06-07 months	3.3	1.7
07-08 months	6.6	5.0
08-09 months	24.5	5.0
09-10 months	32.8	26.7
10-11 months	14.8	48.3
11-12 months	1.6	6.7
had not occurred or could not identify	11.5	3.3
Holds Spoon By Self	(9.7 ± 1.8)[d]	(10.4 ± 1.7)
05-06 months	4.9	----
06-07 months	----	----
07-08 months	9.8	1.7
08-09 months	3.3	3.3
09-10 months	16.4	35.0
10-11 months	11.5	26.7
11-12 months	8.2	13.3
had not occurred or could not identify	45.9	20.0

Table 9: (continued)

Indicators of Physiological Development	Adolescent Mothers (n=61)	Adult Mothers (n=60)
	(Mean ± Std Dev) Percent of Infants	
Takes Bottle When Sitting and Tips To Receive Formula	(7.2 ± 1.8)	(5.7 ± 0.9)
00-05 months	16.4	6.7
05-06 months	14.7	53.3
06-07 months	9.8	21.7
07-08 months	19.7	----
08-09 months	16.4	----
09-10 months	6.6	----
10-11 months	6.6	1.6
11-12 months	----	----
had not occurred or could not identify	9.8	18.3

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

[b] Adult mothers (ages 22-28 years) recruited from same geographic region and similar socio-economic status as the adolescent mothers.

[c] Motor and feeding skills necessary for self-feeding (VORT,1988).

[d] Significantly different at $p \leq 0.05$ between infants of adolescent and adult mothers.

in reporting this gross motor skill compared to adult mothers ($\bar{x}$ = 9.8 $\pm$ 1.6 and $\bar{x}$ = 10.8 $\pm$ 0.9 months, respectively). This report of infants beginning to walk alone may be signs of advanced development or various interpretations of the skill, i.e. walking and holding onto some object with one or two hands. Twenty-five mothers could not report the skill because it had not occurred by 12 months.

Drinks Alone From A Trainer Cup

Adolescent mothers reported that their infants could drink alone from a trainer cup at a significantly ($p \leq 0.05$) earlier age than adult mothers. Infants can usually drink alone from a trainer cup at 12 to 18 months (VORT, 1988). This skill may not have been described clearly by the researcher as the mothers may have reported drinking from a cup that is held for the infant, a feeding skill that occurs at six to 12 months (VORT, 1988).

Holds Spoon By Self

Infants can usually pick up and hold a spoon by nine to 12 months (VORT, 1988). Twenty percent of adult mothers compared to about 46.0 percent of the adolescent mothers could not identify this skill or it had not occurred by the 12 month interviews. Adolescent mothers

reported that this cue occurred significantly earlier ($p \leq 0.05$) than adult mothers.

Takes Bottle When Sitting and Tips to Receive Formula

About half of the adult mothers reported that their infants could hold a bottle and tip it to receive formula at five to six months of age. Adolescent mothers varied in responses to this question. The mean responses between adolescent and adult mothers ($\bar{x} = 7.2 \pm 2.3$ vs. 5.7 ± 0.9 months, respectively) were not significantly different. According to VORT (1988), normal infants can hold their own bottle at 5.5 to nine months. Nine adult mothers who breast fed could not respond to this question as they had not provided any liquids by bottle.

Infants' Responses When First Foods Were Added To The Diet

Six Month Interviews

When all food categories were introduced for the first time, the most frequently reported response of the infant was to swallow the food (Table 10). In nineteen cases adolescent and adult mothers used infant feeders or added the food to their infants' bottles and reported it as swallowing. Thus, the swallowing capabilities of these infants are unknown.

Table 10: Adolescent[a] and Adult[b] Mothers' Six Month Reports of Infants' Responses When First Foods Were Added To The Diet

Food Category/ Infants' Responses	Percent of Infants	
	Adolescent (n=61)	Adult (n=60)
Cereal		
Did not swallow	37.7	43.3
Swallowed[c,d]	44.3	45.0
Choked	03.3	00.0
Leaned back and turned away[e]	04.9	01.7
Leaned forward to receive	00.0	00.0
Did not swallow and leaned back and turned away	06.6	00.0
Did not swallow and choked	01.6	00.0
Swallowed and leaned back and turned away	00.0	00.0
Swallowed and leaned forward to receive	00.0	05.0
Mother did not respond[f]	01.6	05.0
Fruit		
Did not swallow	13.1	13.3
Swallowed[g]	63.9	55.0
Choked	00.0	00.0
Leaned back and turned away	00.0	01.7
Leaned forward to receive	00.0	10.0
Did not swallow and choked	03.3	00.0
Did not swallow and leaned back and turned away	01.6	00.0
Did not swallow and leaned forward to receive	03.3	00.0
Mother did not respond[f]	14.8	20.0

Table 10: (continued)

Food Category/ Infants' Responses	Percent of Infants	
	Adolescent (n=61)	Adult (n=60)
Vegetables		
Did not swallow	24.6	15.0
Swallowed[h]	41.0	50.0
Choked	00.0	00.0
Leaned back and turned away	03.3	01.7
Leaned forward to receive	00.0	08.3
Did not swallow and leaned back and turned away[i]	08.2	00.0
Did not swallow and leaned forward to receive	01.6	00.0
Did not swallow and choked	01.6	00.0
Mother did not report[f]	19.7	25.0
Meat		
Did not swallow	08.2	05.0
Swallowed	08.2	03.3
Choked	03.3	00.0
Leaned back and turned away	00.0	00.0
Leaned forward to receive	00.0	01.7
Mother did not report[f]	80.3	90.0

Table 10: (continued)

Food Category/ Infants' Responses	Percent of Infants	
	Adolescent (n=61)	Adult (n=60)
Table Food		
Did not swallow	09.8	03.3
Swallowed[j]	60.7	05.0
Choked	01.6	00.0
Leaned back and turned away	00.0	00.0
Leaned forward to receive	01.6	03.3
Mother did not report[f]	26.2	88.3

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

[b] Adult mothers (ages 22-28 years) recruited from same geographic region and similar socio-economic status as the adolescent mothers.

[c] Six adolescent mothers reported that infants swallowed cereal that was introduced in an infant feeder, and two mothers reported that infants swallowed cereal that was introduced in a bottle.

[d] One adult mother reported that an infant swallowed cereal that was introduced by infant feeder; two mothers reported that infants swallowed cereal that was introduced by bottle.

[e] One adolescent mother used an infant feeder to introduce cereal to an infant that leaned back and turned away.

[f] When mothers were asked, they could not identify the response of the infant; they were not present when foods were introduced; or the food had not been introduced at the six month interview.

[g] Five adolescent mothers reported that infants swallowed fruit that was introduced by infant feeder.

[h] Two adolescent mothers reported that infants swallowed vegetables that were introduced by infant feeder.

[i] One adolescent mother used an infant feeder to introduce vegetables to an infant that did not swallow and leaned back and turned away.

[j] One adolescent mother reported that an infant swallowed table food that was introduced by infant feeder.

The next most frequently reported response, when all food categories were introduced for the first time, was that the infant did not swallow. Not swallowing food may indicate that the extrusion reflex, which causes an infant to push food out of the mouth and which disappears by three to five months of age, is present (Morris, 1991; Snow, 1991).

Mothers were asked if their infants leaned back and turned away to express disinterest in food. Leaning back and turning away should follow the motor skills of controlling the head and neck and sitting with support, which occurs at about five months of age (Snow, 1991). Four times different mothers reported that their babies leaned back and turned away before these prerequisite motor skills had occurred. Perhaps, the interviewer did not convey the cue in a manner that it could be recognized by the mother or the mothers may be reporting that their infants turned their head, but did not lean back. Mothers who did not report this response did not observe it.

An acceptance cue exhibited by infants involves opening the mouth and leaning forward to receive food. This is associated with the infant's ability to control the head and neck and sit with support (American Academy of Pediatrics Committee on Nutrition, 1980; Fomon et al., 1979). This response was infrequently reported by

mothers. As noted earlier, the description of the cue was not sufficient for it to be recognized by the mothers or the mothers introduced supplemental foods before infants were developmentally able to perform these skills involving trunk control.

12 Month Interviews

When a variety of table foods were introduced for the first time, mothers reported that their infants responded to the changes in food texture in various ways (Table 11). Most infants swallowed foods that were introduced and/or leaned forward to receive or backward to refuse the foods. The responses reflect normal development of infants at 12 months. These responses were probably not influenced by teething because greater than 50.0 percent of those reported as teething swallowed the food introduced. When mothers reported that infants were teething, the most frequent response was that the infant swallowed the food introduced.

Infant Feeding Practices

Summaries of the infant feeding practices of adolescent and adult mothers at the six and 12 month interviews are presented in Appendix M.

Table 11: Adolescent[a] and Adult[b] Mothers' 12 Month Reports of Infants' Responses When First Table Foods Were Added To The Diet

Food Category/ Infants' Responses	Percent of Infants	
	Adolescent (n=61)	Adult (n=60)
Dry/ready-to-eat cereal		
Did not swallow	8.2	3.3
Swallowed	11.5	13.3
Choked	0	0
Leaned back and turned away	1.6	0
Leaned forward to receive	0	0
Did not swallow and leaned back and turned away	8.2	0
Did not swallow and was teething	9.8	0
Did not swallow and leaned forward to receive and was teething	3.3	0
Swallowed and was teething	27.9	16.7
Swallowed and leaned back and turned away	3.3	0
Swallowed and leaned forward to receive	0	13.3
Swallowed, leaned forward to receive and was teething	3.3	33.3
Swallowed, leaned back and turned away and was teething	1.6	0
Mother did not respond[c]	21.3	20.0
Regular cooked cereal		
Did not swallow	6.6	0
Swallowed	3.3	5.0
Choked	0	0
Leaned back and turned away	0	0

Table 11: (continued)

Food Category/ Infants' Responses	Percent of Infants	
	Adolescent (n=61)	Adult (n=60)
Regular cooked cereal (continued)		
Leaned forward to receive	3.3	0
Did not swallow and leaned back and turned away	1.6	0
Did not swallow and was teething	1.6	0
Swallowed and was teething	16.3	26.7
Swallowed, leaned forward to receive	18.0	6.7
Swallowed, leaned forward to receive, and was teething	0	31.7
Mother did not respond[c]	49.3	30.0
Canned vegetables		
Did not swallow	6.6	6.7
Swallowed	18.0	10.0
Choked	1.6	0
Leaned back and turned away	0	0
Leaned forward to receive	1.6	0
Did not swallow and leaned back and turned away	1.6	0
Did not swallow and was teething	6.6	0
Did not swallow and leaned forward to receive and was teething	3.3	0
Did not swallow and choked	1.6	0
Swallowed and was teething	19.6	30.0
Swallowed and leaned forward to receive	14.8	10.0

Table 11: (continued)

Food Category/ Infants' Responses	Percent of Infants	
	Adolescent (n=61)	Adult (n=60)
Canned vegetables (continued)		
Swallowed, leaned forward to receive and was teething	8.2	38.3
Swallowed, leaned back and was teething	3.3	0
Choked and leaned back and turned away	1.6	0
Choked and leaned forward to receive	3.3	0
Mother did not respond[c]	8.2	5.0
Fresh fruit		
Did not swallow	6.6	10.0
Swallowed	26.2	10.0
Choked	1.6	0
Leaned back and turned away	0	0
Leaned forward to receive	1.6	0
Did not swallow and leaned back and turned away	1.6	0
Did not swallow and was teething	1.6	0
Did not swallow and leaned forward to receive and was teething	1.6	0
Did not swallow and leaned back and turned away	1.6	0
Did not swallow, leaned back and turned away and was teething	1.6	0
Swallowed and was teething	19.7	23.3
Swallowed and leaned forward to receive	19.7	10.0

Table 11: (continued)

Food Category/ Infants' Responses	Percent of Infants	
	Adolescent (n=61)	Adult (n=60)
Fresh fruit (continued)		
Swallowed, leaned forward to receive and was teething	8.2	30.0
Swallowed, leaned back and was teething	1.6	0
Mother did not respond[C]	8.2	16.7
Canned fruit		
Did not swallow	4.9	0
Swallowed	11.5	10.0
Choked	0	0
Leaned back and turned away	0	0
Leaned forward to receive	1.6	0
Did not swallow and leaned back and turned away	1.6	0
Did not swallow and was teething	1.6	0
Did not swallow, leaned back and turned away and was teething	1.6	0
Swallowed and was teething	11.5	23.3
Swallowed and leaned forward to receive	16.4	3.3
Swallowed, leaned back and was teething	6.6	35.0
Mother did not respond[C]	42.6	28.3
Meat from the table		
Did not swallow	4.9	3.3
Swallowed	8.2	13.3
Choked	0	0
Leaned back and turned away	0	0

Table 11: (continued)

Food Category/ Infants' Responses	Percent of Infants	
	Adolescent (n=61)	Adult (n=60)
Meat from the table (continued)		
Leaned forward to receive	3.3	0
Did not swallow, leaned back and turned away and was teething	6.6	0
Did not swallow and was teething	9.8	3.3
Swallowed and was teething	19.7	16.7
Swallowed and leaned forward to receive	16.4	6.7
Swallowed, leaned forward, and was teething	6.6	30.0
Swallowed, leaned back and was teething	4.9	0
Choked and was teething	1.6	0
Mother did not respond[c]	18.0	26.7
Junior foods		
Did not swallow	3.3	0
Swallowed	4.9	3.3
Choked	0	0
Leaned back and turned away	0	0
Leaned forward to receive	0	0
Did not swallow and was teething	4.9	0
Did not swallow and choked	1.6	0
Did not swallow, choked and leaned away	1.6	0
Did not swallow and leaned away	3.3	0
Did not swallow, leaned back and turned away, and was teething	0	3.3

Table 11: (continued)

Food Category/ Infants' Responses	Percent of Infants	
	Adolescent (n=61)	Adult (n=60)
Junior foods (continued)		
Swallowed and was teething	8.2	6.7
Swallowed and leaned forward to receive	6.6	6.7
Swallowed, leaned forward, and was teething	1.6	13.3
Swallowed, leaned back and turned away	1.6	0
Mother did not respond[c]	62.3	66.7

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

[b] Adult mothers (ages 22-28 years) recruited from same geographic region and similar socio-economic status as the adolescent mothers.

[c] When mothers were asked, they could not identify the response of the infant; they were not present when foods were introduced; or the food had not been introduced at the 12 month interview.

Breast Feeding

Twelve adolescent mothers (20.0 percent) and 21 adult mothers (35.0 percent) breast fed their infants. The incidence of breast feeding in adolescent mothers is similar to the incidence reported in other studies. In recent national surveys of the population, the incidence of breast feeding in mothers under the age of 20 years was 36.5 percent (Martinez & Kreiger, 1985) and 30.2 percent (Ryan et al., 1991), respectively. Other data from surveys of population subgroups during this time period indicate that the incidence of breast feeding in mothers, 18 years of age and under, ranged from 11.8 percent to 54.0 percent (Baisch et al., 1989; Joffe & Radius, 1987; Neifert et al., 1988; Schneck et al., 1990; Yoos, 1985). Thus, the 20.0 percent incidence of breast feeding in adolescent mothers (ages 14-18 years) falls within the reported ranges in studies of population subgroups.

Maximum duration of breast feeding for adolescent mothers was 16 weeks compared to 52 weeks for adult mothers. The short duration of breast feeding for adolescent mothers has been reported in national surveys. According to Ryan et al. (1991), from 1984-1989 the maximum duration of breast feeding until six months postpartum in mothers under the age of 20 decreased from 9.2 percent in 1984 to 5.6 percent in 1989. When surveys

of population subgroups are considered, however, the maximum duration of breast feeding also is short in adolescent mothers (Neifert et al., 1988). For example, in a study of 55 breast feeding mothers less than 18 years of age, 73.0 percent stopped breast feeding before two months postpartum. The Neifert (1988) study, however, did not have an adult sample to compare with the adolescent mothers.

As reported earlier, adolescent and adult mothers in this study were low or lower-middle socio-economic strata at the 12 month interviews (Hollingshead, 1976). Researchers have found that breast feeding duration is short in low income mothers who have high school education levels and below. Published information, however, separately analyzes data by mothers' age, income, and education (Martinez & Stahle, 1982; Ryan et al., 1989; 1991), and does not combine the variables for analysis. Thus, it is difficult to compare earlier research findings about the duration of breast feeding to mothers in this study.

One study conducted in the state of Georgia reported an incidence of breast feeding in low income women that was evaluated by age of the mother. MacGowan et al. (1991) studied the incidence of breast feeding in low income women who attended Women, Infants, and Children (W.I.C.) Clinics in Georgia. Eleven percent of low

income mothers under the age of 17 years breast fed, which was significantly less ($p \leq 0.05$) when compared to 21.0 percent of mothers, aged 17-19, 19.0 percent of mothers, aged 20-24, and 36.0 percent of mothers, aged 25-29 years.

Other Infant Feeding Practices

Six Month Interviews. Approximately 80.0 percent of infants born to adolescent and adult mothers received infant formula by the six month interview. Most adolescent and adult mothers decided to formula feed while they were pregnant. The amount of formula provided was not significantly different between the groups. The amount of infant formula reportedly consumed daily by infants from both groups, approximately 32 ounces, provided greater than 100.0 percent of the Recommended Dietary Allowances for all of the nutrients needed for a six month old infant (Food and Nutrition Board, 1989).

Three infants of adolescent mothers received cow's milk instead of infant formula compared to no infants born to adult mothers who received cow's milk. Other adolescent and adult mothers provided cow's milk in addition to infant formula. The amount of cow's milk provided was not significantly different between adolescent and adult mothers.

Fifty percent of adolescent mothers offered infants a bottle while in bed compared to three percent of adult mothers. Most of the bottles contained infant formula. This feeding practice is not recommended due to the risk of "baby bottle caries" (American Academy of Pediatrics Committee on Nutrition, 1980).

At the six month interviews, adolescent and adult mothers provided a variety of other fluids in addition to infant formula. Approximately, 85.0 percent of all mothers provided infant juices. About 16.0 percent of mothers furnished Koolaide. Carbonated beverages were supplied by approximately 50.0 percent of the adolescent mothers compared to five percent of adult mothers.

Seventy-five percent of adolescent and adult mothers' infants received a variety of other baby foods, i.e. dry infant cereal, strained fruit, strained vegetables. Strained meat was provided to fewer infants in both groups than other types of foods. Seventy-nine percent of adolescent mothers offered table foods compared to 32.0 percent for adult mothers. The majority of mothers from both groups modified table foods, using a knife, fork, or spoon. Blenders, food processors, and food mills were seldom used to modify table food.

These feeding practices probably reflect the transitional period in which the infant is recognizing the spoon and swallowing non-liquid foods (Table 11)

(American Academy of Pediatrics Committee on Nutrition, 1980). In the transition period at approximately six months, consumption of infant formula, however, continues to be a large portion of the diet. The mean amount of formula provided at six months by adolescent and adult mothers in this study was 32.3 $\pm$ 10.6 fluid ounces/day for the adolescent group and 30.7 $\pm$ 8.3 fluid ounces/day for the adult group.

12 month interviews. Approximately forty percent of all mothers continued to provide infant formula at the 12 month interviews. On average, other mothers stopped giving infant formula at nine to 10 months of age. Almost all mothers were providing cow's milk to their infants either as a replacement for infant formula or in addition to infant formula.

Other fluids provided by a majority of mothers were a variety of infant and adult juices. Koolaide and carbonated beverages continued to be provided by fewer adult mothers than adolescent mothers.

Mothers offered infants a variety of textures of cereal, fruit, vegetables, and meat. The majority of adolescent and adult mothers fed infants a combination of baby foods and table foods. Few mothers provided baby foods only to their infants. Mothers continued to modify table food with a knife, fork, or spoon. Few mothers

used a food processor, blender, or food mill.

These feeding practices at the 12 month interview are probably evidence of the modified adult period of feeding (American Academy of Pediatrics Committee on Nutrition, 1980). In this period, infants are learning to feed themselves and experience food textures and tastes. This feeding period requires that table foods be cut into small pieces (American Academy of Pediatrics Committee on Nutrition, 1980). The change from consumption of infant formula to cow's milk is an indication that the mothers have decided or have been advised that their infants are consuming enough supplemental foods; thus cow's milk can be offered instead of feeding infant formula.

At the 12 month interviews, adolescent and adult mothers were feeding their infants in restaurants as well as at home. Ninety-two percent of adolescent and 77.0 percent of adult mothers fed infants at fast food restaurants such as McDonalds and Hardees. The most common foods consumed by infants were hamburgers, french fries, and carbonated beverages. At other restaurants, infants received a variety of table foods.

Infants' Ages at Introduction of Supplemental Food

Table 12 presents the specific months when categories of foods were added. Forty-one percent of the

Table 12: Addition of Supplemental Foods To Infants' Diets By Food Category and Month of Introduction: A Comparison of Adolescent (n=61) and Adult Mothers (n=60)

Food Category/ Infant Age at Introduction	Adolescent Mothers[a,b]	Adult Mothers[c,d]
	(Mean ± Std Dev.) Percent of Infants	
Cereal	(2.1 ± 1.3)[e]	(3.1 ± 1.3)
00-01 months	41.0	8.3
01-02 months	21.3	23.3
02-03 months	21.3	28.3
03-04 months	13.1	21.8
04-05 months	3.3	15.0
05-06 months	----	3.3
Fruit	(3.2 ± 1.4)	(3.6 ± 1.3)
00-01 months	9.8	6.7
01-02 months	19.7	6.7
02-03 months	26.2	15.0
03-04 months	21.3	33.3
04-05 months	13.2	15.0
05-06 months	4.9	1.7
not added	4.0	15.0
Vegetables	(3.8 ± 1.3)	(4.0 ± 1.0)
00-01 months	4.9	----
01-02 months	9.8	3.3
02-03 months	14.8	13.4
03-04 months	26.2	28.3
04-05 months	21.3	25.0
05-06 months	4.9	3.3
not added	18.1	26.7

Table 12: (continued)

Food Category/ Infant Age at Introduction	Adolescent Mothers[a,b]	Adult Mothers[c,d]
	(Mean ± Std Dev.) Percent of Infants	
Meat	(4.7 ± 1.4)	(5.1 ± 0.8)
00-01 months	----	----
01-02 months	1.7	----
02-03 months	3.3	----
03-04 months	4.9	1.7
04-05 months	4.9	5.0
05-06 months	6.5	5.0
not added	77.0	88.3

[a] Infants of adolescent mothers who participated in AES-TN860:"Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.
[b] No infants breast fed at six months.
[c] Infants of adult mothers (ages 22-28 years) recruited from same geographic region and similar socieconomic status as the adolescent mothers.
[d] Ten infants breast fed at six months.
[e] Significantly different at $p \leq 0.05$ between infants of adolescent and adult mothers.

adolescent mothers added cereal during the first month of life compared to 8.3 percent of adult mothers. Most mothers had not added strained meat at six months,i.e. 77.0 percent of the adolescent and 88.3 percent of adult mothers.

The American Academy of Pediatrics recommends that supplemental foods be added after an infant is four months of age (American Academy of Pediatrics Committee on Nutrition, 1980). Adolescent and adult mothers added cereal, strained fruit, and strained vegetables before four months of age. Adolescent mothers added cereal at an earlier age than did adult mothers ($p \leq 0.05$).

Early introduction of supplemental foods, however, is reported in surveys from subgroups of the population (Andrew et al., 1981; Brodwick et al., 1989; Magnus & Galindo, 1980; Marlin,et al., 1980; McLorg & Bryant,1989; O'Malley et al., 1991). One of the earliest reported ages of introducing supplemental foods is at three to four weeks (Brodwick et al., 1989).

Mothers, who breast feed, also add supplemental foods to infants diets later than those who formula feed (Brogan & Fox, 1984; Marlin et al., 1980; Peters & Worthington-Roberts, 1982; Sarett et al., 1983). Seven of the 10 adult mothers who were breast feeding at six months added supplemental foods at four months or later (4.3 ± 1.3 months). Thus, breast feeding for seven

mothers did result in adding supplemental foods later than four months.

Adolescent mothers introduced supplemental foods to their infants' diets earlier than adult mothers. The earlier introduction of supplemental foods by adolescent mothers is an important finding because published information on when mothers, aged 18 years and under, add supplemental foods to their infants' diets is limited to two studies in which the age of the mother was not a major study variable. For example, Auerbach and Guss (1984), who studied employed mothers under the age of 25, found them to be twice as likely as those over the age of 25 to introduce supplemental foods to their infants' diets before 16 weeks of age. In contrast, a group of mothers with a mean age of 23 years planned on introducing supplemental foods from one to 77 weeks of age (Berkelhamer et al., 1977).

Infants' Ages at Introduction of Food Textures

As shown in Table 13, adolescent mothers introduced a variety of food textures earlier than adult mothers. The age at introduction was significantly earlier ($p \leq 0.05$) than adult mothers for the following foods: regular cooked cereal, canned vegetables, and fresh and canned fruit. Most mothers were not feeding Junior baby foods to their infants by the 12 month interview.

Table 13: Addition of Table Foods To Infants' Diets By Food Category and Month of Introduction: A Comparison of Adolescent (n=61) and Adult Mothers (n=60)

Food Category/ Infant Age at Introduction	Adolescent Mothers[a]	Adult Mothers[b]
	(Mean ± Std Dev.) Percent of Infants	
Cereal, ready to eat	(9.0 ± 2.3)	(10.5 ± 1.3)
00-01 months	1.6	0.0
01-02 months	0.0	0.0
02-03 months	0.0	0.0
03-04 months	1.6	0.0
04-05 months	0.0	0.0
05-06 months	0.0	1.7
06-07 months	6.0	0.0
07-08 months	3.0	1.7
08-09 months	13.3	0.0
09-10 months	16.4	18.3
10-11 months	16.4	20.0
11-12 months	13.3	36.7
12-13 months	8.2	1.7
not added	21.3	20.0
Regular cooked cereal	(7.9 ± 2.4)[c]	(10.4 ± 1.0)
00-01 months	1.6	0.0
01-02 months	0.0	0.0
02-03 months	0.0	0.0
03-04 months	1.6	0.0
04-05 months	0.0	0.0
05-06 months	3.3	0.0
06-07 months	8.2	0.0
07-08 months	4.9	1.7
08-09 months	8.2	0.0
09-10 months	8.2	11.7
10-11 months	6.6	16.7
11-12 months	6.6	33.3
12-13 months	0.0	6.7
not added	50.8	30.0

Table 13: (continued)

Food Category/ Infant Age at Introduction	Adolescent Mothers[a]	Adult Mothers[b]
	(Mean ± Std Dev.) Percent of Infants	
Raw vegetables	(9.0 ± 1.9)	(9.3 ± 2.3)
00-01 months	0.0	0.0
01-02 months	0.0	0.0
02-03 months	0.0	0.0
03-04 months	0.0	0.0
04-05 months	0.0	0.0
05-06 months	3.3	1.7
06-07 months	3.3	3.3
07-08 months	3.3	3.3
08-09 months	3.3	0.0
09-10 months	3.3	3.3
10-11 months	6.7	5.0
11-12 months	1.6	6.7
12-13 months	3.3	5.0
not added	72.1	71.6
Canned vegetables	(8.4 ± 2.4)[c]	(9.8 ± 1.6)
00-01 months	0.0	0.0
01-02 months	3.3	0.0
02-03 months	0.0	0.0
03-04 months	0.0	0.0
04-05 months	8.2	0.0
05-06 months	3.3	1.7
06-07 months	6.6	0.0
07-08 months	6.6	10.0
08-09 months	6.6	6.7
09-10 months	27.9	10.0
10-11 months	14.8	30.0
11-12 months	11.4	26.7
12-13 months	3.3	10.0
not added	8.2	5.0
Fresh fruit	(8.6 ± 2.4)[c]	(10.1 ± 1.5)
00-01 months	1.6	0.0
01-02 months	1.6	0.0
02-03 months	1.6	0.0
03-04 months	1.6	0.0
04-05 months	1.6	0.0
05-06 months	3.3	0.0

Table 13: (continued)

Food Category/ Infant Age at Introduction	Adolescent Mothers[a]	Adult Mothers[b]
	(Mean ± Std Dev.) Percent of Infants	
Fresh fruit (continued)		
06-07 months	6.6	0.0
07-08 months	11.4	6.7
08-09 months	6.6	8.3
09-10 months	21.3	8.3
10-11 months	6.6	20.0
11-12 months	13.1	28.3
12-13 months	6.6	11.7
not added	13.1	16.7
Canned fruit	(8.3 ± 2.9)[c]	(10.2 ± 2.0)
00-01 months	1.6	0.0
01-02 months	1.6	0.0
02-03 months	1.6	0.0
03-04 months	1.6	0.0
04-05 months	1.6	0.0
05-06 months	0.0	0.0
06-07 months	6.6	0.0
07-08 months	6.6	5.0
08-09 months	6.6	3.3
09-10 months	11.4	5.0
10-11 months	5.0	16.7
11-12 months	5.0	26.7
12-13 months	5.0	16.7
not added	45.9	26.7
Meat from the table	(10.0 ± 1.9)	(11.0 ± 1.2)
00-01 months	1.6	0.0
01-02 months	0.0	0.0
02-03 months	0.0	0.0
03-04 months	0.0	0.0
04-05 months	0.0	0.0
05-06 months	0.0	0.0
06-07 months	0.0	0.0
07-08 months	1.6	0.0
08-09 months	6.6	0.0
09-10 months	19.7	16.7
10-11 months	16.4	3.3
11-12 months	21.3	16.7

Table 13: (continued)

Food Category/ Infant Age at Introduction	Adolescent Mothers[a]	Adult Mothers[b]
	(Mean ± Std Dev.) Percent of Infants	
Meat from the table (continued)		
12-13 months	14.8	36.7
not added	18.0	26.7
Junior foods	(8.6 ± 2.1)	(8.9 ± 1.7)
00-01 months	0.0	0.0
01-02 months	0.0	0.0
02-03 months	0.0	0.0
03-04 months	0.0	0.0
04-05 months	1.6	0.0
05-06 months	5.0	3.3
06-07 months	1.6	0.0
07-08 months	5.0	3.3
08-09 months	3.3	3.3
09-10 months	5.0	6.7
10-11 months	11.5	13.3
11-12 months	1.6	3.3
12-13 months	1.6	0.0
not added	63.9	66.7

[a] Infants of adolescent mothers who participated in AES-TN860:"Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

[b] Infants of adult mothers (ages 22-28 years) recruited from same geographic region and similar socieconomic status as the adolescent mothers.

[c] Significantly different at $p \leq 0.05$ between infants of adolescent and adult mothers.

Dietary Intake of Infants at Six Months

On average at six months, the diets of infants of adolescent and adult mothers provided greater than 100.0 percent of the RDA (Food and Nutrition Board, 1989) for all nutrients studied. As shown in Table 14, the diets of all infants were greater than 200.0 percent of the RDA (Food and Nutrition Board, 1989) for seven nutrients: thiamin, riboflavin, niacin, folate, ascorbic acid, vitamin A, and iron. Infants of adolescent mothers received significantly more ascorbic acid and calcium ($p \leq 0.05$). High intakes of thiamin, riboflavin, niacin, and iron are primarily from infant cereals. Infant cereals are high in these nutrients and enriched with iron. All adolescent and adult mothers had introduced cereal by six months.

The high intakes of vitamin A and ascorbic acid are from strained vegetables, strained fruits, and juices. As shown in Table 12, 96.0 percent of adolescent and 85.0 percent of adult mothers added strained fruits to their infants' diets by six months. Most mothers also added strained vegetables to the infants' diets by six months, i.e. 81.9 percent of the adolescent mothers and 73.3 of the adult mothers. All mothers had added fruit juice to the infants' diets by six months.

In the Filer and Martinez (1969) study, meat and vegetables contributed 80.0 percent of vitamin A intake;

Table 14: Mean Dietary Intake and Percent of Recommended Dietary Allowances (RDA) for Infants at Six Months of Age: A Comparison of Infants Born to Adolescent[a] (n=61) and Adult[b] (n=60) Mothers

Energy/Nutrient	Mean ± Std Dev	Percent RDA
Adolescent Mothers[c]		
Kilocalories[d,e]	871 ± 305	109
Carbohydrate (gm)	119 ± 41	---
Protein (gm)	23 ± 13	140
Fat (gm)	36 ± 15	---
Thiamin (mg)	1.0 ± 0.5	333
Riboflavin (mg)	1.4 ± 0.6	350
Niacin (mg)	15 ± 6	300
Folate (ug)	119 ± 46	476
Ascorbic acid (mg)[f]	166 ± 89	553
Vitamin A (IU)	4003 ± 3816	214
Vitamin D (IU)	381 ± 135	127
Calcium (mg)	640 ± 238	160
Iron (mg)	21 ± 11	350
Zinc (mg)	6 ± 2	120
Adult Mothers[g]		
Kilocalories	730 ± 155	87
Carbohydrate (gm)	99 ± 27	---
Protein (gm)	18 ± 5	105
Fat (gm)	31 ± 8	---
Thiamin (mg)	0.9 ± 0.3	300
Riboflavin (mg)	1.1 ± 0.4	275
Niacin (mg)	12 ± 5	240
Folate (ug)	109 ± 32	436
Ascorbic acid (mg)	125 ± 66	417

Table 14: (continued)

Energy/Nutrient	Mean ± Std Dev	Percent RDA
Adult Mothers (continued)		
Vitamin A (IU)	4606 ± 4240	246
Vitamin D (IU)	306 ± 149	102
Calcium (mg)	543 ± 180	136
Iron (mg)	19 ± 2	317
Zinc (mg)	5 ± 2	100

[a] Infants of adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.
[b] Infants of adult mothers (ages 22-28 years) recruited from same geographic region and similar socieconomic status as the adolescent mothers.
[c] No infants breast fed at six months.
[d] Energy and protein allowances are based on kilogram weight of the infant (7.4 kg mean six month weight of infants of adolescent mothers and 7.8 kg mean six month weight of infants of adult mothers). There are no RDA for fat and carbohydrate.
[e] The mean energy and nutrient intake are based on one 24 hour recall/infant at six month interview.
[f] Significantly different at $p \leq 0.05$ between infants of adolescent and adult mothers.
[g] Ten infants breast fed at six months.

cereal 30.0 percent of thiamine intake; meat 15 percent of riboflavin intake; cereal 23.0 percent of niacin intake; and fruit juice provided 55.0 percent of vitamin C intake. A high iron intake was attributed to consumption of cereal added to the diet. The investigators did not report the number of mothers that added supplemental foods and the infant's age when supplemental foods were added.

These dietary data have some limitations that influence the results and their interpretation. That is, the dietary data reflect one 24 hour recall taken at six and 12 month interviews and are valid in describing group patterns, but do not reflect daily variation in nutrient intakes (Karvetti & Knuts, 1985). Twenty-four hour recalls also are biased by memory (Dwyer & Krall, 1987). Study methodology required that adolescent and adult mothers recall what their infants had consumed the day before, and in some cases, the mother was not the primary care giver (Appendix M).

These findings also are influenced by changes made by the manufacturers of strained baby food. The accuracy of this information is altered at six months, because 24 hour recall data about strained infant foods consumed by the infants were collected by jar sizes. Manufacturers changed from 4.25 ounce strained food jars to 4.00 ounce jars after 72.0 percent (n=44) of the adolescent mothers

completed 24 hour recalls at six months. The difference in strained baby food jar sizes, assuming total consumption of the content, resulted in significant differences ($p \leq 0.005$) in the number of calories, protein, iron, folate, calcium, ascorbic acid, and magnesium available. Therefore, the nutrient consumption of 18.0 percent (n=17) of the infants born to adolescent mothers is significantly less ($p \leq 0.05$) than the nutrient intake of 72.0 percent (n=44) for the infants of adolescent mothers who reported consumption data when larger strained baby food (4.25 ounce) jars were available for purchase. But if the amounts of nutrients exceeds 100.0 percent of the RDA, this may not be a problem in interpreting the nutrient consumption data. However, this may account for the reportedly larger nutrient consumption by the infants of adolescent mothers compared to infants of adult mothers.

Dietary Intakes of Infants at 12 Months

On average at the 12 month interviews, all infants had nutrient intakes greater than 75.0 percent of the RDA (Food and Nutrition Board, 1989) for infants at 12 months of age (Table 15). The diets exceeded the RDA by 200.0 percent for the following nutrients: thiamin, riboflavin, folate, ascorbic acid, and vitamin A. Ascorbic acid intake was significantly different between the infants

Table 15: Mean Dietary Intake and Percent of Recommended Dietary Allowances (RDA) for Infants at 12 Months of Age: A Comparison of Infants Born to Adolescent[a] (n=61) and Adult[b] Mothers (n=60)

Energy/Nutrient	Mean ± Std Dev	Percent RDA
Adolescent Mothers[c]		
Kilocalories[d,e]	1135 ± 387	121
Carbohydrate (gm)	148 ± 53	---
Protein (gm)	37 ± 17	241
Fat (gm)[f]	45 ± 19	---
Thiamin (mg)	1.2 ± 0.8	240
Riboflavin (mg)	1.7 ± 0.9	283
Niacin (mg)[f]	12 ± 6	150
Folate (ug)	119 ± 61	264
Ascorbic acid (mg)[f]	87 ± 64	249
Vitamin A (IU)	4403 ± 4920	220
Vitamin D (IU)	301 ± 158	75
Calcium (mg)	849 ± 497	157
Iron (mg)	14 ± 14	93
Zinc (mg)	5 ± 2	100
Adult Mothers[g]		
Kilocalories	895 ± 200	91
Carbohydrate (gm)	118 ± 28	---
Protein (gm)	36 ± 11	225
Fat (gm)	33 ± 13	---
Thiamin (mg)	1.0 ± 0.4	200
Riboflavin (mg)	1.4 ± 0.4	233
Niacin (mg)	8.9 ± 4.8	111
Folate (ug)	116 ± 65	258
Ascorbic acid (mg)	120 ± 71	343

Table 15: (continued)

Energy/Nutrient	Mean ± Std Dev	Percent RDA
Adult Mothers (continued)		
Vitamin A (IU)	4725 ± 4614	236
Vitamin D (IU)	257 ± 107	64
Calcium (mg)	816 ± 274	151
Iron (mg)	9 ± 6	60
Zinc (mg)	4 ± 1	80

[a] Infants of adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.
[b] Infants of adult mothers (ages 22-28 years) recruited from same geographic region and similar socieconomic status as the adolescent mothers.
[c] No infants breast fed at six months.
[d] Energy and protein allowances are based on kilogram weight of the infant (9.6 kg mean 12 month weight of infants of adolescent mothers and 10.0 kg mean 12 month weight of infants of adult mothers). There are no RDA for fat and carbohydrate.
[e] The mean energy and nutrient intakes are based on one 24 hour recall/infant at 12 month interview.
[f] Significantly different at $p \leq 0.05$ between infants of adolescent and adult mothers.
[g] Nine infants breast fed at 12 months.

($p \leq 0.05$) of adolescent and adult mothers.

Similarly, Marlin et al. (1980) reported on the contribution of supplemental foods to the macronutrient intake of 12 month old infants. A maximum of 40.0 percent of calcium, sodium, potassium, chloride, thiamin, riboflavin, and pyridoxine intake was provided by supplemental foods given to 12 month old infants, who also received formula or human milk. Strained fruits, yellow vegetables, and orange juice were important sources of vitamin A and vitamin C in formula fed infants who participated in this study.

Mothers' Reports of Infants Health Care/Health Status

Mothers' Reports of Health Care Resources Available to Infants

The health care practices of adolescent and adult mothers are presented in Tables 16 and 17. Adolescent mothers were twice as likely to utilize Medicaid as a method of payment for health care for their infants as adult mothers. Almost equal numbers of adult mothers paid medical bills with private insurance as those who received Medicaid. Greater than 60.0 percent of mothers from both groups received W.I.C. benefits during and after pregnancy. In this program, along with the provision of infant formula and food supplements, infant

Table 16: Adolescent[a] Mothers' Reports of Health Care Resources Available to Infants

Health Care Resource	Number of Adolescent Mothers (Percent of n=61 mothers)
Medical expenses and WIC participation	
Payment of hospital bill and physician bill after birth of baby	
Medicaid	49 (80)
private insurance	8 (13)
self-pay	4 (07)
Payment of medical care after birth	
Medicaid	50 (82)
private insurance	9 (15)
self-pay	2 (03)
Mother received WIC benefits during pregnancy	50 (82)
Infant received WIC benefits	53 (87)
Sources of Information About Infant Feeding	
Who talked with mother about infant feeding most important	
own mother	29 (48)
health care provider	14 (22)
experience with other children	5 (08)
own grandmother	3 (05)
friends	2 (03)
mother-in-law	2 (03)
no one	2 (03)
sister-in-law	1 (02)
home for pregnant adolescents	1 (02)
aunt	1 (02)
stepmother	1 (02)
family	
during pregnancy	3 (05)
after pregnancy	34 (56)
during and after pregnancy	8 (13)

Table 16: (continued)

Health Care Resource	Number of Adolescent Mothers (Percent of n=61 mothers)
Sources of Information About Infant Feeding (continued)	
friends	
during pregnancy	2 (03)
after pregnancy	7 (12)
during and after pregnancy	5 (08)
health professionals	
during pregnancy	7 (15)
after pregnancy	29 (48)
during and after pregnancy	11 (18)
Other sources of information	
television	
during pregnancy	0
after pregnancy	8 (13)
during and after pregnancy	1 (02)
newspapers	
during pregnancy	2 (03)
after pregnancy	0
magazines	
during pregnancy	3 (05)
after pregnancy	13 (21)
during and after pregnancy	3 (05)
others	
during pregnancy	4 (07)
after pregnancy	6 (10)
during and after pregnancy	2 (03)

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

[b] Others = day care classes, books, pamphlets, Gerber, video tapes from child care classes.

Table 17: Adult[a] Mothers' Reports of Health Care Resources Available to Infants

Health Care Resource	Number of Adult Mothers (Percent of n=60 mothers)
Medical expenses and WIC participation	
Payment of hospital bill and physician bill after birth of baby	
Medicaid	28 (47)
private insurance	31 (52)
self-pay	1 (01)
Payment of medical care after birth	
Medicaid	24 (40)
private insurance	29 (48)
self-pay	7 (12)
Mother received WIC benefits during pregnancy	37 (62)
Infant received WIC benefits	39 (65)
Sources of Information About Infant Feeding	
Who talked with mother about infant feeding most important	
health care provider	27 (45)
experience with other children	15 (25)
own mother	10 (17)
friends	3 (05)
mother-in-law	4 (07)
own grandmother	1 (01)
family	
during pregnancy	1 (01)
after pregnancy	41 (68)
during and after pregnancy	1 (01)

Table 17: (continued)

Health Care Resource	Number of Mothers (Percent of n=60 mothers)
Sources of Information About Infant Feeding (continued)	
friends	
during pregnancy	0
after pregnancy	21 (35)
during and after pregnancy	0
health professionals	
during pregnancy	2 (03)
after pregnancy	49 (82)
during and after pregnancy	1 (01)
Other sources of information	
television	
during pregnancy	1 (01)
after pregnancy	2 (03)
during and after pregnancy	0
newspapers	
during pregnancy	0
after pregnancy	0
magazines	
during pregnancy	1 (01)
after pregnancy	16 (27)
during and after pregnancy	0
others[b]	
during pregnancy	1 (01)
after pregnancy	18 (30)
during and after pregnancy	0

[a] Infants of adult mothers (ages 22-28 years) recruited from same geographic region and similar socioeconomic status as the adolescent mothers.

[b] Others = hospital discharge packet, video in the hospital, rented video on breast feeding, books, pamphlets.

health status is assessed.

The sources of information about infant feeding practices varied between adolescent and adult mothers. Forty-eight percent of the adolescent mothers compared to 17.0 percent of adult mothers indicated that their own mother was the most important source of information about infant feeding. In contrast, 45.0 percent of adult mothers stated that health care providers were their most important source of information about infant feeding compared to 22.0 percent of adolescent mothers. Most information about infant feeding was obtained after mothers delivered their babies. Other sources of information such as television, newspapers, and magazines were not frequently reported by either group of mothers.

Mothers' Reports of Infants' Health Care and Illnesses

The number of physician visits and infant illnesses as well as calculated illness scores are shown in Table 18. Compared to adult mothers, the infants of adolescent mothers had illness scores that were significantly greater ($p \leq 0.05$) at six months. The higher illness scores of infants born to adolescents reflect the severity of the illnesses and the number of days of hospitalization. No adolescent mothers indicated illnesses or hospitalizations related to food allergies. Eighty-two percent of adolescent and 72.0 percent of

Table 18: Adolescent[a] (n=61) and Adult[b] (n=60) Mothers' Reports of Infants' Health Care/Illnesses at Six and 12 Months

Health Care/Illnesses	(Mean ± Std Dev) Number Reported	
	6 Months	12 Months
Adolescent Mothers		
Number of physician/clinic visits (birth through 12 months)	(9.4 ± 6.2)	
Number of infant illnesses[c]		
Skin infections, rashes, thrush	7	8
Colds	41	68
Eye/ear infections	41	88
Respiratory/allergies	51	28
Gastrointestinal problems/ colic/diarrhea	18	10
Injuries that immobilize and influence food intake	--	3
Infant illness index	(9.6 ± 8.4)[d]	(10.5 ± 6.8)
Adult Mothers		
Number of physician/clinic visits birth through 12 months	(8.0 ± 3.0)	
Number of infant illnesses[e]		
Skin infections, rashes, thrush	5	7
Colds	77	93
Eye/ear infections	37	91
Respiratory/allergies	12	6
Gastrointestinal problems/ colic/diarrhea	7	2
Injuries that immobilize and influence food intake	--	--
Infant illness index	(7.3 ± 6.5)	(10.1 ± 4.8)

[a] Infants of adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

[b] Infants of adult mothers recruited from same geographic region and similar socioeconomic status as the adolescent mothers.

[c] No infants breast fed at six and 12 months.

[d] Significantly different ($p \leq 0.05$) between infants of adolescent and adult mothers.

[e] Ten infants breast fed at six months and nine infants breast fed at 12 months.

adult mothers felt positive about their infants' health (Appendix O).

Factors Influencing Weight of Infants at Six and 12 Months

The results of statistical analyses to examine the relationship between infant weight at six and 12 months as the dependent variables and the independent variables, i.e. birthweight, maximum duration of breast feeding, illness index score, infant's age at introduction of supplemental foods, and mean dietary intake of calories, protein, and fat intake are presented in Table 19. Analysis within the adolescent and adult groups resulted in T values, and comparison between the two groups in F values. Negative T values indicated that as the independent variable increased infants' weights decreased. Positive T values indicated that as the independent variable increased infants' weights increased. Independent variables with high p-values were dropped from the final model, but the overall results were not changed.

Significant Predictor Variables

Within the groups. Birthweight. Infants' weights at six and 12 months were related ($p \leq 0.05$) to

Table 19: Description of Statistical Findings About the Factors Influencing Infants' Weight at Six and 12 Months: A Comparison of Adolescent[a] and Adult[b] Mothers

Factors	Statistical Relationship to Weight		
	T value	F value	P
Birth weight			
within groups	2.89	----	0.005[c]
between groups	----	8.38	0.005[d]
Breast feeding duration			
within groups	-2.53	----	0.013[c]
between groups	----	6.42	0.013[d]
Illness index score			
within groups	-1.72	----	0.088
between groups	----	2.97	0.088
Infant Age At Introduction of Supplemental Foods			
within groups	-0.24	----	0.814
between groups	----	0.06	0.814
Calorie intake			
within groups	-0.82	----	0.414
between groups	----	0.67	0.414
Protein intake			
within groups	2.25	----	0.027[c]
between groups	----	5.06	0.027[d]
Fat intake			
within groups	-0.67	----	0.505
between groups	----	0.45	0.505

[a] Infants of adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews (n=61).

[b] Infants of adult mothers who were recruited from the geographic region and were of similar socioeconomic status as the adolescent mothers (n=60).

[c] Significantly different ($p \leq 0.05$) within the groups of adolescent and adult mothers' infants.

[d] Significantly different ($p \leq 0.05$) between adolescent and adult mothers' infants.

birthweight. This means that the birthweight of an infant, whether the mother is an adolescent or adult, is related to an infant's weight at six and 12 months. Infants who were heavy at birth were likely to be heavier at six and 12 months, regardless of the age of their mother.

Other researchers reported conflicting results regarding the predictive value of birthweight. Birthweight explained 24.0 percent of the variance in relative weight at 12 months in 3,000 low income black Americans (Mack & Ipsen, 1974). These researchers concluded that birthweight was a strong predictor of weight at one year. Other researchers have concluded that birth weight is related to weight at six and 12 months, but it is not a strong predictor (Kramer et al., 1985). Kramer et al. (1985) found that birthweight was a determinant of infant weight at six and 12 months, but most of the variance remained unexplained.

Breast feeding. Maximum duration of breast feeding was also related ($p \leq 0.05$) to infants' weights at six and 12 months. The negative T value means that as the maximum duration of breast feeding increased infants' weights decreased. Maximum duration of breast feeding, whether the mother was an adolescent or adult, is related to infants' weights at six and 12 months. Twelve

adolescent mothers in this study breast fed and the maximum duration of breast feeding was too short (16 weeks) to draw specific conclusions about the relationship.

The relationship of breast feeding and infant weight from birth to 12 months was reported by Neumann and Alpaugh (1976). Neumann and Alpaugh examined 357 infants from birth to one year of age. They reported that formula fed infants doubled their birthweights at 113 days compared to 124 days for breast fed infants. Other researchers, however, have found that breast feeding is not related to the weight of infants at six and 12 months (Huenemann, 1974; Dine et al., 1979).

Protein. The protein content of the infants' diets at six and 12 months also was related ($p \leq 0.05$) to weight for infants of both adolescent and adult mothers. These data, however, were derived from one 24-hour recall of the infants' food intake at the six and 12 month interviews and is probably biased by day to day variation in intake (Skinner et al., 1992).

Between the groups. Birthweight. Birthweight is significantly related ($p \leq 0.05$) to differences in the infants' weights at six and 12 months between the groups. This finding is similar to other studies that show that

adolescent mothers have lower birth weight babies than adult mothers who are older than 19 years of age (Frisancho et al., 1985; Haiek & Lederman, 1989; Naeye, 1981). Thus, the significant difference between the weights of infants at six and 12 months for adolescent mothers compared to adult mothers in this study supports earlier findings that adolescent mothers are more likely to have lower birth weight infants than adult mothers, but not necessarily low birth weight babies (<2501 gm).

Breast feeding. Maximum duration of breast feeding was significantly related ($p \leq 0.05$) to weight at six and 12 months between infants of adolescent and adult mothers. This means that the difference in maximum breast feeding duration between adolescent (16 weeks) and adult mothers (52 weeks) resulted in significantly different weights at six and 12 months between infants of adolescent and adult mothers, respectively. However, the sample of adolescent mothers who breast fed (12) was too small to draw specific conclusions about the relationship between breast feeding, age of the mother, and the infant's weight.

Protein. The protein content of the diets at six and 12 months also was significantly related ($p \leq 0.05$) to the difference in weight at six and 12 months between

infants of adolescent and adult mothers. These data, however, were derived from one 24-hour recall of the infants' food intake at the six and 12 month interviews and are biased by individual day to day variation in intake (Skinner et al., 1992). Interpretations and generalizations of this finding must be done cautiously because of inherent problems with 24-hour recall data.

Non-significant Predictor Variables Within and Between the Groups

Factors that were not related to infant's weight at six and 12 months included age of the infant when supplemental foods were introduced, illness scores, and calorie and fat content of the diet.

Age of the infant at introduction of supplemental foods. The infants' ages at introduction of supplemental foods were not significantly related to weights at six and 12 months between and within the two groups. However, adolescent mothers added the first supplemental food, i.e. cereal, significantly ($p \leq 0.05$) earlier than adult mothers. Similarly, other researchers reported no relationship between the infant's age at introduction of supplemental foods and the weight at six and 12 months (Huenemann, 1974; Lauver et al., 1981). One investigator

did report that age at introduction of supplemental foods was a significant predictor of weight at six months, but not at 12 months. Most of the variance (88.0 percent) in weight at six months remained unexplained. (Kramer, 1985a).

Illness scores. Infants' illness scores were not related to the infants' weights at six and 12 months. The sample of adolescent mothers who breast fed is too small to make more specific comparisons and to make definite conclusions about the influence of illness scores on the weight of infants.

Population studies have shown breast feeding to be protective against gastrointestinal illnesses, respiratory illnesses, and illnesses that require hospitalization (Cunningham, 1979; Duncan et al., 1993; Fallot et al., 1980; Larsen & Homer, 1978; Leventhal et al., 1986; Myers et al., 1984; Paine & Cobble, 1982). In contrast, other findings indicate that breast feeding resulted in little or no protection against illnesses (Abebonojo, 1972; Cushing & Anderson, 1982; Weinberg et al., 1984). None of these studies investigated the relationships among illnesses of breast fed infants, age at introduction of supplemental foods, and weight gain of those infants in the first year of life.

Calorie and fat intake. Calorie and fat intake were not related to weight at six and 12 months. The nutrient data were, however, from one 24-hour recall of the infants' food intake at the six and 12 month interviews and are influenced by individual day to day variation (Skinner et al., 1992).

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

The objective of this study was to determine if the feeding practices of adolescent mothers were different from those of adult mothers. If differences existed in feeding practices, then these practices were evaluated to determine their impact on the infant's weight at six and 12 months.

It was hypothesized that the incidence of breast feeding and its maximum duration would be less in adolescent mothers than adult mothers. It was further hypothesized that this would result in the introduction of supplemental foods to the infants' diets before 16 weeks of age. Thus, greater infant weight gain at six and 12 months would occur in infants born to adolescent mothers compared to those of adult mothers. Data from this study support a portion of this hypothesis. Twelve adolescent mothers (20.0 percent) and 21 adult mothers (35.0 percent) breast fed their infants. Additionally, maximum duration of breast feeding was also shorter in the adolescent mothers (16 weeks) compared to adult mothers (52 weeks). Maximum duration of breast feeding was related to the infants' weights at six and 12 months, but the age at introduction of supplemental foods was not

related to weight.

Another hypothesis was that illness index scores would be higher for infants of adolescent mothers because the incidence and maximum duration of breast feeding would be lower in the adolescent group compared to the adult group. Thus, infants' weights would be related to the illness index scores of infants of the adult mothers because the incidence and maximum duration of breast feeding was greater and thus, infants would weigh more. This hypothesis was not supported by data from this study.

It also was hypothesized that the diets of infants of adolescent mothers who received supplemental foods earlier than infants of adult mothers would exceed recommended caloric and nutrient allowances for age and weight and would be related to the infant's weight at six and 12 months. This hypothesis was not supported by results of this study. The nutrient content of the diets of infants of adolescent and adult mothers were greater than 100.0 percent of the RDA for kilocalories and protein at six months and greater than 85.0 percent at 12 months. Moreover, the calorie and fat content of the diets were not significantly related to infants' weights at six and 12 months. Protein, however, was related to the infants' weights.

Thus, data from this study support the hypothesis

that infants' weights at six and 12 months are related to maximum duration of breast feeding and birthweight. The different maximum duration of breast feeding between adolescent (16 weeks) and adult mothers (52 weeks) resulted in significantly different ($p \leq 0.05$) weights between and within the two groups of infants. The weights of adolescent and adult mothers' infants also were significantly related ($p \leq 0.05$) to birthweight within the groups. This means that the birthweight of an infant, whether the mother was an adolescent or adult, is related to weight at six and 12 months. Birthweight was also significantly related ($p \leq 0.05$) to differences in the infants' weights at six and 12 months between the groups. This supports earlier findings that adolescent mothers are more likely to have lower birthweight infants than adult mothers, but not necessarily low birthweight babies (<2501 gm).

Implications for Health Care Providers

In this study, adolescent and adult mothers of low socio-economic status added supplemental foods to their infants' diets earlier than four months of age (Table 12). The early introduction of supplemental food is not currently recommended by the American Academy of Pediatrics (American Academy of Pediatrics Committee on

Nutrition, 1980), nor espoused in the literature received by the mothers who participated in this study and were in postpartum care. Forty-eight percent of adolescent mothers and 17 percent of adult mothers in this study indicated that their own mother was their most important source of advice about infant feeding practices. Perhaps, the advice from their mothers, particularly the adolescents' mothers, was to provide supplemental foods at an earlier age than is currently recommended; however, no data were collected to support this explanation, although mothers were cited as important sources. In other studies conducted at the University of Tennessee, post partum upper SES mothers identified nurses and physicians as important sources about infant feeding practices. Results of this study suggest that education about supplemental foods needs to be directed towards grandmothers and other individuals identified as significant sources of information for low socio-economic status mothers, not specifically oriented toward ethnicity and associated feeding practices reported for subgroups (Adair, 1983; Andrew et al., 1981; Berkelhamer et al., 1977; Bevan et al., 1984; Bowering et al., 1978; Brodwick et al., 1989; Brogan & Fox, 1984; Cole, 1977; Ferris et al., 1979; Guthrie & Guthrie, 1966; Kokinos & Dewey, 1986; Magnus & Galindo, 1980; Marlin,et al.,1980; Maslansky et al., 1974; McLorg & Bryant, 1989; Morse et

al., 1979; O'Malley et al., 1991; Parraga et al., 1988: Peters & Worthington-Roberts, 1982: Romero-Gwynn & Carias, 1989; Salber & Feinleib, 1966; Wright et al., 1988; Yoos, 1985).

Maximum duration of breast feeding also was related to infants' weights at six and 12 months. However, the sample of mothers who breast fed were dissimilar and comparisons between the adolescent and adult groups are difficult in this study. Breast feeding promotion is currently among the Healthy People 2000 National Health Promotion and Disease Prevention Objectives (United States Department of Health and Human Services, 1992), and breast feeding is advocated by the American Dietetic Association (American Dietetic Association, 1993).

Research Needs

Although the physical development needed for the introduction of supplemental foods was evaluated, it was not a major study variable. The data on the physical skill development of infants and observed feeding cues may be inaccurate because they were reported retrospectively. Mothers' responses also may reflect the potential for misunderstanding when the investigator described and/or demonstrated motor skills, and the mothers had to recognize/recall these skills at a given

age of the infants. Future studies should assess motor development during the time when it occurs and use other methods of describing motor skill development and infant readiness cues, such as pictures and videotapes.

Other changes in infant behavior should be investigated along with the cues recommended by the American Academy of Pediatrics (American Academy of Pediatrics Committee on Nutrition, 1980). This would provide information about whether changes in the infant's behavior at eating occasions coincide with readiness cues, such as leaning back and turning away and leaning forward to receive food. In this study, as well as studies by DuBois et al. (1979) and Kramer et al. (1985a and 1985b), data were collected retrospectively versus observing specific cues and recording anthropometric changes concurrently. Current observations would help determine if weight changes of the infants served as readiness cues for the mother to feed, and if these weight changes significantly correlated with readiness cues.

Further research is needed with mothers who represent different age ranges and SES groups. The results of this study represent adolescent and adult mothers from lower SES groups. Because of educational limitations, their responses to questions about the physical development of the infant and about the

introduction of supplemental foods may be quite different than responses of educated, adult women with higher SES status.

In summary, infants' weights were related to birthweight and maximum duration of breast feeding. However, in regard to precursors of overweight/obesity factors other than infant's age at introduction of supplemental food, illness scores, and the nutrient content of the diet may increase the incidence of overweight/obesity in infants born to adolescent mothers compared to adult mothers. For example, one factor that was not a major variable of this study relates to the mother's role in recognizing the infant's developmental readiness to feed. That is, controlling the head and neck, sitting with support, and leaning forward to receive food, may be related to infant weight. In general, adolescent mothers reported most of these events earlier than the normative age. Lower SES women, may irrespective of age, recognize developmental readiness to feed differently than mothers from higher SES groups, and this may influence the infant's weight gain. Therefore, investigating the mother's recognition of developmental cues to feed should be a research priority in women from low SES groups.

LIST OF REFERENCES

LIST OF REFERENCES

Adebonojo, F. O. (1972). Artificial vs breast feeding. Clinical Pediatrics, 11, 25-29.

Adair, L. S. (1983). Feeding babies: Mother's decisions in an urban U.S. setting. Medical Anthropology, 7, 1-19.

American Academy of Pediatrics Committee on Nutrition. (1958). On the feeding of solid foods to infants. Pediatrics, 21, 685-692.

American Academy of Pediatrics Committee on Nutrition. (1976). Commentary on breast-feeding and infant formulas, including proposed standards for formulas. Pediatrics, 57, 278.

American Academy of Pediatrics Committee on Nutrition. (1978). Breast-feeding. Pediatrics, 62, 591.

American Academy of Pediatrics Committee on Nutrition. (1980). On the feeding of supplemental foods to infants. Pediatrics, 65, 1178-1181.

American Academy of Pediatrics Committee on Nutrition. (1989). Follow-up or weaning formulas. Pediatrics, 83, 1067.

American Dietetic Association. (1993) Position of the American Dietetic Association: Promotion and support of breast feeding. Journal of the American Dietetic Association, 93, 467-469.

American Dietetic Association. (1989). Marketing of infant formulas. Journal of the American Dietetic Association, 89, 268-269.

American Dietetic Association. (1986). Position of the American Dietetic Association: Promotion of breastfeeding. Journal of the American Dietetic Association, 86, 1580.

Andrew, E. M., Clancy, K. L., & Katz, M. G. (1980). Infant feeding practices of families belonging to a prepaid group practice health care plan. Pediatrics, 65, 978-988.

Auerbach, K. G., & Guss, E. (1984). Maternal employment and breast feeding-A study of 567 women's experiences. American Journal of Diseases of Children, 138, 958-960.

Bain, K. (1948). The incidence of breast feeding in hospitals in the United States. Pediatrics, 2, 313-320.

Baisch, M. J., Fox, R. A., & Goldberg, B. D. (1989). Breast-feeding attitudes and practices among adolescents. Journal of Adolescent Health Care, 10, 41-45.

Bayley, N. (1969). Bayley scales of infant development. New York: Psychological Group.

Beal, V. A. (1969). Termination of night feeding in infancy. Journal of Pediatrics, 75, 690-692.

Bee, D. E., Baranowski,T., Rassin, D. K., Richardson, J., & Mikrut, W. (1991). Breast-feeding initiation in a triethnic population. American Journal of Diseases of Children, 145, 306-309.

Berkelhamer, J. E., Whitham, R. H., & North, J. J. (1977). Distorted conceptions of infant nutrition among urban mothers. Clinical Pediatrics, 16, 986-987.

Berkowitz, R. I., Agras, S., Korner, A. F., Kraemer, H. C. & Zeanah, C. H. (1985). Physical activity and adiposity: A longitudinal study from birth to childhood. Journal of Pediatrics, 106, 734-738.

Bevan, M. L., Mosley, D., Lobach, K. S., & Solimano, G. R. (1984). Factors influencing breast feeding in an urban WIC program. Journal of the American Dietetic Association, 84, 563-567.

Biegelson, D., Cowell, C., & Goldberg, D. (1986). Breast-feeding practices in a low-income population in New York City: A study of selected health department child health stations. Journal of the American Dietetic Association, 86, 90-91.

Binkin, N. J., Yip, R., Fleshood, L. & Trowbridge, F. L. (1988). Birth weight and childhood growth. Pediatrics, 82, 828-834.

Bowering, J., Lowenberg, R. L., Morrison, M. A., Parker, S. L., & Tirado, N. (1978). Infant feeding practices in East Harlem. Journal of the American Dietetic Association, 72, 148-154.

Brodwick, M., Baranowski, T., & Rassin, D. K. (1989). Patterns of infant feeding in a tri-ethnic population. Journal of the American Dietetic Association, 89, 1129-1132.

Brogan, B. D., & Fox, H. M. (1984). Infant feeding practices of low and middle income families in Nebraska. Journal of the American Dietetic Association, 84, 560-563.

Butte, N. F., Smith, E. O., & Garza, C. (1990). Energy utilization of breast-fed and formula-fed infants. American Journal of Clinical Nutrition, 51, 350-358.

Butte, N. F., Garza, C., Smith, E. O., & Nichols, B. L. (1984). Human milk intake and growth in exclusively breast-fed infants. Journal of Pediatrics, 104, 187-195.

Cole, J. P. (1977). Breastfeeding in the Boston suburbs in relation to personal-social factors. Clinical Pediatrics, 16, 352-356.

Cunningham, A. S. (1979). Morbidity in breast-fed and artificially fed infants II. Journal of Pediatrics, 95, 685-689.

Cushing, A. H., & Anderson, L. (1982). Diarrhea in breast-fed and non-breast-fed infants. Pediatrics, 70, 921-925.

deCastro, F. J. (1968). Decline of breast feeding. Clinical Pediatrics, 7, 703.

Department of Health and Human Services, United States Department of Agriculture. (1984). W.I.C. Manual B22-B31. Washington,DC: United States Department of Agriculture.

Dewey, K. G., & Lonnerdal, B. (1983). Milk and nutrient intake of breast-fed infants from 1 to 6 months: Relation to growth and fatness. Journal of Pediatric Gastroenterology Nutrition, 2, 497-506.

Dietz, W. J., Gross, W. C., & Kirkpatrick, J. A. (1982). Blount disease (tibia vara): Another skeletal disorder associated with childhood obesity. Journal of Pediatrics, 101, 735-737.

Dine, M. S., Gartside, P. S., Glueck, C. J., Rheines, L., Greene, G., & Khoury, P. (1979). Where do the heaviest children come from? A prospective study of white children from birth to 5 years of age. Pediatrics, 63, 1-7.

Dubois, S., Hill, D. E., & Beaton, G. H. (1979). An examination of factors believed to be associated with infantile obesity. American Journal of Clinical Nutrition, 32, 1997-2004.

Duncan, B., Ey, J., Holberg, C. J., Wright, A. L., Martinez, F. D., & Taussig, L. M. (1993). Exclusive breast-feeding for at least 4 months protects against otitis media. Pediatrics, 91, 867-872.

Dwyer, J. T., & Krall, E. A. (1987). The problem of memory in nutritional epidemiology research. Journal of the American Dietetic Association, 87, 1509-1511.

Eckhardt, K. W., & Hendershot, G. E. (1984). Analysis of the reversal in breast feeding trends in the early 1970's. Public Health Reports, 99, 410-415.

Esterik, P. V., & Greiner, T. (1981). Breastfeeding and women's work: Constraints and opportunities. Studies in Family Planning, 12, 184-197.

Fallot, M. E., Boyd, J. L., & Oski, F. A. (1980). Breast feeding reduces incidence of hospital admissions for infection in infants. Pediatrics, 65, 1121-1124.

Ferris, A. G., Vilhjalmsdottir, L. B., Beal, V. A., & Pellett, P. L. (1978). Diets in the first six months of infants in western Massachusetts. Journal of the American Dietetic Association, 72, 160-163.

Filer, L. J., & Martinez, G. A. (1964). Intake of selected nutrients by infants in the United States. Pediatrics, 65, 1178-1181.

Fisch, R. O., Bilek, M. K., & Ulstrom, R. (1975). Obesity and leanness at birth and their relationship to body habitus in later childhood. Pediatrics, 56, 521-528.

Fomon, S. J. (1977). Nutritional disorders of children-Prevention, screening, and follow-up. Maryland: United States Department of Health Education and Welfare.

Fomon, S. J. (1987). Reflections on infant feeding in the 1970's and 1980's. American Journal of Clinical Nutrition, 46, 171-182.

Fomon, S. L., Filer, L. J., Anderson, T. A., & Zeigler, E. E. (1979). Recommendations for feeding normal infants. Pediatrics, 63, 52-59.

Fomon, S. L., Rogers, R. R., Ziegler, E. E., Nelson, S. E.,& Thomas, L. N. (1984). Indices of fatness and serum cholesterol at age eight years in relation to feeding and growth during early infancy. Pediatric Research, 18, 1233-1238.

Fomon, S. J., Filer, L. J., Zeigler, E. E., & Leonard, M. T. (1971). Food consumption and growth of normal infant fed milk-based formulas. Acta Paediatrica Scandinavica, Supplement, 223.

Food and Nutrition Board. (1989). Recommended Dietary Allowances (10th ed.). Washington, DC: National Academy of Sciences.

Forman, M. R., Fetterly, K., Graubard, B. I., & Wooton, K. G. (1985). Exclusive breast-feeding of newborns among married women in the United States: the National Natality Surveys of 1969 and 1980. American Journal of Clinical Nutrition, 42, 864-869.

Frankenburg, W., Dodds, J., & Fandal, A. (1973). Denver Developmental Screening Test. Denver, CO: Denver Developmental Materials.

French, D. (1978). National Survey of Family Growth, Cycle I: Sample design, estimation procedures, and variance estimation. Vital and Health Statistics. Washington, DC: United States Department of Health, Education, and Welfare.

French, J. G. (1967). Relationship of morbidity to the feeding patterns of Navajo children from birth through twenty-four months. American Journal of Clinical Nutrition, 20, 375-385.

Frisancho, A. R., Matos, J., Leonard, A. R., & Yaroch, L. A. (1985) Developmental and nutritional determinants of pregnancy outcome among teenagers. American Journal of Physiological Anthropology, 66, 247-261.

Garn, S. M., & Clark, D. C. (1976). Trends in fatness and the origins of obesity. Pediatrics, 56, 443-456.

Garn, S. M., & LaVelle, M. (1985). Two-decade follow-up of fatness in early childhood. American Journal of Diseases of Children, 139, 181-185.

Gielen, A. C., Faden, R. R., O'Campo, P., Brown, H., & Paiged, M. (1991). Maternal employment during the early postpartum period: Effects on initiation and continuation of breast-feeding. Pediatrics, 87, 298-305.

Gortmaker, S. L., Dietz, W. H., Sobol,A. M., & Wehler, C. A. (1987). Increasing pediatric obesity in the United States. American Journal of Diseases of Children, 141, 535-540.

Gross, R. T., & Moses, L. E. (1956). Weight gains in the first four weeks of infancy: A comparison of diets. Pediatrics, 18, 362-368.

Gruwaldt, E., Bates, T., & Guthrie, D. (1960). The onset of sleeping through the night? Pediatrics, 26, 667-668.

Guthrie, H. A. (1966). Effect of early feedings of solid foods on nutritive intake of infants. Pediatrics, 38, 879-885.

Guthrie, H. A., & Guthrie, G. M. (1966). The resurgence of natural child Feeding. Clinical Pediatrics, 5, 481-484.

Haiek, L., & Lederman, S. A. (1989). The relationship between maternal weight gain in teens and adult women. Journal of Adolescent Health Care, 10, 16-22.

Halpern, S. R., Sellars, W. A., Johnson, R. B., Anderson, D. W., Saperstein, S., & Shannon, S. (1972). Factors influencing breast-feeding. Southern Medical Journal, 65, 100-102.

Harris, G. (1988). Determinants of the introduction of solid food. Journal of Reproductive Infant Psychology, 6, 241-249.

Heald, F. P., & Hollander, R. J. (1965). The relationship between obesity in adolescence and early growth. Journal of Pediatrics, 67, 35-38.

Hendershot, G. E. (1984). Trends in breast-feeding. Pediatrics supplement, 74, 591-602.

Himes, J. H. (1979). Infant feeding practices and obesity. Journal of American Dietetic Association, 75, 122-125.

Hirschman, C., & Butler, M. (1981). Trends and differentials in breast feeding: An update. Demography, 18, 39-54.

Hirschman, C., & Hendershot, G. (1979). Trends in Breast Feeding Among American Mothers. Vital and Health Statistics. Washington, DC: United States Department of Health, Education, and Welfare.

Hollingshead, A. B. (1976). Four factor index of social status. New Haven, CT: Hollingshead.

Holmes, G. E., Hassanein, K. M., & Miller, H. C. (1983). Factors associated with infections among breast-fed babies fed proprietary milks. Pediatrics, 72, 300-306.

Huenemann, R. L. (1974). Environmental factors associated with preschool obesity. Journal of the American Dietetic Association, 64, 480-487.

Interagency Committee on Nutrition Monitoring. (1989). Nutrition monitoring in the United States-The directory of federal nutrition monitoring activities. Washington, DC: United States Department of Health and Human Services.

Jacobson, S. W., Jacobson, J. L., & Frye, K. F. (1991). Incidence and correlates of breast-feeding in socioeconomically disadvantaged women. Pediatrics, 88, 728-736.

Joffe, A., & Radius, S. M. (1987). Breast versus bottle: Correlates of adolescent mothers infant-feeding practices. Pediatrics, 79, 689-695.

John, A. M., & Martorell, R. (1989). Incidence and duration of breast-feeding in Mexican-American infants, 1970-1982. American Journal of Clinical Nutrition, 50, 868-874.

Karvetti, R., & Knuts, L. (1985). Validity of the 24-hour recall. Journal of the American Dietetic Association. 85, 1437-1442.

Kokinos, M., & Dewey, K. G. (1986). Infant feeding practices of migrant Mexican-American families in northern California. Ecology of Food and Nutrition, 18, 209-220.

Kramer, M. S., Barr, R. G., Leduc, D. G., Bisjoly, C., & Pless, I. B. (1983). Maternal psychological determinants of infant obesity. Journal of Chronic Diseases, 36, 329-335.

Kramer, M. S., Barr, R. G., Leduc, D. G., Boisjoly, C., McVey-White, L., & Pless, I. B. (1985a). Determinants of weight and adiposity in the first year of life. Journal of Pediatrics, 106, 10-14.

Kramer, M. S., Barr, R. G., Leduc, D. G., Boisjoly, C., McVey-White, L., & Pless, I. B. (1985b). Infant determinants of childhood weight and adiposity. Journal of Pediatrics, 107, 104-107.

Kurinij, N., Axelson, M. L., Forman, M. R., & Feingold, A. B. (1984). Predicting duration of breast feeding in a group of urban primiparae. Ecology of Food and Nutrition, 15, 281-291.

Kurinij, N., Shiono, P. H., & Rhoads, G. G. (1988). Breast-feeding incidence and duration in black and white women. Pediatrics, 81, 365-371.

Ladas, A. (1972). Breastfeeding: The less available option. Journal of Tropical Pediatrics, 18, 318-346.

Larsen, S. A., & Homer, D. R. (1978). Relation of breast versus bottle feeding to hospitalization for gastroenteritis in a middle-class U.S. population. Journal of Pediatrics, 92, 417-418.

Lauver, M. A., Hizon, L., Bulla, A., Connell, C., & Wagoner,B. (1981). Infant feeding practices. Journal of the Kansas Medical Society, 9, 403-406.

Lawrence, R. A. (1982). Practices and attitudes toward breast-feeding among medical professionals. Pediatrics, 70, 912-920.

Leventhal, J. M., Shapiro, E. D., Aten, C. B., Berg, A. T., & Egerter, S. A. (1986). Does breast-feeding protect against infections in infants less than 3 months of age? Pediatrics, 78, 896-903.

Lipsman, S., Dewey, K. G., & Lonnerdal, B. (1985). Breast-feeding among teenage mothers: Milk composition, infant growth, and maternal dietary intake. Journal of Pediatric Gastroenterology Nutrition, 4, 426-434.

Loughlin, H. H., Clapp-Channing, N. E., Gehlbach, S. H., Pollard, J. C., & McCutchen, T. M. (1985). Early termination of breast-feeding: Identifying those at risk. Pediatrics, 75, 508-513.

MacGowan, R. J., MacGowan, C. A., Serula, M. K., Lane, M., Joesoef, R. M., & Cook, F. H. (1991). Breast-feeding among women attending Women, Infants, and Children Clinics in Georgia, 1987. Pediatrics, 87, 361-366.

Mack, R. W., & Ipsen, J. (1974). The height-weight relationship in early childhood. Human Biology, 46, 21-32.

Magnus, P. D., & Galindo, S. (1980). The paucity of breast-feeding in an urban clinic population. American Journal of Public Health, 70, 75-76.

Marlin, D. W., Picciano, M. F., & Livant, E. C. (1980) Infant feeding practices. Journal of the American Dietetic Association, 77, 668-676.

Martinez, G. A. (1984). Trends in breastfeeding in the United States. Breastfeeding and Human Lactation. Washington, DC: United States Department of Health and Human Services.

Martinez, G. A., & Dodd, D. A. (1983). 1981 Milk feeding patterns in the United States during the first 12 months of life. Pediatrics, 71, 166-170.

Martinez, G. A., & Krieger, F. W. (1985). 1984 Milk-feeding patterns in the United States. Pediatrics, 76, 1004-1008.

Martinez, G. A., & Nalezienski, J. P. (1979). The recent trend in breast-feeding. Pediatrics, 64, 686-692.

Martinez, G. A., & Nalezienski, J. P. (1981). 1980 update: The recent trend in breast-feeding. Pediatrics, 67, 260-263.

Martinez, G. A., Dodd, D. A., & Samartgedes, J. A. (1981). Milk feeding patterns in the United States during the first 12 months of life. Pediatrics, 68, 863-868.

Martinez, G. A., & Stahle, D. A. (1982). The recent trend in milk feeding among WIC infants. American Journal of Public Health, 72, 68-71.

Maslansky, E., Cowell, C., Carol, R., Berman, S. N., & Grossi, M. (1974). Survey of infant feeding practices. American Journal of Public Health, 64, 780-785.
McAnarney, E. R. (1985). Adolescent pregnancy and childbearing: new data, new challenges. Pediatrics, 73, 358-362.
McAnarney, E. R., Lawrence, R. A., Aten, M. J., & Iker, H. P. (1984). Adolescent mothers and their infants. Pediatrics, 73, 358-362.
McLorg, P. A., & Bryant, C. A. (1989). Influence of social network members and health care professionals on infant feeding practices of economically disadvantaged mothers. Medical Anthropology, 10, 265-278.
Meyer, H. F. (1958). Breast feeding in the United States: Extent and possible trend. Pediatrics, 22, 116-121.
Meyer, H. F. (1968). Breast feeding in the United States. Clinical Pediatrics, 7, 708-715.
Mohrer, J. (1979). Breast and bottle feeding in an inner city community: An assessment of perceptions and practices. Medical Anthropology, 3, 125-145.
Monello, L. F., & Mayer, J. (1972). Obese adolescent girls: An interdisciplinary study of adolescent obesity. Journal of Pediatrics, 13, 35-39.
Morris, W. E. (1991). A Profile of the Development of Oral-Motor Skills in Early Infancy-Birth to 12 Months. Faber, VA: Morris.
Morris, W. E., & Klein, M. D. (1987). Pre-feeding skills: a comprehensive approach. Tucson, AZ: Morris.
Morse, W., Sims, L. S., & Guthrie, H. A. (1979). Mothers' compliance with physicians recommendations on infant feeding. Journal of the American Dietetic Association, 75, 140-148.
Myers, M. G., Fomon, S. J., Koontz, F. P., McGuinness, G. A., Lachenbruch, P. A., & Hollinghead, R. (1984). Respiratory and gastrointestinal illnesses in breast- and formula-fed infants. American Journal of Diseases of Children, 138, 629-632.
Naeye, R. L. (1981). Maternal nutrition in pregnancy: Eating for two. London: Academic Press.
National Center for Health Statistics. (1979). Dietary Intake Source Data, United States, 1971-1974. Washington, DC: United States Government Printing Office.
National Center for Health Statistics. (1983). Dietary Intake Source Data. Vital and Health Statistics. Washington, DC: United States Government Printing Office.
National Center for Health Statistics. (1986). Contraceptive Use: United States 1982. Vital and Health Statistics. Washington, DC: United States Government Printing Office.

National Center for Health Statistics. (1986). Use of Services for Family Planning and Infertility: United States, 1982. Vital Statistics. Washington, DC: United States Government Printing Office.
National Center for Health Statistics. (1986). Fertility, Infertility, and Reproductive Health in the United States, 1982. Vital and Health Statistics. Washington, DC: United States Government Printing Office.
Neifert, M., Gray, J., Gary, N., & Camp, B. (1988). Factors influencing breast-feeding among adolescents. Journal of Adolescent Health Care, 9, 470-473.
Neumann, C. G., & Alpaugh, M. (1976). Birthweight doubling time: A fresh look. Pediatrics, 57, 469-473.
North, L. (1989). Nutritionist III. Silverton, OR: N-Square Computing.
O'Malley, B., Brown, A. C., Tate, M., Hertzler, A. A., & Rojas, M. H. (1991). Infant feeding practices of migrant farm laborers in northern Colorado. Journal of the American Dietetic Association, 91, 1084-1087.
Paine, R., & Coble, R. J. (1982). Breast-feeding and infant health in a rural US community. American Journal of Diseases of Children, 136, 36-38.
Parmelee, A. H., Wenner, W. H., & Schulz, H. R. (1964). Infant sleep patterns: from birth to 16 weeks of age. Journal of Pediatrics, 65, 576-582.
Parraga, I. M., Weber, M. A., Engel, A., Reeb, K. G., & Lerner, E. (1988). Feeding patterns of urban black infants. Journal of the American Dietetic Association, 88, 796-800.
Paulsen, E. P., Richendorfer, L., & Ginsberg-Fellner, F. (1968). Plasma glucose, free fatty acids, and immunoreactive insulin in 66 obese children. Diabetes, 17, 261-269.
Peters, D. C., & Worthington-Roberts, B. (1982). Infant feeding practices of middle-class breast-feeding mothers. Birth, 9, 91-95.
Placek, P. J. (1984). The 1980 National Natality Survey and National Fetal Mortality Survey-Methods used and PHS agency participation. Public Health Reports, 99, 111.
Pratt, W. F. (1984). Understanding U.S. fertility: findings from the national survey of family growth, cycle III. Population Bulletin, 39, 28.
Rames, L. K., Clarke, W. R., Connor, W. E., Reiter, M. A., & Lauer, R. M. (1978). Normal blood pressure and the evaluation of sustained blood pressure elevation in childhood: The Muscatine Study. Pediatrics, 61, 245-251.

Rassin, D. K., Richardson, C. J., Baranowski, T., Nader, P. R., Guenther, N., Bee, D. E., & Brown, J. P. (1984). Incidence of breast-feeding in a low socioeconomic group of mothers in the United States: ethnic patterns. Pediatrics, 73, 132-137.

Reames, E. S. (1985). Opinions of physicians and hospitals of current breastfeeding recommendations. Journal of the American Dietetic Association, 85, 79-80.

Reiff, M. I., & Essock-Vitale, S. M. (1985) Hospital influences on early infant-feeding practices. Pediatrics, 76, 872.

Robertson, W. O. (1961). Breast feeding practices: Some implications of regional variations. American Journal of Public Health, 51, 1035-1042.

Romero-Gwynn, E., & Carias, L. (1989). Breast-feeding intentions and practices among Hispanic mothers in Southern California. Pediatrics, 84, 626-632.

Rotherberg, P. B., & Varga, P. E. (1981). The relationship between age of mother and child health and development. American Journal of Public Health, 71, 810-817.

Rueda-Williamson, R., and Rose, H. E. (1962). Growth and nutrition of infants. Pediatrics, 30, 639-653.

Ryan, A. S., & Martinez, G. (1989). Breast-feeding and the working mother: A profile. Pediatrics, 83, 524-531.

Ryan, A. S., Rush, D., Krieger, F. W., & Lewandowski, G. E. (1991). Recent declines in breast-feeding in the United States, 1984 through 1989. Pediatrics, 88, 719-727.

Ryder, N., & Westoff, C. (1971). Reproduction in the United States. Princeton, NJ: Princeton University Press.

Salathe, L. E., & Buse, R. E. (1979). Household food consumption patterns in the United States. USDA Tech. Bull. no. 1587. Washington, DC: USDA.

Salber, E. J., Stitt, P. G., & Babbott, J. G. (1959). Patterns of Breast Feeding in a Family Practice Health Clinic. New England Journal of Medicine, 260, 310-315.

Salber, E. J., & Feinleib, M. (1966). Breast-Feeding in Boston. Pediatrics, 37, 299-303.

Salzarulo, P., Fagioli, I., & Salmon, F. (1980). Maturation of sleep patterns in infants under continuous nutrition from birth. Acta Chirurgica Scandinavica, 498, 78-82.

Samuels, S. E., Margen, S., & Schoen, E. J. (1985). Incidence and duration of breast-feeding in a health maintenance organization population. American Journal of Public Health Nutrition, 42, 504-510.

Sarett, H. P., Bain, K. R., & O'Leary, J. C. (1983). Decisions on breast-feeding of formula feeding and trends in infant-feeding. American Journal of Diseases of Children, 137, 719-725.

SAS Institute. (1987). SAS System for Statistical Analysis. Cary,NC: SAS.

Schneck, M. E., Sideras, K. S., Fox, R. A. & Dupuis, L. (1990). Low-income pregnant adolescents and their infants: Dietary findings and health outcomes. Journal of the American Dietetic Association, 90, 555-558.

Scrimshaw, S. C. M., Engle, P. L., Arnold, L., & Haynes, K. (1987). Factors affecting breastfeeding among women of Mexican origin or descent in Los Angeles. American Journal of Public Health, 77, 467-470.

Seltzer, C., & Mayer, J. (1965). Simple criterion of obesity. Post Graduate Medicine, 38, A101-A107.

Shapiro, L. R., Crawford, P. B., Clark, M. J., Pearson, D. L., Raz,J., & Huenemann,R. L. (1984). Obesity prognosis: A longitudinal study of children from the age of 6 months to 9 years. American Journal of Public Health, 74, 968-972.

Silver, H. (1984). Growth and Development. In C. Kempe, H. Silver & D. O'Brien (Eds.), Current diagnosis and treatment. Los Altos, CA: Lange.

Simpser, M. D., Strieder, D. J., & Wohl, M. E. (1977). Sleep Apnea in a child with Pickwickian syndrome. Pediatrics, 60, 290-293.

Skinner, J. D., Carruth, B. R., Pope, J., Varner, L., & Goldberg, D. (1992) Food and nutrient intake of white, pregnant adolescents. Journal of the American Dietetic Association, 92, 1127-1129.

Skinner, J. D., Salvetti, N. N., Ezell, J. M., Penfield, M. P., & Costello, C. A. (1985). Appalachian adolescents' eating patterns and nutrient intakes. Journal of the American Dietetic Association, 85, 1093-1099.

Smith, J. C., Mhango, C. G., Warren, C. W., Rochat, R. W., & Huffman, S. L. (1982). Trends in the incidence of breastfeeding for Hispanics of Mexican origin and Anglos on the US Mexico border. American Journal of Public Health, 72, 59-61.

Snow, C. W. (1991). Infant Development. Englewood Cliffs, NJ: Prentice-Hall.

Stuff, J. E., & Nichols, B. L. (1989). Nutrient intake and growth performance of older infants fed human milk. Journal of Pediatrics, 115, 959-968.

Switsky, L. T., Vietze, P., & Switsky, H. N. (1979). Attitudinal and demographic predictions of breast-feeding and bottle-feeding behavior by mothers of six-week-old infants. Psychological Reports, 45, 3-14.

Tanner, J. (1978) Fetus into man. Cambridge, MA: Harvard University Press.

United States Department of Health Education and Welfare Public Health Service, Center for Disease Control (1979). Evaluation of Body Size and Physical Growth 1-4. Washington, DC: United States Government Printing Office.

United States Department of Health and Human Services (1988). The Surgeon General's Report on Nutrition and Health. Washington, DC: Department of Health and Human Services.

United States Department of Health and Human Services, Public Health Service (1992). Healthy People 2000: National Health Promotion and Disease Prevention Objectives. Washington, DC: Department of Health and Human Services.

Van Esterik, P., & Greiner, T. (1981). Breastfeeding and women's work: Constraints and opportunities. Studies in Family Planning, 12, 184-197.

VORT Corporation. (1988). Hawaii Learning Profile. Palo Alto, CA: VORT.

Weinberg, R. J., Tipton, G., Klish, W. J., & Brown, M. R. (1984). Effect of breast-feeding on morbidity in rotavirus gastroenteritis. Pediatrics, 74, 250-253.

Weller, S. C., & Dungy, C. I. (1986). Personal preferences and ethnic variations among Anglo and Hispanic breast and bottle feeders. Social Science Medicine, 23, 539-548.

Westoff, C., & Ryder, N. (1977). The Contraceptive Revolution. Princeton, NJ: Princeton University Press.

White, B. (1990). The First Three Years of Life. Englewood Cliffs, NJ: Prentice Hall.

White, A., & Skinner, J. D. (1988). Can goal setting as a component of nutrition education effect behavior change among adolescents? Journal of Nutrition Education, 20, 327-335.

Whitehead, R. G. (1985). Infant physiology, nutritional requirements, and lactational adequacy. American Journal of Clinical Nutrition, 41, 447-458.

Wright, A. L., Holberg, C., Taussig, L. M., & the Group Health Medical Associates Pediatricians. (1988). Infant-feeding practices among middle-class Anglos and Hispanics. Pediatrics, 82, 496-803.

Yoos, L. (1985). Developmental issues and the choice of feeding method of adolescent mothers. Journal of Obstetrics and Gynecology, 14, 68-72.

Zuckerman, B., Winsmore, G., & Alpert, J. J. (1979). A study of attitudes and support systems of inner city adolescent mothers. Journal of Pediatrics, 95, 122-125.

APPENDICES

APPENDIX A

EXTENDED REVIEW OF THE LITERATURE

TABLE OF CONTENTS

I. Factors Associated With Infant's Weight in the First Year.....129
Birth Weight.....130
Infant's Weight During The First Year....131
Infant's Weight Gain in The First Year...131
Breast vs. Formula Feeding.....132
Incidence/duration of breast feeding.....132
Sources of information.....133
National surveys by the government.....134
Commercial formula company surveys.....136
Private investigator surveys.....138
Subgroup surveys.....139
Breast vs. formula feeding/ infant's weight.....148
Kilocalorie content of breast milk.....149
Supplemental Foods.....149
Infant's age at introduction of supplemental foods.....149
Sources of information.....150
National surveys by the government.....150
Commercial formula company surveys.....151
Subgroup surveys.....151
Supplemental foods/infant's weight.....158
Mothers' recognition of physical cues to feed supplemental foods.....158
II. Factors Related to Breast Feeding That May Be Associated With Infant's Weight.....160
Age of the Mother/Breast Feeding.....160
Income of the Mother/Breast Feeding.....162
Education of the Mother/Breast Feeding.....163
Employment of the Mother/Breast Feeding.....164
Age, Income, Education, and Employment of the Mother Associated Together With Breast Feeding.....166
Ethnicity/Breast Feeding/ Age of the Mother.....166
Social Networks/Breast Feeding/ Age of the Mother.....167

Influence of Health Professionals/
Breast Feeding/Age of the Mother.....167
Incidence of Infants' Illnesses/
Breast Feeding.....169
Gastrointestinal diseases.....169
Respiratory illnesses.....171
Bacterial infections.....171
Ear, eye, and nose infections.....172
Incidence of Hospitalizations/
Breast Feeding.....172
III. Factors Related To Infant's Age When
Supplemental Foods Are Introduced
That May Be Associated With Infant's Weight..173
Breast Feeding/Infant's Age When
Supplemental Foods Introduced.....173
Breast Feeding/Income of the
Mother/Infant's Age When
Supplemental Foods Introduced.....174
Age, Income, Education
Ethnicity, and Employment of the Mother
Associated Together With Infant's
Age When Supplemental Foods
Introduced.....174
Social Networks/Age
of the Mother/Infant's Age When
Supplemental Foods Introduced.....176
Influence of Health Professionals/
Age of the Mother/Infant's Age When
Supplemental Foods Introduced.....177
Nutrient Contribution of
Supplemental Foods.....177
Kilocalories.....177
Macronutrients.....178
Micronutrients.....179
Summary.....179
Incidence of Infants' Illness/
Infant's Age When Supplemental
Foods Introduced.....179
VI. Summary/Implications For Future Research.....180

APPENDIX A

EXTENDED REVIEW OF THE LITERATURE

This literature review examines current research about causes of obesity that may begin in infancy. The association of some antecedents with obesity in the first year of life such as the infant's weight at birth and during the first year of life, breast feeding or formula feeding modes, kilocalorie content of breast milk, infant's age at introduction of supplemental foods, and mother's recognition of physical cues to feed supplemental foods has been investigated and the results are known. Other factors in infancy that are related to breast feeding and infant's age when supplemental foods are introduced also may be associated with the infant's weight. These factors include: age, income, education, and employment of the mother, ethnicity, social networks, influence of health professionals, incidence of infant's illnesses and hospitalizations, and kilocalorie content of supplemental foods. These factors, however, have not been clearly investigated by researchers because of research design problems.

While published research is available on international feeding practices of infants, this review concentrates on data for the United States. In addition, this review does not include recent studies of the nutrient, biochemical, growth-promoting, and immunologic composition of breast milk and commercial formulas.

Factors Associated With Infant's Weight in the First Year

Investigators have examined weight of the infant and its relationship to later obesity as a child or adult. In these studies, obesity was defined/measured by body weight (Heald and Hollander, 1965; Huenemann, 1974; Lauver et al., 1981), skinfolds (Garn and LaVelle, 1985; Huenemann, 1974; Shapiro et al., 1984), relative weight determined by a regression of weight on observed height (Mack & Ipsen, 1974), and body mass index (Berkowitz et al., 1985; Dine et al., 1979; Fisch et al., 1975). Also infants entered the studies at various ages and their weights were evaluated at various months of age. For example, in a study by Huenemann et al. (1974) infants entered the study at six months of age and were assessed at one, two, and three years of age. In another study, mothers were enrolled during pregnancy, and the infants were followed-up at four, 12, and 48 months (Mack & Ipsen, 1974). Other researchers examined preschool/school-age children (Dine et al., 1979; Fisch et al., 1975; Shapiro et al., 1984). For instance, infants were enrolled in the Fisch et al. (1975) study at

birth and were evaluated at four and seven years of age. Dine et al. (1979) followed infants from birth to five years of age. In contrast, Shapiro et al. (1984) enrolled infants at six months of age and collected data at one, two, three, four, six, and nine years of age. In another investigation, children entered the study at six months to 5.5 years and were assessed at various intervals until twenty years later (Garn & Lavelle, 1985). Conclusions about the relationship between birth weight and weight in the first year of life and later obesity have varied reflecting the various researchers definitions of obesity and measures of obesity.

Birth Weight

Birth weight has been both a good and poor predictor of infant's weight at six months through seven years of age. Heald and Hollander (1965) compared the stated birth weight of adolescents attending an obesity camp with non-obese adolescents and found no difference between the groups. In contrast, birth weight explained 24 percent of the variance in relative weight at 12 months in 3,000 low income black Americans (Mack & Ipsen, 1974). These researchers concluded that birth weight was a strong predictor of weight at one year of age. Also, Fisch et al. (1975) classified 96 of 1,786 infants as obese when birth weight exceeded the 95th percentile. Twenty six percent of these obese infants were above the 90th percentile at four years and 19.0 percent were above the 90th percentile at seven years. Conclusions indicated that infants who were classified as obese at birth tend to remain obese at four and seven years of age, but the rate of obesity in the cohort group decreased. In another study, Huenemann (1974) examined 448 six month old infants and classified seven of 14 low birth weight infants as obese at six months. The author concluded that a larger weight gain at six months was related to low birth weight. Additionally, Binkin et al. (1988) reported similar results when investigating the relationship of birth weight to childhood growth. In children 36 to 41 months of age, the rate of obesity was one percent in those children with birth weights of 1,000 to 1,499 grams. Whereas, the rate of obesity was 8.7 percent in children with birth weights of 4,500 to 4,999 grams. Results were the same for each age group. Infants with higher birth weights were likely to remain heavier and taller, and they had a higher risk of obesity.

Other researchers have concluded that birth weight is related to later weight, but it is not a strong predictor. For example, Berkowitz et al. (1985) determined an adiposity index, i.e. the log of body mass index, for 112 infants and found that birth adiposity

index was not significantly related to a child's adiposity index or triceps skinfold. The authors concluded that the birth adiposity index was a poor predictor of later adiposity in childhood.

Infant's Weight During the First Year

In the same studies that examined the relationship of birth weight to later obesity, the researchers also examined the relationship of the infant's weight at various months of age during the first year of life to obesity in childhood and adulthood. Heald and Hollander (1965) reported that the average weight at one year for adolescent girls attending a obesity camp was significantly greater than that of the control, non-obese group. Mack and Ipsen (1974) in a study of 3,000 low income black Americans found a strong correlation between relative weight (determined by regression of weight on observed height) at four months and relative weight at one year. However, relative weight at four months accounted for only 30.0 percent of the variance.

Other researchers investigated the relationship between infant weight at various months of age during the first year to the incidence of obesity later in childhood. For example, Shapiro et al. (1984) used a longitudinal approach to investigate the incidence of obesity in 450 children. Data were collected at six months, one year, two years, three years, four years, six years, and nine years. At each follow-up visit, weight, height, four skin folds (triceps, subscapular, chest, and suprailiac), and five circumferences (head, waist, chest, calf, and biceps) were taken. Parents recorded three days of food intake and one day of activity. Obesity in Shapiro's study was defined as those skinfold values falling in the upper 15.0 percent of the study population. Values were based on the sum of four skinfolds. Results showed that the skinfolds of infants who were obese at six months and one year decreased from year to year as the infants became less obese with age. Activity scores were negatively related to the sum of skinfolds. Thus, the authors concluded that weight gain in infancy was not significantly correlated with obesity at nine years of age.

On the other hand, Garn and LaVelle (1985) reported some evidence that obese children are likely to become obese adults. Their investigation of 383 children, who entered the study at 0.5-5 years old, compared skinfold measurements from 1959 to measurements made 20 years later. Obesity/fatness was categorized as low, medium, and high. Results showed that 26.0 percent of the initially obese children remained obese 20 years later compared to 15.0 percent of the children that would be expected to be obese by chance.

Infant's Weight Gain in the First Year

Investigators have examined the relationship between the amount of weight gain in the first year to obesity at an older age. Huenemann (1974) studied 448 six month old infants and reported that weight gain from birth to six months was associated ($p \leq 0.001$) with obesity in six month old infants. In another study, Dine et al. (1979) conducted a prospective investigation of 582 white children from birth to age five. Correlations between weight at one year with weight at five years of age were significant ($p \leq 0.001$), but only partially related to weight at age five. Approximately, 70.0 percent of the variance in weight at age five was unexplained.

Breast vs. Formula Feeding

Incidence/duration of breast feeding. Although surveys of feeding practices have specific limits which influence their comparability, reliability, and validity, results show a consistent picture of the general direction and magnitude of national trends in breast feeding in the United States. Demographers such as Hendershot (1984) and Hirschman and Butler (1981) have been able to use this information to access trends in breast feeding. Generally, there has been a downward trend in the incidence of breast feeding,i.e. 77.0 percent in 1936-1940 to 28.0 percent in 1970 (Hendershot, 1984). However, there has been a reported increase in the incidence of breast feeding from 25.0 percent in 1970 to 60.5 percent in 1982 with a leveling off in 1983 to 61.0 percent (Martinez & Krieger, 1985). According to Ryan and Martinez (1989), the incidence of breast feeding in 1987 had decreased to 55.0 percent. Ryan et al. (1991) confirmed this decrease by comparing the incidence of breast feeding in the 1984 Ross Laboratory survey to the 1989 Ross Laboratory Survey. The incidence of breast feeding declined approximately 13.0 percent (from 59.7 to 52.2 percent) in five years.

Survey results for population subgroups do not support an increase in the incidence of breast-feeding in the 1970s and early 1980s. When Cole (1977) surveyed 338 suburban women in Boston, the incidence of breast feeding was 57 percent and continued until three to three and one-half months post partum. Berkelhamer et al. (1977) found that 85 percent of 248 mothers surveyed in 1975 indicated that they would formula feed their infants compared to four percent who planned to breast feed only. Samuels et al. (1985) found a breast feeding rate of 66.0 percent in a group of 632 women who were involved in a health maintenance organization (H.M.O.). Bee et al. (1991) reported that the incidence of breast feeding was 31.3 percent in a mixed ethnic population.

As the incidence of breast-feeding reportedly decreased, the maximum duration of it also declined. Greater than 40 percent of women with infants born from 1910 to 1920 continued to breast feed their infants at six months of age (Hirschman & Butler, 1981). Maximum duration of breast feeding declined to three months in 1960, and two months in the 1970s, and did not increase again until in the 1980s. Martinez and Krieger (1985) reported that in 1971, 13.9 percent of mothers breast fed their infants at two months; the amount of breast feeding at two months tripled to 42.3 percent in 1980. Since 1984, the increase in breast feeding at two months was minimal and declined slightly between three to six months of age (Martinez & Krieger, 1985).

When information about the incidence and maximum duration of breast feeding from various surveys is combined the overall incidence and maximum duration increased in the United States in the 1970s. Furthermore, the incidence of breast feeding leveled off in the 1980s, but the maximum duration increased. Results of surveys from population subgroups vary, and no general trend is observable.

Sources of information. In the United States, data about breast feeding are available from a) national surveys by the government (Forman et al., 1985; French, 1978; Hirschman and Hendershot, 1979; Interagency Committee on Nutrition Monitoring, 1989; National Center for Health Statistics [N.C.H.S.], 1979, 1983, 1986, 1987; Placek, 1984; Pratt, 1984; Ryder & Westoff, 1971; Westoff & Ryder, 1977), b) commercial formula company surveys (Martinez, 1984; Martinez & Dodd, 1983; Martinez & Krieger, 1985; Martinez & Nalezienski, 1979; Martinez & Nalezienski, 1981; Martinez & Stahle, 1982; Martinez et al., 1981; Ryan & Martinez, 1989; Ryan et al., 1991; Sarett et al., 1983), c) private national surveys of the population (Bain, 1948; Meyer, 1958; Meyer, 1968; Robertson, 1961) and d) surveys of population subgroups (Andrew et al., 1980; Baisch et al., 1989; Bee et al., 1991; Berkelhamer et al., 1977; Bevan et al., 1984; Biegelson et al., 1986; Bowering et al., 1978; Cole, 1977; deCastro, 1968; Guthrie & Guthrie, 1966; Halpern et al., 1972, Joffe & Radius, 1987; Kokinos & Dewey, 1986; Kurinji et al., 1988; Magnus & Galindo, 1980; Marlin et al., 1980; Maslansky et al., 1974; McLorg & Bryant, 1989; Mohrer, 1979; Neifert et al., 1988; O'Malley et al., 1991; Peters & Worthington-Roberts, 1982; Rassin et al., 1984; Romero-Gwynn & Carias, 1989; Salber et al., 1959; Salber & Feinleib, 1966; Schneck et al., 1990; Scrimshaw et al., 1987; Smith et al., 1982; Weller & Dungy, 1986; Wright et al., 1988; Yoos, 1985).

a) National surveys by the government. There have been eight national cross-sectional surveys, conducted in various years, that provide information about breast feeding: National Fertility Studies (Ryder & Westoff, 1971; Westoff & Ryder,1977), National Survey of Family Growth (French, 1978; Hirschman & Hendershot, 1979; N.C.H.S., 1986; Interagency Committee on Nutrition Monitoring, 1989; Pratt et al., 1984), National Health and Nutrition Examination Survey (N.C.H.S., 1979, 1983; Interagency Committee on Nutrition Monitoring, 1989), and National Natality Surveys (Forman, 1985; Placek, 1984).

The National Fertility Studies of 1965 (Ryder & Westoff, 1971), and 1970 (Westoff & Ryder, 1977) were funded by the National Institute of Child Health and Human Development. Retrospective information was collected to provide an understanding of reproductive behavior,i.e. contraception, religion, attitudes, and fecundity. Data collected about contraception included questions about breast feeding because it purportedly suppresses ovulation. In 1965, 5,600 women currently married (not separated, widowed, or divorced) were interviewed (Ryder & Westoff, 1971). In contrast, the 1970 sample included 6,900 women who were currently married, separated, widowed, or divorced (Westoff & Ryder, 1977). Each sample was the result of a probability design that was intended to represent the continental United States. All of the women selected were under the age of 55 and white or non-white.

The National Survey of Family Growth was conducted in 1973-1974 (French, 1978), 1976 (Hirschman & Hendershot, 1979), 1982 (N.C.H.S.,1986,1987; Pratt, 1984), and 1988 (Interagency Committee on Nutrition Monitoring, 1989) by the National Center for Health Statistics (N.C.H.S). The purpose of this survey was to provide information on family planning, fertility, and maternal and child health. In each survey, approximately 8,000 women, 15-44 years of age living in the United States, were personally interviewed; information was collected about trends in fertility, family planning practices, sources of advice, and breast feeding as a method of contraception. The sample included only married women until 1982; thereafter, single and divorced women were included.

In addition to the National Surveys of Family Growth (French, 1978; Hirchman & Hendershot, 1979; Interagency Committee on Nutrition Monitoring, 1989; N.C.H.S., 1986, 1987; Pratt, 1984, N.C.H.S. conducted the National Health and Nutrition Examination Surveys (NHANES I,II,III) (N.C.H.S., 1975, 1979, 1985, 1989). The sample for NHANES I, II, and III included a stratified probability clustered sample of households throughout the United States. Sample size for NHANES I and II was

approximately 28,000 (N.C.H.S., 1979, 1985). For the NHANES I and II in 1988-1989, the proposed sample size was 40,000. The purpose of NHANES I and II was to collect and disseminate data that could be best obtained through direct observation, i.e. clinical and laboratory tests, and related measurements. When personal interviews were conducted, parents were asked if their child had ever been breast fed. From this study, a limited amount of data about the incidence and maximum duration of breast feeding has been published,i.e. the Hispanic HANES (John & Mantorell, 1989). Therefore, a potentially large data base on breast feeding will be available at some time in the future.

Data also have been provided by the National Natality Surveys conducted in 1967-1969, and 1980 (Forman, 1985; Placek, 1984). The surveys, conducted by the National Center for Health Statistics, are based on a probability sample of live births during each year in the United States. Information is taken annually from birth certificates from individual State's vital records and a representative sample selected. In 1969 the sample was selected from 54 registration areas and 52 areas in 1980. Mothers selected in 1969 included one in every 1,000 live births of white infants and one in every 500 births of all non-whites, resulting in a 85 percent response rate for 3,666 mothers (Forman, 1985). In 1980, the survey sample was larger with 7,825 mothers; the response rate decreased to 80.0 percent because the criteria for selection were more strict. That is, the sample included one in 400 live births weighing greater than 2,500 grams and one in 95 births weighing less than 2,500 grams. Mothers were sent mailed questionnaires when their infants were three to six months old. Both of the 1969 and 1980 surveys included a question about the mother's choice of infant feeding when the infant was discharged from the hospital. In contrast to the 1969 survey, factors influencing the mother's choice to breast feed or formula feed were obtained in 1980 (Forman, 1985).

The strengths of the National Fertility Studies of 1965 (Ryder & Westoff, 1971) and 1970 (Westoff & Ryder, 1977) are that information on the prevalence and maximum duration of breast feeding was provided for a large number of women,i.e. 5,600 in 1965 (Ryder & Westoff, 1971), and 6,900 women in 1970 (Westoff & Ryder, 1977), and covered a wide span of years. Questions were asked about all infants born to participants in a period from 1910-1970. Also, data were based on a scientifically selected, nationally representative sample. A limitation of the data is that some infants were not included because of age and marital status of their mother. Only currently married women were interviewed in 1965; mothers who were separated, widowed, divorced, or unmarried were

not included in the sample. In 1970, the sample was different because separated, widowed, or divorced women were included. Unmarried mothers were not included in either the 1965 or 1970 studies.

Similar strengths and limitations are found in the National Survey of Family Growth (French, 1978; Hirschman & Hendershot, 1979; Interagency Committee on Nutrition Monitoring, 1989; N.C.H.S., 1986, 1987; Pratt, 1984;). While the number of women interviewed, approximately 8,000, was greater than the National Fertility Surveys [5,600 in 1965 (Ryder & Westoff, 1971; and 6,900 in 1970 (Westoff & Ryder, 1977)], the National Surveys of Family Growth included ever married women i.e., currently married, separated, widowed, and divorced (Forman, 1985; Pratt, 1984). Unmarried mothers were not included until after 1982.

One strength of the National Natality Surveys (Forman, 1985; Placek, 1984) is that information is provided from a nationally representative sample of 3,666 mothers in 1965 and 7,825 in 1980. A limitation of the survey is that the sample was biased by over sampling of nonwhite births in 1969 and oversampling of low birth weight newborns in 1980. Also, the selection of participants was restricted to married women, and information on breast feeding was collected from a large nonwhite population and represents an over sampling of low birth weight infants. These inconsistencies in survey design limit generalization of the information about breast feeding practices to the entire population.

b) Commercial formula company surveys. Breast feeding data are also available from market research surveys conducted by commercial formula companies (Martinez, 1984; Martinez & Dodd, 1983; Martinez & Krieger, 1985; Martinez & Nalezienski, 1979; Martinez & Nalezienski, 1981; Martinez & Stahle, 1982; Martinez et al, 1981; Ryan & Martinez, 1989; Sarett et al., 1983). Ross Laboratories Division of Abbott Laboratories,U.S.A., has conducted yearly surveys of breast feeding practices since 1955 (Martinez, 1984; Martinez & Dodd, 1983; Martinez & Krieger, 1985; Martinez & Nalezienski, 1979; Martinez & Nalezienski, 1981; Martinez & Stahle, 1982; Martinez et al, 1981; Ryan & Martinez, 1989;Martinez & Nalezienski, 1979; Martinez & Nalezienski, 1981; Martinez et al., 1981; Martinez & Stahle, 1982). The sample of participants has been drawn from a list said to include 70 percent of all hospital reported births per year. From the yearly lists, probability samples were drawn,i.e. 1,500 in 1955 (Martinez & Nalezienski, 1979) 56,894 in 1984 (Martinez & Krieger, 1985), and 154,958 in 1987 (Ryan & Martinez, 1989). Each selected mother received a mailed questionnaire when her infant was six

months old. On the questionnaire, mothers were asked to recall the type of milk fed to their infant at specified points in time up to six months postpartum. While most of the information collected since 1955 concerns breast-feeding and formula feeding, a bimonthly telephone survey was added in 1980 to assess infant feeding practices at eight, 10, and 12 months. Responses to the mailed questionnaire decreased from 82.0 percent to 54.0 percent in 1984 and remained at 54.0 percent in 1987 (Martinez & Krieger, 1985; Ryan & Martinez, 1989).

Meade Johnson conducted a survey about breast feeding as part of three nationwide studies of infant feeding practices. These studies included information on breast feeding, formula feeding, and the addition of supplemental foods to the infant's diet. The research design for the first breast feeding study included questionnaires that were mailed to 1,800 pregnant women, who were randomly selected from the American Baby magazine's mailing list, and who were in the last trimester of their pregnancy (Sarett et al., 1983). Mothers were asked whether or not they intended to breast feed or formula feed their infants, and if they had discussed breast feeding with their physician. When their infants were six months old, mothers were sent another questionnaire asking if they actually had breast fed or bottle fed as indicated in the first survey.

In the second part of the study, 200 expectant mothers in their last trimester of pregnancy and 200 mothers who had four month old infants or younger were interviewed by telephone. They were asked the basis for their decision to breast feed or formula feed their infants and what factors influenced their decisions. Response rates were 67 percent for the first part of the study and greater than 80 percent for the 200 mothers participating in the second part of the study (Sarett et al., 1983).

Strengths of the Ross Laboratory surveys are that data were collected over a long period of time and at frequent intervals, and results were available to the public within one year of the study. The data are short term and retrospective because they are reported within six months of birth. These surveys provide information on use of commercial formulas also. Those infants omitted included infants born to unwed mothers, and all out-of-hospital births, births associated with infant mortality, and multiple births (Martinez & Stahle, 1982). Also, women with little education, those from low socioeconomic status, and those living in rural-urban residences were not well represented in the responses for the years 1955-1980. Subsequently, the sample was weighted statistically in order to correct the data to reflect geographic birth distribution, race, age, and

education of individuals residing in the United States (Martinez & Krieger, 1985). Response to the questionnaires has varied over time,i.e. 82.0 percent in 1955 (Hendershot, 1984), 55.0 percent in 1981 (Martinez & Dodd, 1983), 54.0 percent in 1984 (Martinez & Krieger, 1985), and 54.0 percent in 1987 (Ryan & Martinez, 1987).

In regard to limitations of the Meade Johnson survey, the sample was drawn from the American Baby Magazine mailing list that includes only 70.0 percent of annual births. The strengths of the study by Meade Johnson are that it represented a national sample, both rural and urban, and it provided information in several areas such as the decision to breast feed or to formula feed (Sarett et al., 1983). The sample (1,200), however, was smaller than a) the National Fertility Studies; b) the National Surveys of Family Growth; and c) the Ross Laboratories Surveys. Also clinic patients and those from lower socio-economic groups were under represented (Sarett et al., 1983).

c) Private investigator surveys. Special purpose surveys about infant feeding practices provide estimates that can be compared to the national surveys. Surveys by Bain (1948), Meyer (1958,1968), and Robertson (1961) are particularly important because they provide data on the incidence of breast feeding from 1946-1966. Bain in 1946 and 1947 surveyed 3,500 hospitals in the United States and had a 72.0 percent return rate on the questionnaires. Whereas, in Meyer's 1956 survey of 2,981 hospitals, 64.3 percent of the questionnaires were returned. Also, Robertson (1961) mailed questionnaires to 1,500 mothers, who were randomly selected from a commercial mailing list that was not named by the researcher. Questionnaires were returned by 85 percent of those contacted.

Strengths of the national studies by private investigators (Bain, 1948; Meyer, 1958, 1968; Robertson, 1961) are a) the data are national and b) there is no recall bias because data were obtained from hospital discharge records and are not retrospectively provided by mothers as in the National Fertility Studies (Westoff & Ryder, 1977; Ryder & Westoff, 1971) and the National Surveys of Family Growth (French, 1978; Hirschman & Hendershot, 1979; N.C.H.S., 1986, 1987; Pratt, 1984). Limitations, reported by Hendershot (1985), include a) participants were not selected by probability sampling and the sample omitted births that did not occur in the hospital, b) many hospitals were not included, and c) the response rate was low. Sample sizes were smaller in the private investigators' surveys than those in the National Fertility Surveys.

d) Subgroup surveys. Surveys of subgroups of the population also provide information about breast feeding practices. Reported studies are summarized in Table 1A. Surveys of the breast feeding practices in population subgroups were conducted in various geographic locations in the United States. The number of subjects represented ranged from 1,753 to 41. As shown in Table 1A, information was collected by various methods; a) 16 researchers used personal interviews; b) 11 investigators gave self-administered and mailed questionnaires to their subjects; c) three conducted dietary interviews; d) used 24-hour recalls; and e) one reviewed medical records.

Researchers who conducted breast feeding studies in population subgroups from 1959 to 1972 did not provide information about the ethnic group represented. Seven studies conducted after 1976 represent various ethnic groups singly. For example, in Table 1A, four investigators studied Black Americans, with sample sizes ranging from 116 to 254, one researcher surveyed 132 Hispanics, one researcher studied 131 caucasians, and one researcher examined 49 Mexican Americans. Twenty-two other surveys conducted after 1973 were of mixed ethnic populations.

Adolescents were the only special age group reported in studies of infant feeding practices. Ages of the mother ranged from 12 to 46 years in other studies. Additionally, some researchers did not provide the age of the mother.

Various income levels have been studied: a) 10 researchers surveyed middle income mothers; b) 30 investigators investigated low income mothers; c) and three studies involve high/upper income mothers.

In regards to educational levels of the mothers, surveys by Salber et al. (1959), Guthrie and Guthrie (1966), Berkelhammer et al. (1977), Cole (1977), Andrew et al. (1980), and Peters and Worthington-Roberts (1982) included subjects that had a high school or college education; education less than 11 years is represented in the surveys by Berkelhamer et al. (1977), Biegelson (1986), Weller and Dungy (1986), Kokinos and Dewey (1986), and Romero-Gwynn and Carias (1989). Overall education of the mothers ranged from six years of school to college degrees. Some researchers did not provide the educational level of the mother (Adair, 1983; Baisch et al., 1989; Biegelson et al., 1986; Bowering et al., 1978; deCastro, 1968; Halpern et al., 1972; Magnus & Galindo, 1980; Maslansky et al., 1974; Neifert et al., 1988; Salber & Feinleib, 1966).

Generalization of information from surveys of population subgroups to the population as a whole is limited because information was gathered in a) specific geographic locations; b) sample sizes varied and were

Table 1A : Summary of Breast Feeding Surveys of Population Subgroups

Author	Geographic Location	No. of Subjects	Method[a]	Ethnic Group[b]	Income Level	Mothers' Educa. (yrs.)	Mothers' Age (yrs.)
Salber et al. 1959	MA	114	Medical Records	N/A	Low Middle Upper	Non-college College	N/A
Salber and Feinleib 1966	MA	2,333	Mailed	N/A	Various	N/A	<25->30
Guthrie and Guthrie 1966	PA	55	Mailed	N/A	Middle	HS College	N/A
deCastro 1968	MI	1,476	Mailed	N/A	Low	N/A	N/A
Halpern et al. 1972	TX	1,753	Mailed	N/A	Middle Upper	N/A	N/A
Maslansky et al. 1974	NY	451	Inter-view	B,PR	Low	N/A	50% <25
Cole 1977	MA	472	Mailed	N/A	N/A	HS College	20s

Table 1A : (cont.)

Author	Geographic Location	No. of Subjects	Method[a]	Ethnic Group[b]	Income Level	Mothers' Educa. (yrs.)	Mothers' Age (yrs.)
Berkel-hamer et al. 1977	IL	248	Inter-view	B	Low	HS 50%	23 median
Bowering et al. 1978	NY	153	Inter-view	PR,B S	Low	N/A	14-44
Mohrer 1979	CT	141	Inter-view	W,B,H	Low	11.4 mean	15-43
Morse et al. 1979	PA	131	Mailed	W	Low Middle	13 mean	Early 20s
Magnus and Galindo 1980	CA	846	Mailed	H,W,A,B	Low	N/A	N/A
Marlin et al. 1980	IL	39	Inter-view	W,B,O	Various	<HS-college	16-36

Table 1A: (cont.)

Author	Geographic Location	No. of Subjects	Method[a]	Ethnic Group[b]	Income Level	Mothers' Educa. (yrs.)	Mothers' Age (yrs.)
Andrew et al. 1980	NY	270	Inter-view	W,B,H	Low Middle	<11->HS	17-43
Peters and Worth-ington Roberts 1982	WA	100	Inter-view	B,W	Low Middle	HS-college	19-39
Smith et al. 1982	TX,NM,AZ CA	1,034	Inter-view	H,A	N/A	<12->12	15-44
Adair 1983	PA	91	Inter-view	N/A	Low Middle Upper	N/A	N/A
Bevan et al. 1984	NY	103	Self-admin Quest.	N/A	Low	<11->12	N/A

Table 1A : (cont.)

Author	Geographic Location	No. of Subjects	Method[a]	Ethnic Group[b]	Income Level	Mothers' Educa. (yrs.)	Mothers' Age (yrs.)
Brogan and Fox 1984	NE	202	Mailed	N/A	Low Middle	≤college	N/A
Rassin et al. 1984	TX	358	Mailed	A,B,M	Low	<8->HS	13-40
Yoos 1985	NY	50	Inter-view	N/A	N/A	8-14	15-19
Kokinos and Dewey 1986	CA	226	Inter-view	H,M	Low	0-13	19-46
Weller and Dungy 1986	CA	195	Inter-view	H,A	Low	11.7(A)[c] 6.0(H)	22.3(A) 25.5(H)
Biegelson et al. 1986	NY	1,391	Medical Records	N/A	Low	N/A	N/A

Table 1A : (cont.)

Author	Geographic Location	No. of Subjects	Method[a]	Ethnic Group[b]	Income Level	Mothers' Educa. (yrs.)	Mothers' Age (yrs.)
Joffe and Radius 1987	MD	254	Self-admin Quest.	B	N/A	7-12	12-19
Scrimshaw et al. 1987	CA	518	Inter-view	H,M	Low	7.6 mean	21 mean
Wright et al. 1988	CA	1,025[d] mothers 1,112 infants	Inter-view	A,H	Middle	14.6(A) 12.8(H)	27.5(A) 26.0(H)
Kurinji et al. 1988	DC	1,179	Inter-view	B,W	Low Middle	≤12-≥17	18-≥31
Neifert et al. 1988	CO	244	Inter-view	W,O	N/A	N/A	adol.
Parraga et al. 1988	OH	116	Inter-view	B	Low	>11-college	14-41

Table 1A: (cont.)

Author	Geographic Location	No. of Subjects	Method[a]	Ethnic Group[b]	Income Level	Mothers' Educa. (yrs.)	Mothers' Age (yrs.)
Romero-Gwynn and Carias 1989	CA	132	Interview	H	Low	4.2-11.4	28.7±5.3
McLorg and Bryant 1989	Southern US	41	Interview	B,W	Low[e]	<11	18-34
Baisch et al. 1989	WI	128	Self-admin. Quest.	B,W,H	Low	N/A	13-20
Brodwick et al. 1989	TX	254	Interview	A,B,M	Low Middle	<11->HS	≤25(21%) >25(52%)
Schenck et al. 1990	WI	99	Interview	B,W,H NA	Low	7->12	13-19

Table 1A : (cont.)

Author	Geographic Location	No. of Subjects	Method[a]	Ethnic Group[b]	Income Level	Mothers' Educa. (yrs.)	Mothers' Age (yrs.)
Kristin et al. 1990	ILL	159	Inter-view	B	Low	≤12	21 mean 22 mean
O'Malley et al. 1991	CO	49	Inter-view	M	Low	<11	N/A
Bee et al. 1991	TX	868	Mailed	A,W,B,M	Low	>8-some college	13-43
MacGowan et al. 1991	GA	404	Quest.	B,W	Low	≤9->12	<17->29

Table 1A : (cont.)

Author	Geographic Location	No. of Subjects	Method[a]	Ethnic Group[b]	Income Level	Mothers' Educa. (yrs.)	Mothers' Age (yrs.)
Jacobson et al. 1991	MI	187	Inter-view	B,W	Upper Middle	<8-some college	14-44

N/A=not available

[a] mailed=mailed questionnaire, interview=personal interview

[b] B=Black, W=White, H=Hispanic, A=Anglo, M=Mexican, PR=Puerto Rican, O=Oriental, S=Spanish, NA=Native American

[c] A=Anglo, H=Hispanic

[d] Unable to determine mother/infant pairs

[e] Low because a WIC population

non-probability based; and c) data were collected by various methods. A strength of surveys of population subgroups is that larger numbers of special groups of the population are represented,i.e. ethnic, economic, specific age, than those included in government surveys.

Breast vs. formula feeding/infant's weight. Does breast feeding or formula feeding influence an infant's weight gain? This relationship has been investigated in infancy and in older children with various results. Gross and Moses (1956) studied weight gains in 407 four week old infants who received breast milk or infant formula. There was no significant difference between the type of diet and weight gains at four weeks. Weight gains at four weeks were not related to kilocalorie intake or physical activity of the infants.

In a study by Huenemann (1974), no relationship between the infant's weight gain and breast and formula feeding practices was found. Weight gain at six months, one year, two years, and three years was examined in a subsample; 45 infants with the highest obesity score were compared to 45 infants with the lowest obesity score. No difference in obesity scores between the breast fed group and the formula fed groups was found.

Fomon et al. (1971) and Neumann and Alpaugh (1976) reported significantly ($p \leq 0.05$) greater weight gain in formula fed infants compared to infants who were breast fed. Fomon et al. (1971) investigated weight gains in 471 breast fed and formula fed infants over a period of 112 days. Infants who received formula gained weight and length more rapidly than their cohorts. At 112 days of the study, the number of infants' whose weights fell on the 90th percentile were greater for formula fed vs. breast fed infants. The authors concluded that it seemed likely that these differences were related to kilocalorie intake and not composition of the infant's diet. In another study, Neuman and Alpaugh (1976) examined 357 infants from birth to one year of age. They reported that formula fed infants doubled their birth weights at 113 days compared to 124 days for breast fed infants.

Other researchers have followed infants from birth to greater than one year of age. For example, 582 infants were followed from birth to five years in a study by Dine et al. (1979). Weight did not differ significantly in breast fed and formula fed infants. In a longitudinal study, Fomon et al. (1984) examined 469 children (8 years of age) out of the original sample of 471 infants. Weight at eight years was not significantly different between subjects who were breast or formula fed in infancy.

Kilocalorie content of breast milk. The relationship of kilocalorie and nutrient intake of breast and formula fed infants to weight gain has been studied by several researchers. In 1962, Rueda-Williamson and Rose followed 67 healthy infants from less than two to three months of age until age 15 months. Mean kilocalorie intake for infants, two to 12 months old, was 83.5 kilocalories per kilogram body weight. Total kilocalorie intakes were not analyzed separately for breast milk and formula even though three infants were breast fed, and the percent of kilocalories contributed by each energy nutrient was not evaluated. Mean infant's weights were significantly correlated to kilocalorie intake, but not protein intake.

A series of dietary intake studies conducted at the Children's Nutrition Research Center (Houston) resulted in varied findings. In the first study, 45 exclusively breast fed infants were followed for four months (Butte et al., 1984). The overall mean kilocalorie intake was 476$\pm$90 kcal/day. Kilocalorie intake per kilogram body weight per day declined significantly from 110$\pm$24 kcal/kg/day at one month to 71$\pm$17 kcal/kg/day at four months. Protein intake from breast milk decreased relative to body weight of the infant from 1.63$\pm$0.31 gm/kg/day at one month to 0.88$\pm$0.19 gm/kg/day at four months. Protein provided eight percent of the total kilocalorie intake for all infants at four months. Breast milk intake (gm/day) at one, two, and four months was significantly correlated ($p \leq 0.001$) with infant weight. In a second study, breast and formula fed infants (n=65) were surveyed at one and four months of age (Butte et al., 1990). The amount of milk consumed/day was not significantly different between breast and formula fed infants at one month, but intakes were significantly higher ($p \leq 0.05$) in the formula fed group at four months. Mean kilocalorie intake from breast milk (463$\pm$113) and from infant formula (491$\pm$101) was not significantly different at one month; however at four months, kilocalorie intake/day was significantly different ($p \leq 0.05$), i.e. breast fed 487$\pm$73 and formula fed, 668$\pm$89. Infant's weights were not significantly different between breast and formula fed infants. At age four months, the weight gain of formula fed infants was greater than breast fed infants, but not statistically significant. Weight gain of both was significantly correlated ($p \leq 0.05$) with kilocalorie intake.

Supplemental Foods

Infant's age at introduction of supplemental foods.

In the United States, the infant's age when supplemental foods are introduced has varied over time. In the 1920s, supplemental foods were infrequently

offered until the infant was one year old, but by the 1930s supplemental foods were introduced at two to three months of age (American Academy of Pediatrics Committee on Nutrition, 1958). As reported in surveys of population subgroups, this early introduction of supplemental foods continued through the 1970s (Berkelhamer et al., 1977; Bowering et al., 1978; Cole, 1977; Ferris et al.,1979; Guthrie, 1966; Maslansky et al., 1974; Morse et al., 1979). In the 1980s, however, results of a large population survey showed that supplemental foods were being added at a later age than in earlier years. According to Sarett et al. (1983) from 1976 to 1980 the infant's age of introduction of supplemental foods declined every month. Specifically, cereal was offered to 62.0 percent of one month old infants in 1976, but by 1980 infants were two and one-half months old before cereal was offered. Most infants received a cereal supplement after four months of age. This information, is limited by sample selection which included 70.0 percent of the population and a response rate of 70.0 percent from a mailed questionnaire.

Based on surveys of population subgroups, a majority of mothers introduced supplemental foods at four months of age. When Brodwick et al. (1989) surveyed 254 children in Texas, most mothers reportedly introduced supplemental foods at four months of age or later. O'Malley et al. (1991) also found that 49 children received supplemental foods at a mean age of 6.6 months.

Whereas, the infant's age at introduction of supplemental foods has increased over all, introduction of supplemental foods before four months has been reported in subgroups of the population (Andrew et al., 1981; Brodwick et al., 1989; Magnus & Galindo, 1980; Marlin,et al.,1980; McLorg & Bryant,1989; O'Malley et al., 1991). One of the earliest reported infant's age at introduction of supplemental foods was three to four weeks (Brodwick et al., 1989).

In summary, from published information available regarding trends for introducing supplemental foods, it appears that most mothers add supplemental foods at four months. Results of population subgroup surveys indicate that the infant's age for introducing supplemental foods varies from weeks to months after birth.

Sources of information. a) National surveys by the government. There have not been any published government surveys that examined when mothers introduced supplemental foods to the infants' diets. The Food and Drug Administration is conducting a survey of approximately 2,000 mothers, selected by probability sampling. In this survey, a series of questionnaires (one mailed during the third trimester of pregnancy and

12 mailed monthly during the postnatal period) are being used to collect data on the transition between breast and formula feeding, about the kinds of supplemental foods added and the timing of adding supplemental foods and cow's milk (Interagency Committee on Nutrition Monitoring, 1989). No published reports are available, yet.

b) Commercial formula company surveys. Although the Ross Laboratories surveys (Martinez, 1984; Martinez & Dodd, 1983; Martinez & Krieger, 1985; Martinez & Nalezienski, 1979; Martinez & Nalezienski, 1981; Martinez & Stahle, 1982; Martinez et al, 1981; Ryan & Martinez, 1989; Martinez & Nalezienski, 1979; Martinez & Nalezienski, 1981; Martinez et al., 1981; Martinez & Stahle, 1982) have not published information about the introduction of supplementary foods, some data from a 1986 Ross Laboratories survey were reported in an article published by Fomon in 1987 (Fomon, 1987).

Another formula company, Meade Johnson, conducted a national survey in 1983 that included a component that assessed when mothers added supplemental foods to their infants' diets. Names of mothers had been randomly selected from the American Baby Magazine's mailing list and questionnaires were sent to mothers of infants who were about four months of age. Mothers were asked when the infant started or continued to receive breast milk, formula, and various types of commercial foods for infants. These results were published by Sarett et al. in 1983.

A strength of the Meade Johnson study is that it represents a large national sample (5,600), including both rural and urban groups. However, results are limited because the American Baby Magazine's list is said to provide access to 70.0 percent of annual births occurring in the United States. Thus, 30.0 percent of the annual births i.e. infants would not be eligible for inclusion in the survey. These exclusions likely include mothers who do not read, and mothers who represent clinic populations and lower socio-economic states. In addition the reported response rate of 70.0 percent on the questionnaires means that fewer women are included in the analyses. Thus, the sample in the Meade Johnson survey is not representative of the population of annual births in the United States.

c) Subgroup surveys. Various surveys of population subgroups have included information on the addition of supplemental foods as a part of an overall survey of infant feeding practices or as a separate study on introduction of supplemental foods. These studies are summarized in Table A2.

Table 2A : Summary of Supplemental Feeding Surveys of Population Subgroups

Author	Geographic Location	No. of Subjects	Method[a]	Ethnic Group[b]	Income Level	Mothers' Educa. (yrs.)	Mothers' Age (yrs.)
Salber and Feinleib 1966	MA	2,333	Mailed	N/A	Various	N/A	<25- >30
Guthrie and Guthrie 1966	PA	55	Mailed	N/A	Middle	HS College	N/A
Maslansky et al. 1974	NY	451	Inter-view	B,PR	Low	N/A	50% <25
Cole 1977	MA	472	Mailed	N/A	N/A	HS College	20s
Berkel-hamer et al. 1977	IL	248	Inter-view	B	Low	HS 50%	23 median
Bowering et al. 1978	NY	153	Inter-view	PR,B S	Low	N/A	14-44

Table 2A : (cont.)

Author	Geographic Location	No. of Subjects	Method[a]	Ethnic Group[b]	Income Level	Mothers' Educa. (yrs.)	Mothers' Age (yrs.)
Peters and Worthington Roberts 1982	WA	100	Interview	B,W	Low Middle	HS-college	19-39
Adair 1983	PA	91	Interview	N/A	Low Middle Upper	N/A	N/A
Bevan et al. 1984	NY	103	Self-admin Quest.	N/A	Low	<11->12	N/A
Brogan and Fox 1984	NE	202	Mailed	N/A	Low Middle	≤college	N/A
Yoos 1985	NY	50	Interview	N/A	N/A	8-14	15-19

Table 2A : (cont.)

Author	Geographic Location	No. of Subjects	Method[a]	Ethnic Group[b]	Income Level	Mothers' Educa. (yrs.)	Mothers' Age (yrs.)
Peters and Worth-ington Roberts 1982	WA	100	Inter-view	B,W	Low Middle	HS-college	19-39
Adair 1983	PA	91	Inter-view	N/A	Low Middle Upper	N/A	N/A
Bevan et al. 1984	NY	103	Self-admin Quest.	N/A	Low	<11->12	N/A
Brogan and Fox 1984	NE	202	Mailed	N/A	Low Middle	≤college	N/A
Yoos 1985	NY	50	Inter-view	N/A	N/A	8-14	15-19

Table 2A : (cont.)

Author	Geographic Location	No. of Subjects	Method[a]	Ethnic Group[b]	Income Level	Mothers' Educa. (yrs.)	Mothers' Age (yrs.)
Kokinos and Dewey 1986	CA	226	Inter-view	H,M	Low	0-13	19-46
Weller and Dungy 1986	CA	195	Inter-view	H,A	Low	11.7(A)[c] 6.0(H)	22.3(A) 25.5(H)
Wright et al. 1988	CA	1,025[d] mothers 1,112 infants	Inter-view	A,H	Middle	14.6(A) 12.8(H)	27.5(A) 26.0(H)
Parraga et al. 1988	OH	116	Inter-view	B	Low	>11-college	14-41
Romero-Gwynn and Carias 1989	CA	132	Inter-view	H	Low	4.2-11.4	28.7±5.3

Table 2A : (cont.)

Author	Geographic Location	No. of Subjects	Method[a]	Ethnic Group[b]	Income Level	Mothers' Educa. (yrs.)	Mothers' Age (yrs.)
McLorg and Bryant 1989	Southern US	41	Inter-view	B,W	Low[e]	<11	18-34
Brodwick et al. 1989	TX	254	Inter-view	A,B,M	Low Middle	<11->HS	≤25(21%) >25(52%)
O'Malley et al. 1991	CO	49	Inter-view	M	Low	<11	N/A

a N/A=not available

b mailed=mailed questionnaire, interview=personal interview
B=Black, W=White, H=Hispanic, A=Anglo, M=Mexican, PR=Puerto Rican, O=Oriental, S=Spanish, NA=Native American

c

d A=Anglo, H=Hispanic

e Unable to determine mother/infant pairs
Low because a WIC population

Surveys that investigated introducing supplemental foods to infants were conducted in various locations. The number of research subjects varied from 2,333 to 39 people. As shown in Table 2A, information about introducing supplemental foods was collected by various methods: a) 18 researchers used personal interviews; b) seven investigators gave their subjects self-administered and mailed questionnaires; and c) one researcher conducted telephone interviews.

Seven ethnic groups were surveyed. Eight researchers studied multiple ethnic groups with sample sizes ranging from 41 to 1,112 people. Four researchers examined single ethnic groups: a) two investigated Black Americans with sample sizes of 116 and 248; b) one studied 132 Hispanics; and c) one investigated 49 Mexicans.

The only age group represented separately in the studies was adolescents (Yoos, 1985); otherwise the reported age of mothers ranged from 12 to 46 years. Some researchers did not provide the age of the mother and analysis of data specific to adolescents were not published separately.

Various income levels are represented: a) seven researchers investigated middle income; b) 17 investigators studied low income; and c) one surveyed high/upper income. Thirteen researchers surveyed subjects that had a high school or college education, and females who had an education less than 11 years are reported in 15 of the surveys. Overall reported education of the mothers ranged from college to zero years of school. Some researchers did not list the educational level of the mothers in their study.

In conclusion, published information about the introduction of supplemental foods to the diets of infants residing in the United States is available from one large cross-sectional survey of the population conducted from 1976 to 1980 (Sarret et al., 1983), and from surveys of population subgroups (Table A2).

In determining the usefulness of supplemental food data, researchers must consider several factors. Studies of population subgroups are conducted in various geographic locations, and represent specific ethnic groups with various income levels and a wide range of years of education. Specific age groups, such as mothers less than 20 years of age, have not been assessed. Also, the reported data have not been analyzed by age of the mother, and ages of the mothers are not given in some of the surveys. The application of information from surveys of population subgroups to the general population is limited because of geographic location of the studies, small sample sizes, non-randomized sample selection, and use of different methods of data collection. Yet, a

strength is that larger numbers of special groups of the population are represented,i.e. ethnic, low socioeconomic. As noted earlier in discussions of national surveys, results are biased by research design and response rate to questionnaires (Sarett et al., 1983).

Supplemental foods/infant's weight. The relationship between infant's age at introduction of supplemental foods and infant's weight has been investigated by several researchers. In these studies, weight/obesity as a variable was measured differently and the relationship of infant's weight to infant's age when supplemental foods were introduced was investigated at various ages of the infants. Data were collected prospectively or retrospectively.

Weight of the infant at six months was not influenced by infant's age at introduction of supplemental food (Huenemann, 1974; Lauver et al., 1981). No significant increase in infant's weights at six months was reported by Lauver et al. (1981). Seventy infants of mothers, 15-43 years old, were followed monthly through six months of age. At follow-up visits, heights and weights of the infants were measured; feeding histories were obtained; and feeding instructions were given to the mothers. Those who deferred adding supplemental foods to their infants' diets until five months were considered compliant (29 infants) and the other mothers were considered non-compliant (41). The mother's compliance with supplemental food recommendations was not a significant variable in predicting the infant's weight. Also, Huenemann (1974) reported no difference in the weight of infants who received supplemental foods at the same age. In a study of 270 infants, a subsample of 45 infants with the highest obesity score were compared to 45 infants with the lowest obesity score. Age of the infant at introduction of supplemental foods was the same for the two groups. Infant's weight gain at six, 12, 24, or 36 months was not influenced by age of the infant when supplemental foods were introduced.

Mothers' recognition of physical cues to feed supplemental foods. It has been postulated that the mother's inability to recognize and respond to the infant's cues is related to infant's weight (American Academy of Pediatrics Committee on Nutrition, 1980; Fomon et al., 1979). The development of motor skills and individual needs of the infant have been associated with physical cues to feed supplemental foods. During the first year of life, an infant gains the ability to feed by controlling the movement of muscles throughout the body (Bayley ,1969; Morris & Klein, 1987). These motor

skills are given as major reasons that the American Academy of Pediatrics (American Academy of Pediatrics Committee on Nutrition, 1980) recommends that supplemental foods not be added before four months of age. At this age, the infant can sit with support and control his/her head and neck and, therefore, give cues indicating satiety and/or disinterest in food. The infant's desire for food can be indicated by leaning forward, and disinterest or satiety indicated by the infant leaning back and turning away. The other approach for assessing readiness cues to feed supplemental foods is based on the mother's observations of her infant's behavior and her perceptions of the infant's need (Whitehead, 1985). Dubois et al., (1979) studied mothers' responses to infants' cues and developed some definitions. External cues of the infant were defined as time of day,i.e. 12 noon and the prepared portion size. Internal cues included sucking the fingers to indicate hunger or an infant turning the head away to show satiety when food was offered.

Harris (1988) investigated factors that determined when mothers introduced of supplemental foods to the diets of 40 infants. Seventy-five percent of the mothers added supplemental foods because of observed changes in infant behavior, i.e. more frequent feedings, the return of night waking, and refusing the breast. Other reasons involved mothers' adding foods on the advice of a health practitioner (12.5 percent), and mothers' feelings that their infants were at an appropriate age for introduction of supplemental foods.

Kramer et al. (1983) developed and tested a maternal infant feeding attitude questionnaire that asked what kind of behavior the mother would exercise in response to ten feeding issues. These feeding issues included the infant crying, crying after recent feeding, sleeping through normal feeding time, and refusing to eat. The questionnaire measures the mother's self-reported attitudes toward feeding by asking her 24 to 48 hours after delivery how she would respond to specific feeding situations. This questionnaire was tested with 50 women. Test-retesting results indicated high consistency and the intra-class correlation coefficient was 0.95. After testing, the questionnaire was used in a subsequent infant obesity study in which a computed maternal feeding attitude score was entered into a regression equation, however, specific results from the questionnaire were not published (Kramer et al., 1985a; 1985b).

Other researchers have reported information about the infant's food acceptance and rejection as part of larger studies about infant feeding practices, but cues to feed were not major study variables (Ferris et al., 1978; Guthrie, 1966). For example, Guthrie (1966)

reported that mothers mentioned that their infants were rejecting food because infants were tired of the food or they became colicky.

The relationship of physical/readiness cues to addition of supplemental foods to the diet and the infant's weight gain has not been explored extensively. Two prospective studies involved assessing the infant's weight at six months. Dubois et al. (1979) examined mothers' responses to infants' cues as a factor associated with obesity. In a study of 47 obese infants compared to 42 normal infants, the authors indicated that maternal disregard for infant hunger and satiety cues did not appear to contribute to development of infant obesity. Kramer et al. (1985a) investigated maternal feeding attitudes such as feeding the infant in response to hunger or only when the mother perceived that the baby needed food, waking up the baby to feed it, persisting to offer new foods, offering food when the baby cried, and feeding the baby during illness. Maternal feeding attitudes were not a significant determinant of infant obesity at six, 12, or 24 months (Kramer et al., 1985a, 1985b).

Factors Related to Breast Feeding That May Be Associated With Infant's Weight

Other factors related to breast feeding that may be associated with weight gain in infancy have not been clearly investigated. For instance, a mother's age, education, and income may cause her not to breast feed or to decrease the maximum duration of breast feeding. Few researchers have predicted infants' weight at six months or one year by the incidence of breast feeding or related breast feeding to age of the mother, income, and education. Also family members and health professionals may influence the incidence of breast feeding. Their influence on breast feeding practices together with infant weight has not been investigated. It is also postulated that the incidence of infant illnesses may be less in infants who are breast fed vs. bottle fed, but the relationship of illnesses and breast feeding to the infant's weight has not been explored.

Age of the Mother/Breast Feeding

Results of cross-sectional population surveys provide information on the incidence of breast feeding in mothers younger than 20 and 20-35 and beyond 35 years of age. Women were grouped in various age categories. For example, mothers in the Ross Laboratories Surveys are divided into the following age groups: less than 20 years, 20-24 years, 25-29 years, 30-34 years, and over 35 years. Results of these surveys indicate that the

incidence of breast feeding is lowest in women less than 20 years of age and continues to be lowest when compared to mothers who are older than 20 years of age (Martinez & Krieger, 1985; Ryan et al., 1991). The incidence of breast feeding in mothers less than 20 years of age was 36.5 percent compared to 58.0 percent in mothers 20-24 years old, and to 66.6 percent of mothers 25-29 years old (Martinez & Krieger, 1985). According to Ryan et al. (1991), 30.2 percent of mothers less than 20 years of age breast fed compared to 45.2 percent of mothers ages 20-24, and 58.8 percent of mothers age 25-29. These figures, however, are complicated by questionable statistical accuracy about the age of the mother, because some surveys did not include unwed mothers who would probably be under the age of 20 (Hirschman & Butler, 1981; Martinez, 1984; Martinez & Dodd, 1983; Martinez & Krieger, 1984; Martinez & Nalezienski, 1979; Martinez & Nalezienski, 1981; Martinez & Stahle, 1982; Martinez et al., 1981).

Until 1982 the National Surveys of Family Growth (Hendershot, 1984) did not include information about infants born to single women, because the 1976 and 1973-74 surveys included women who were ever married, e.g. currently married, separated, or divorced. After 1982 infants born to single women were included in the surveys along with infants born to married, separated, or divorced women. Only infants that were adopted were omitted after 1982 (Hendershot, 1984).

Also, there is difficulty calculating the percent of unwed mothers surveyed by Martinez et al., because marital status was not asked until 1987 (Martinez, 1984; Martinez & Dodd, 1983; Martinez & Krieger, 1985; Martinez & Nalezienski, 1979; Martinez & Nalezienski, 1981; Martinez & Stahle, 1982; Martinez et al. 1981). After interviewing an independent sample of the 1985 survey participants, Martinez and Krieger (1985) concluded that unmarried mothers were included. They suggested that other surveys by Martinez et al. (Martinez, 1984; Martinez & Dodd, 1983; Martinez & Nalezienski,1979; Martinez & Nalezienski, 1981; Martinez & Stahle, 1982; Martinez et al., 1981) may include unwed young women because results are very similar to national surveys of the same time period. A preliminary report on the 1987 data indicates that the percent unmarried in the sample may be approximately that number estimated by United States census data (Ryan & Martinez, 1989).

With this in mind, the Martinez et al. statistics for 1984 and 1989 indicate that the incidence of breast-feeding in mothers under the age of 20 declined from 36.8 percent in 1984 to 30.2 percent in 1989. In older age groups, the incidence of breast feeding also decreased. In mothers, aged 20-24 years, breast feeding declined

from 58.0 in 1984 to 45.2 percent in 1989, and for mothers, aged 25-29 years, the decrease was 66.6 to 58.8 percent, respectively (Ryan et al., 1991).

Data available from surveys of population subgroups during this time period indicate that the incidence of breast feeding in mothers age 18 and under varies within a range of 11.8 percent to 54 percent (Baisch et al., 1989; Joffe & Radius, 1987; Neifert et al., 1988; Schneck et al., 1991; Yoos, 1985).

According to Ryan et al. (1991), maximum duration of breast feeding from birth to six months in mothers less than 20 years of age decreased from 9.2 percent in 1984 to 5.6 percent in 1989. In contrast, over 11 percent of mothers, 20-24 years of age, continued to breast feed at six months compared to 21.1 percent of mothers, 25-29 years old (Ryan et al., 1991). When surveys of population subgroups are considered, the maximum duration of breast feeding also is low in adolescent mothers. In a study by Neifert et al. (1988) of 60 mothers, aged 14-20 years, 21 mothers breast fed less than one month, 13 mothers (22.0 percent) breast fed less than two months, and 26 mothers (43.0 percent) continued to breast feed. This study, however, did not have a comparable adult sample.

In summary, information from large cross-sectional surveys of the population indicates that the incidence of breast feeding in mothers less than 20 is lower than mothers aged 19 to 28 years. For instance, in 1989 the incidence of breast feeding was 30.2 percent in mothers under the age of 20, 45.2 percent in mothers aged 20-24 years, and 58.8 percent in mothers 25-29 years old. There is wide variation in the incidence of breast feeding results from surveys of population subgroups that were reviewed,i.e. 11.8 percent to 54 percent (Baisch et al., 1989; Joffe & Radius, 1987; Neifert et al., 1988; Yoos, 1985).

The maximum duration of breast-feeding also is lower for women less than 18 years of age when compared to women older than age of 18. In 1989, 5.6 percent of mothers under the age of 20 continued to breast feed their infants at six months after delivery (Ryan et al., 1991).

Income of the Mother/Breast Feeding

The relationship between a) breast feeding and b) income, is complicated by the fact that income is difficult to measure using survey methodology and that income covaries with education in national surveys (Hendershot, 1984). When family income alone is considered, the incidence of breast feeding is lowest at family incomes less than $7000, and it gradually increases with rising income (Ryan et al., 1989, 1991).

In a 1989 national survey, the incidence of breast feeding in mothers with family incomes below $7,000 was lower when compared to all income categories,i.e. 28.8 percent in family incomes lower than $7,000; 44.0 percent in family incomes of $7000-14,999; 54.7 percent in family incomes of $15,000-24,555; and 66.3 percent in family incomes greater than $25,000 (Ryan et al., 1991).

In another national survey, income was related to the incidence of breast feeding. Reported data from a national survey of 3,427 women that participated in the Women Infants and Children Program (W.I.C.) confirmed that the incidence of breast feeding was less than 40.0 percent in a sample of mothers with incomes less than $7,000 (35.4 percent),and 47.9 percent for mothers with incomes from $7,000-$14,999.

Surveys of population subgroups provide information about the incidence of breast feeding in low income groups. In a survey of mothers in a New York City population who attended selected Health Department Child Health Stations in 1979 and 1982, the decreased incidence of breast feeding in low income women was confirmed. In this survey, 2.7 percent of 1,391 low income women breast fed in 1979 and 3.2 percent of 1,410 low income women breast fed in 1982 (Biegelson et al., 1986). In contrast, Brogan and Fox (1984), compared infant feeding practices of 100 low-income and 102 middle income families, and found that income level above $10,000 was not associated with the incidence of breast feeding.

In summary, cross-sectional surveys of the population have shown that the incidence of breast-feeding is lowest in mothers whose income is below $7,000 compared to mothers with incomes above $7,000. Surveys of population subgroups confirm findings from cross-sectional surveys that the incidence of breast-feeding is lowest at low income compared to high income levels.

Education of the Mother/Breast Feeding

Cross-sectional population surveys have shown a strong association between the mother's educational level beyond high school, and the incidence and maximum duration of breast feeding. When the National Survey of Family Growth Statistics for 1970-1975 were analyzed to determine which factors influenced the decision to breast feed (education, race, employment status, and source of prenatal care), education of the mother appeared to have the greatest single influence (Eckhart & Hendershot, 1984). Researchers have reported that the incidence of breast feeding is higher in mothers with a college education compared to those who do not have a college education, and that the maximum duration of breast feeding is also less in those without college education. In 1984, 77.5 percent of mothers with a college education

breast fed compared to 50.7 percent of mothers without a college education. Also, in 1984 maximum duration of breast feeding from birth to six months was 19.2 percent in mothers with a non-college education and 38.3 percent in mothers with a college education (Martinez & Krieger, 1985).

In summary, cross-sectional surveys of the population and subgroup surveys show a strong association between the mother's educational level beyond high school, and the incidence and maximum duration of breast feeding.

Employment of the Mother/Breast Feeding

When reviewing data trends from cross-sectional population surveys, breast feeding among women in the 1950-1960 period declined in both employed and non-employed mothers; no significant difference was found between the two groups (Hendershot, 1984). Recent surveys by Ross Laboratories indicate that maximum duration of breast feeding is more influenced by maternal employment than the mother's decision to breast feed. For example, Martinez et al. (Martinez & Dodd, 1983; Martinez & Nalezienski, 1981) reported that in 1980 and 1981 more unemployed mothers than employed mothers continued to breast feed their infants at six months of age, but the incidence of breast feeding was higher in the unemployed.

When employment was included as a major variable in studies of population subgroups, varying results have been found. In a 1967 survey of feeding patterns in Navajo children, employment of the mother was a reason given for starting artificial feedings in seven of 48 children receiving infant formula (French, 1967). In a survey by Ladas (1972), two percent of 756 women gave employment as a reason for terminating breast feeding. Mohrer (1979), also, found that nine percent of 104 mothers gave employment as the reason for starting their infants on formula feedings. In regard to cessation of breast feeding, Kurinji et al. (1984) found that the main reason for stopping was the mother's returning to work before the infant was four months old (34.0 percent of 109 mothers over the age of 18). In contrast, Loughlin et al. (1985) studied patients who were attending a private pediatric practice; the maximum duration of breast feeding did not correlate with the mother's anticipated return to work. From this data, it is difficult to draw conclusions about the influence of employment on breast feeding practices because women were asked about the role of employment in different ways.

Yet, what factors account for these differences in breast feeding between employed and unemployed women? The difference may be in location of the household (rural

vs. urban) and type of employment available. In a number of publications about specific groups (French, 1967; Ladas, 1972; Mohrer, 1979), a greater number of rural mothers than urban mothers was reported as more likely to indicate employment as a reason for terminating breast feeding and starting formula feeding. This may be due to the specific jobs available in rural areas and the fact that rural mothers return to employment sooner than urban mothers (Van Esterik & Greiner, 1981)

More information is available from a study of 567 working mothers, who were mostly well educated and white. Participants indicated that the timing of when they returned to work and the number of hours worked influenced maximum duration of breast feeding (Auerbach & Guss, 1984). Mothers who returned to work before their infants were 16 weeks old and those employed full-time weaned their infants earlier than their cohorts. Women, who returned to work earlier, indicated that employment negatively influenced breast feeding; whereas, those who returned to work after their infants were four months old or greater, were less likely to indicate that employment negatively influenced breast feeding. The Auerbach and Guss study mainly included well-educated (10 to 28 years of education), married, white women, with an average age of 30 years; therefore, results provide little information about low income, young, employed mothers. Also some occupations with a large number of female workers were over represented, such as nurses, clerical workers, teachers (high school, junior high school, and elementary) and airline flight attendants.

In another study, the influence of employment on the maximum duration of breast feeding also was confirmed. Gielen et al. (1991) examined breast feeding practices in an urban population of 52.0 percent Black and 48.0 percent White mothers. Mean duration of education for both groups was approximately 13 years. Through telephone interviews, breast feeding and employment information were obtained. After analyses were adjusted for demographic variables, there was no association between initiation of breast feeding and planned employment in the first six months postpartum. Employment in the first two or three months after delivery was associated with decreased maximum duration of breast feeding when analyses were adjusted for demographic variables.

In summary, information about the association between mother's employment and breast feeding practices is based on both cross-sectional surveys of the population and surveys of population subgroups. While the maximum duration of breast feeding is associated with the mother's employment, the incidence of breast-feeding is not.

Age, Income, Education, and Employment of the Mother Associated Together With Breast Feeding

Mother's age, income, education, and employment, however, overlap and the effects are confusing (Hendershot, 1984). Population and population subgroup surveys have shown that the incidence and maximum duration of breast feeding are related to mother's age, education, income, and employment (Baisch et al., 1989; Joffe & Radius, 1987; Neifert et al., 1988; Ryan et al., 1991; Yoos, 1985). The researchers, however, did not analyze the data by age of the mother, together with income, education, and employment. Breast feeding is lowest in women less than 20 years of age (Baisch et al., 1989; Martinez & Krieger, 1985; Joffe & Radius,1987; Neifert et al., 1988; Ryan et al., 1991; Yoos, 1985). When family income alone is considered, the incidence of breast feeding is lowest at family incomes less than $7,000/year, and it gradually increases with rising income (Beigelson et al., 1986; Brogan & Fox, 1984; Martinez & Stahle, 1982; Ryan et al., 1991). Mothers without a college education breast feed less frequently than those with a college education (Cole, 1977; Martinez & Kreiger, 1985; Parraga et al., 1988; Switsky, 1979); and education covaries with income (Hendershot, 1984). Few researchers have measured these variables directly and statistically adjusted for them by stratification, matching, or multivariate techniques.

A recent population subgroup study by MacGowan et al. (1991) examined the incidence of breast feeding in low income women attending W.I.C. Clinics in Georgia and included age of the mother and education in the analysis. The initiation of breast feeding was associated with greater maternal education and with being married. After adjustment for marital status and education, age of the mother and employment status did not influence the incidence of breast feeding.

Ethnicity/Breast Feeding/Age of the Mother

Cross-sectional surveys of the population have shown that the incidence of breast feeding is greatest in the White/Caucasian population compared to other ethnic classifications. In 1984 the incidence of breast feeding in White women was 65.0 percent compared to 33.3 percent in Black women and 53.8 percent in Hispanic women. By 1989 the incidence of breast feeding had decreased, but White women (58.5 percent) continued to breast feed more than Black women (23.0 percent) and Hispanic women (48.4 percent). Ethnicity was not a covariate with education, income level, and employment of the mother (Ryan et al., 1991).

In one population subgroup study, the incidence of breast feeding was contrasted in two independent, low

income groups, one White and the other Black. The Black mothers, aged 14-17 years, did not breast feed, but 20.0 percent of White mothers of the same age group did breast feed. Low income Black mothers, aged 22-29 years, also breast fed less (21.0 percent) than White mothers of the same age group (80.0 percent) (Jacobson et al., 1991).

In summary, cross-sectional and population subgroup surveys have shown that the incidence of breast feeding is higher in White mothers compared to Black mothers.

Social Networks/Breast Feeding/Age of the Mother

Possibly family members, friends, or the baby's father may influence decisions to breast feed. Studies thus far have revealed that the group/person who is perceived as influencing infant feeding varies by age of the mother. In a study of 254 adolescent mothers, Joffe and Radius (1987) reported that adolescent mothers were influenced by discussion with a family member or the baby's father, but the presence of others to take care of the infant was unrelated to the adolescent's choice in infant feeding. Also Lipsman et al. (1985) studied breast feeding of adolescent mothers and found that they received pressure to stop breast feeding from the father of the baby, from parents, or other relatives. Pressure was associated with feeling embarrassed over breast feeding in public; a feeling that not enough milk was being produced by the mother to support infant growth; or a feeling that the baby was too old for breast feeding and the mother was too young.

Social support of breast feeding in adolescent mothers was investigated by Zuckerman et al. (1979). Twenty-three adolescent primiparas, less than 18 years of age, were compared with 32 adult mothers (8 primiparas and 25 multiparas older than 21 years). Adolescent mothers reported seeking health advice from their mothers, whereas adult mothers sought health advice from health professionals. The mothers did not differ in seeking advice from visiting nurses, social workers, radio, television, books, radio and/or magazines.

In summary, published research about the influence of social support networks on the incidence of breast feeding is available from population subgroup surveys that focused on adolescent mothers. In general, adult mothers older than 18 years of age seek breast feeding advice from health professionals. In contrast, adolescents seek breast feeding advice from their mother.

Influence of Health Professionals/Breast Feeding/Age of the Mother

In the 1970s, abundant information about formula feeding of infants was available in clinics and physicians' offices, but little information was available

on breast feeding. Perhaps, it was because medical school curricula provided more information on the formula feeding mode than on breast feeding. This changed when the American Academy of Pediatrics recommended that all physicians encourage breast feeding (American Academy of Pediatrics Committee on Nutrition, 1978). On the other hand, the influence of health care professionals on breast feeding is not strong even though professional organizations have encouraged their members to promote breast feeding (American Academy of Pediatrics Committee on Nutrition, 1976; American Academy of Pediatrics Committee on Nutrition, 1980; American Dietetic Association, 1986; American Dietetic Association, 1989).

While physicians see themselves as helpful to mothers about making feeding decisions (Lawrence, 1982), they are not perceived as helpful by most women or as the main source of advice for the mother's choice of infant feeding (Reiff & Essock-Vitale, 1985; Sarett et al., 1983). In regards to income as a factor, women from low income and middle income families indicated that the physician had the most influence on their infant feeding practices (Brogan & Fox, 1984). Most women make the decision to breast feed or formula feed during pregnancy; and, therefore, discussions with the obstetrician, if they see one before delivery, would be important (Niefert et al., 1988; Sarett et al., 1983; Switsky et al., 1979).

The amount of support provided by physicians for various infant feeding practices varies among the specialty areas in medicine. Obstetricians tend not to support breast feeding as strongly as pediatricians, when the mother is undecided as to method of infant feeding (Lawrence, 1982; Reames, 1985). According to Lawrence (1982), if a mother has decided to formula feed, 44.0 percent of family physicians, 27.0 percent of pediatricians, and 22.0 percent of obstetricians will encourage breast feeding. Even though a high percentage of medical professionals may encourage breast feeding, 34.0 percent of medical professionals reportedly initiated discussions with the mother. When breast feeding is discussed, it is mentioned usually during the first and second trimesters of pregnancy (Lawrence, 1982). Women who formula feed take the advice of their pediatrician, while those who breast feed are just as likely to take advice from classes attended or friends (Peters & Worthington-Roberts, 1982).

In summary, most of the information about the influence of health professionals on the incidence of breast feeding is based on studies of adult mothers. In reviewing the literature, no published information that included mothers less than 18 years of age was found.

Incidence of Infants' Illnesses/Breast Feeding

Studies investigating the relationship of breast feeding to the incidence of illness in children who reside in the United States have provided conflicting information. Some population studies have shown breast feeding to be protective against gastrointestinal illnesses, respiratory illnesses, and illnesses that require hospitalization (Cunningham, 1979; Duncan et al., 1993; Fallot et al., 1980; Larsen & Homer, 1978; Leventhal et al., 1986; Myers et al., 1984; Paine & Cobble, 1982). Other studies have shown that breast feeding results in little or no protection against illnesses (Abebonojo 1972; Cushing & Anderson, 1982; Weinberg et al., 1984). These studies did not investigate the relationship of illness to infant's weight gain. Conflicting results may be due to: (a) not specifically defining what is meant by breast feeding practices and the specific infectious disease; (b) not collecting data prospectively; and (c) not controlling for socioeconomic variables.

Gastrointestinal diseases. Three researchers investigated the incidence of gastrointestinal disease in breast and formula fed infants. Larsen and Homer (1978) retrospectively reviewed the medical records of infants who were hospitalized for acute onset of diarrhea and weight loss. Breast feeding was defined as the type of feeding used at hospital admission of the infant. Of 35 infants, less than six months old, who were admitted with diagnoses of gastroenteritis, only one infant was breast fed. The authors concluded that breast feeding plays a major role in protection of the infant against intestinal infections.

In a prospective study, Myers et al. (1984) used birth date and gender as criteria to pair 10 breast fed infants with 10 formula fed infants. Infants were examined at two week intervals from the ages of six to nine days to 112 days. Gastroenteritis was defined as an increase in stooling and a decrease in consistency of stools that persisted for greater than 24 hours. Breast feeding was defined as a) receiving human milk as the sole source of energy for 112 days; or b) combining human milk with infant formula. Significantly more gastroenteritis was observed in infants receiving only formula compared to breast fed milk as defined in this study.

Paine and Cobble (1982) also studied gastrointestinal illnesses in infants. In this retrospective study, medical charts of 113 infants attending a Family Practice Office were reviewed to determine the number of office visits for various illnesses, including gastrointestinal disturbances during

the first year of life. Components of the diagnoses for gastrointestinal disturbances were not specifically defined in the Myers et al. research. Infants were divided into the following groups: a) exclusively breast fed; b) formerly breast fed and changed to formula; and c) exclusively formula fed. The authors reported a significant difference in the number of office visits for gastrointestinal illnesses; the number of visits was greater for formula fed infants compared to those who were exclusively breast fed or breast fed combined with formula feedings.

In contrast, Weinberg et al. (1984) prospectively studied infants from middle class families and reported that breast feeding offered little protection against rotavirus gastroenteritis. Fifty infants less than one year old, who were diagnosed with rotavirus gastroenteritis, were retrospectively studied to determine the protective effect of breast feeding. Parents of these infants were contacted to determine the incidence and maximum duration of breast feeding and to complete an initial questionnaire. Stool samples were collected to determine the presence of rotavirus using immune electrophoresis. Researchers compared the average age of infants who had rotavirus at the time of medical record review as well as reports of vomiting, irritability, and presence of fever. The number of stools/24 hours, number of days of diarrhea and the other indicators were compared to mode of feeding,i.e. breast feeding, formula feeding, and ceasing to breast fed prior to infection. Findings were compared to 50 control infants selected from the same pediatric practice. The incidence of breast feeding,i.e. receiving breast feeding for at least two feedings per day, in infants with rotavirus was 64.0 percent compared to 70.0 percent in the control group. No apparent difference was found in the average age that infants had rotavirus infection; the infections occurred at about seven months in breast fed infants, eight months in those who stopped breast feeding, and seven months in formula fed infants. None of the breast fed infants developed rotavirus at less than three months of age compared to an earlier occurrence in two of the formula fed infants. Mean duration of diarrhea and number of stools was the same for breast fed and formula fed infants. Less vomiting was reported in the breast fed group, i.e. 14.0 percent compared to 67.0 percent in the formula fed group.

In another study, Abebonojo (1972) reported that gastrointestinal disturbances were not different in 60 breast fed and 53 artificially fed infants who attended a pre-paid medical group practice. Infants who received breast milk for the first three months of age or longer were considered to be breast fed. Infants who were

exclusively formula fed and those breast fed infants who received formula before three months of age were classified as formula fed. Gastrointestinal symptoms were not clearly defined by Abebonojo or diagnosed by laboratory tests, such as immune electrophoresis.

Cushing and Anderson (1982) found no difference in the number of breast fed and formula fed infants who had diarrhea. Forty infants were followed weekly. At each visit mothers responded to questions about infant feeding practices, illnesses, medications, and medical visits. Thirty of the 40 infants had 62 episodes of diarrhea in 73 weeks. When the groups were compared, there was no significant difference in overall occurrence of diarrhea or the duration of diarrhea associated with breast or formula feeding modes.

Respiratory illnesses. When the rate of respiratory illnesses in breast fed infants was compared with the rate for formula fed infants, results also varied. Myers et al. (1984) investigated the incidence of respiratory illnesses, as well as gastroenteritis, in infants who were either breast or formula fed. Breast fed infants had more respiratory illnesses than formula fed infants, but the difference was not significantly different. The diagnostic categories of upper respiratory infections included conjunctivitis, rhinitis, and acute suppurative otitis media. Categories for lower respiratory illness were bronchiolitis, pneumonitis, epiglottitis, and laryngotracheobronchitis. Similar to findings in the Abebonojo (1972) study, the frequency of respiratory infections was the same in a group of 113 infants who were breast fed exclusively or received formula.

Other researchers, Paine and Cobble (1982), reported that by one month of age there was a significant difference in the number of office visits between breast and formula fed infants. From birth to age six months, the proportion of months with diagnosed illnesses was not significantly different between exclusively breast fed infants and infants receiving breast milk with a formula supplement. However, these two groups combined had significantly less months of reported illnesses than those infants who received formula exclusively. From six to 12 months, there was no significant difference in the rate of illnesses between breast and formula fed infants.

Bacterial infections. Some researchers specifically have investigated the occurrence of bacterial infection in breast fed infants compared to formula fed infants. For instance, Leventhal et al. (1986) investigated bacterial infection in 35 infants and 35 control infants who were matched for birth date,

gender, race, socioeconomic status, and site of pediatric care. Medical charts of infants, who were greater than three months of age and were admitted to the same hospital, were reviewed. Bacterial diseases were classified diagnostically as bacterial meningitis, otitis media, abscess, bacteremia, gastroenteritis with a positive stool culture for enteric pathogen, urinary tract infection, and osteomyelitis. Infants were considered to be breast fed, if they were exclusively breast fed or received one bottle of formula per day plus breast milk. Findings indicate that breast feeding appeared to have a positive effect on infants diagnosed with bacterial infections compared to the effect of breast feeding on non bacterial diseases.

Eye, ear, and nose infections. In study by Duncan et al. (1993), medical records of 1,013 infants, who attended a health maintenance organization clinic for incidence of otitis media, were examined. Acute or recurrent otitis media was defined as three or more episodes of acute otitis media in a six month period or four episodes in 12 months; 47.0 percent had at least one episode of acute otitis media and 17.0 percent had recurrent otitis media. Those infants who were exclusively breast fed for four or more months, had half the mean number of episodes of otitis media as those infants who were not breast fed, and 40.0 percent less otitis media infections than those infants whose diets were supplemented with formula or other foods prior to four months. The investigators concluded that exclusive breast feeding for four or more months protected infants from acute or recurrent otitis media.

In summary, published information about the incidence of infant illness in breast fed infants has shown various results. Some researchers have concluded that breast feeding plays a major role in protection against intestinal infections (Larsen & Homer, 1978; Myers et al., 1984; Paine & Cobble 1982), bacterial infections (Leventhal et al., 1986), and otitis media (Duncan et al., 1993). Other researchers did not find breast feeding associated with less intestinal infections (Abebonojo, 1972; Cushing & Anderson, 1982; Weinberg et al., 1984), and respiratory infections (Abebonojo, 1972; Paine & Cobble, 1982; Myers et al., 1984).

Incidence of Hospitalizations/Breast Feeding

Investigators have found that the incidence of hospitalizations is less in breast fed infants compared to formula fed infants, but the incidence of infection was not different. Cunningham (1979) studied 503 infants from a variety of socioeconomic backgrounds that were regularly seen in a pediatric clinic. A review of

medical records revealed that during the first four months of life, only four percent of hospital admissions occurred in breast fed infants; only nine percent of hospital admissions during the first 12 months of life occurred in breast fed infants. The overall incidence of infections regardless of hospital admission was not studied, and the infections were not confirmed by culture assay. In a mixed socioeconomic population Fallot et al. (1980) reported that exclusive breast feeding significantly reduced the incidence of infections that ultimately require hospitalization. One hundred and thirty six medical records of infants, ages birth to three months old, were reviewed. No documented bacterial infections (otitis media, meningitis, pertussis, pneumonitis) were found in exclusively breast fed infants. In a case-control study, Leventhal et al. (1986) investigated previously healthy infants admitted to the hospital at or before three months of age. The control sample was selected from birth records and infants were matched for five demographic variables, i.e. birth date, gender, race, socioeconomic status, and site of pediatric care. Breast feeding was defined as either exclusively breast fed or as breast milk formula in a quantity plus less than one supplemental bottle per day. The investigators concluded that breast feeding protects against infections, and breast feeding protects infants from severe infections that can result in hospitalizations.

In summary, investigators have found that the incidence of hospitalizations is less in breast fed infants compared to formula fed infants, but the incidence of infection was not different.

Factors Related To Infant's Age When Supplemental Foods Are Introduced That May Be Associated With Infant's Weight

Researchers have examined factors that were related to infant's age when supplemental foods were introduced: breast feeding, mother's age, income, education, and employment status, the influence of social networks, and health professionals, nutritional contribution of supplemental foods to infants' diets, and incidence of infant illness. These factors, however, have not been related to an infant's weight.

Breast Feeding/Infant's Age When Supplemental Foods Were Introduced

Information about the association between breast feeding and the addition of supplemental foods indicates that the infant's age when supplemental foods are introduced differs between breast fed and formula fed

infants. In a cross-sectional population survey, Sarett et al. (1983) found that supplemental foods were introduced later for breast fed infants than for formula fed infants. Specific months when supplemental foods were added were not available in this study. Fomon (1987) reported unpublished data from Martinez et al. (1986); 26.0 percent of breast fed infants and 58.0 percent of formula fed infants received supplemental foods by two to three months of age. By four to five months of age, 51.0 percent of breast fed infants and 88.0 percent of formula fed infants received supplemental foods.

Breast Feeding/Income of the Mother/Infant's Age When Supplemental Foods Introduced

Subgroup surveys in which mothers were selected because of their income status provide information about the association between breast feeding, income of the mother, and infant's age at introduction of supplemental foods. In a study of 100 middle class women in the Pacific Northwest, breast feeding mothers introduced cereal later than mothers who fed formula to their infants (Peters & Worthington-Roberts, 1982). This difference appeared not to be related to socioeconomic status. Marlin et al. (1980) surveyed a group of White and Black infants, from a university community of mothers with various socioeconomic status. Regardless of income, breast fed infants received supplemental foods later than infants who received formulas. Similarly, Brogan and Fox (1984) surveyed 100 infants from low income and 103 infants from middle income urban families; breast fed infants were introduced to supplemental foods later than infant's receiving formula.

Age, Income, Education, Ethnicity, and Employment of the Mother Associated Together With Infant's Age When Supplemental Foods Introduced

Information about mother's age, income, education, and employment associated with infant's age when supplemental foods were introduced is available from four studies of specific groups of the population rather than from large population surveys. Mothers were chosen for these surveys represent specific ethnic groups, income levels, and employment. Mother's age and education were not specifically assessed although some information is available.

Auerbach and Guss (1984) studied employed mothers under the age of 25 and found them to be twice as likely as those over 25 to introduce supplemental foods to their infants' diets before 16 weeks of age. All of these urban working mothers introduced supplemental foods to

the infants' diets from two to 63 weeks. The study did not provide information as to whether this was related to the type of employment or to the timing of the mother's return to work. Also the information from this survey is biased because the population included White, married mothers with 10-18 years of education. These statistics are not reflective of the general population of mothers in the United States.

Berkelhamer et al. (1977) studied a group of mothers with a mean age of 23 years, and found that low income Afro-Americans planned on introducing supplemental foods to their infants' diets at a mean age of 10 weeks. All mothers planned on introducing supplemental foods to their infants over an age range of one to 77 weeks.

In another study, Brogan and Fox (1984) compared infant feeding practices of 100 low income families and 102 middle income families. More infants (76 percent) from low income families received cereal at three months than infants from middle income families (56 percent). Low income mothers fed their infants supplemental foods on a regular basis compared to mothers from middle income families. They also reported that college educated mothers introduced supplemental foods at later ages than those who had not attended college. Ages of the mothers and mothers' employment status were not reported.

In a population subgroup survey by Ferris et al (1978), 268 infants under six months of age from three income levels (low, middle, high) and three ethnic groups (Black, Spanish-surnamed, White) were studied. The authors found that differences in infant's age at introduction of supplemental food were related to ethnicity and income. Data was presented as mothers who added supplemental foods before and after infants were three months of age. The exact infant ages when supplemental foods were added to infants' diets were not presented. Fifty-three percent of low income Black and 53 percent of Spanish-surnamed infants under the age of three months received cereal. Cereal intake of Spanish-surnamed infants was the lowest of all ethnic groups (70 percent) in infants greater than three months of age. Fewer low-income Black infants, who were less than three months of age, received fruit than White or Spanish-surnamed infants of similar age who were from low, middle, or high income levels. After the Black infants reached three months of age, their fruit intake was nearly the same intake of White low income infants. In addition, low income White infants under three months of age received the most plain vegetables, compared to low income Black and Spanish-surnamed infants. This feeding trend reversed by the time the infants reached three months of age; White infants in the high income group received the greatest amount of plain vegetables,

followed by those White infants in the middle income group. White infants received juice under three months of age; whereas, after three months, upper-income White infants and middle income Black infants received the largest amount of juice. Upper income White infants were more likely to receive meat on a regular basis after three months of age (46 percent), while White infants in the low and middle income families and Black low income infants received little meat after three months of age. The mean age of low income Black and Spanish-surnamed mothers in this study was 19.5 years. The average age of high income white mothers was 27.5 years. Supplemental food information in this study was not analyzed by age of the mother. Education of the mother was not a study variable.

Thus, evidence as to the association among the age of the mother, income level, educational level, ethnicity and timing of introducing supplemental foods is limited.

Social Networks/Age of the Mother/Infant's Age When Supplemental Foods Introduced

Published research about the influence of social networks on the addition of supplemental foods to infants' diets is available from a limited number of population subgroup studies involving specific age groups of mothers. In 1983, adolescent mothers' decisions about adding foods were studied by Adair (1983). In that study, adolescents depended on their mothers for advice especially, if the adolescents lived at home. Adolescent mothers with more than one child made their own decisions about the introduction of supplemental foods.

In the McLorg and Bryant (1989) study that included adult mothers, aged 18-34 years, members of the social network encouraged the introduction of supplemental foods based on several factors. Maternal grandmothers and male partners were concerned that formula or breast milk was not meeting nutritional requirements of the infant. Also, an infant crying when adults were eating, excessive milk drinking by the infants, and frequent crying of the infant in general were interpreted as signs that the infant's appetite was growing. Supplemental foods, not breast milk or formula, were introduced to satisfy the infant's appetite. Social network members and mothers also reported that adding supplemental foods to the infant's diet helped her/him sleep through the night. Information was not analyzed by age of the mother.

Thus, information about the influence of social networks on the adolescent mother's decision to add supplemental foods is available from one population subgroup survey.

Influence of Health Professionals/Age of the Mother/Infant's Age When Supplemental Foods Introduced

Although the American Academy of Pediatrics (AAP) recommends that supplemental foods be added to the infant's diet after four months of age, yet pediatricians and family practitioners recommend the addition of supplemental foods and to varying degrees; they do not agree with the AAP recommendation (Lawrence, 1982; Morse et al., 1979). In a survey of 131 mothers, 30.0 percent did not follow the advice of their physicians (Morse et al., 1979). Mothers cited the W.I.C. Program, maternal grandmothers, and pediatricians (McLorg & Bryant, 1989) as their major advisors about supplemental foods. Respondents in the McLorg and Bryant (1989) study reported that W.I.C. advisors and pediatricians recommended addition of supplemental foods when the infant was at least four months old; in contrast maternal grandmothers advised that supplemental foods be given before the infant reached four months of age. The health professional's advice was discounted, if source members disagreed with the recommendations. Once one health professional indicated that early introduction of supplemental foods was permitted, contrary advice of other health professionals was dismissed. Furthermore, pressure from family and friends forced those mothers who delayed adding solids to the diet to succumb before their infants were four months old (McLorg & Bryant, 1989). Thus, family/social network members' advice prevailed over recommendations of health professionals.

Nutrient Contribution of Supplemental Foods

The nutritional contribution of supplemental foods to the infant's diet has been investigated in relationship to a) how these foods contribute to total kilocalorie intake and to food groups and b) how individual foods contribute to calorie and nutrient intake. In these studies, the nutritional contribution of supplemental foods was not related to the infant's weight. Research results are difficult to compare across the various studies because infants were followed for varying periods of time.

Kilocalories. When 58 breast fed infants were followed from birth to approximately 10 weeks after supplemental foods were added to their diets (birth to 18-36 weeks), energy intake of breast fed infants did not increase after solid foods were added. Energy intake was maintained at approximately 20% below recommended levels (Stuff & Nichols, 1989). A study by Andrew et al., (1980) compared the contribution of foods, other than milk and formula, to mean kilocalorie intake; mean intake from supplemental foods increased from seven to 35.0

percent from birth to six months. From six to eleven months mean kilocalorie intake from supplemental foods decreased from 35.0 to 30.0 percent. Regarding specific food groups that contribute to caloric intake, Maslansky et al. (1974) found that fruits represented 15.0 to 20.0 percent of kilocalorie intake and were the highest contributor to overall kilocalorie intake with the exception of milk. Similarly, Filer & Martinez (1964) reported that fruit supplied 10.0 percent of the kilocalories in the diets of six month old infants and was the second major source of kilocalories, with milk as the highest contributor of kilocalories.

Cereal has been found to be among the lowest contributors to the kilocalorie intake of infants. Stuff and Nichols (1989) reported that nine percent of total kilocalories were supplied by cereal in the diets of 36 week old infants who were exclusively breast fed. Maslansky et al. (1974) reported that cereal accounted for four percent of kilocalorie intake of infants at one month and 13.0 percent at 12 months. In contrast, Filer and Martinez (1969) reported that four percent of dietary kilocalories came from cereal consumed by six month old infants. In a study by Andrew et al. (1981), cereal provided 2.3 percent of calories at one month, increased to 9.7 percent by 5-7 months, and then decreased to 5.7 percent by 12 months.

Macronutrients. The caloric contribution of protein from supplemental food is limited. Breast fed infants consuming supplemental foods (rice cereal, fruits, vegetables) received the lowest percent of kilocalories from protein (Andrew et al., 1981). In the study of Stuff and Nichols (1989) protein intake of infants increased from 0.9 gm/kg/day during exclusive breast feeding to 1.5 gm/kg/day at 36 weeks of age, when supplemental foods had been added to the diet. Meat was the primary source of protein in this study. In the diets of six month old infants who received milk formula, meat provided 15.0 percent of the kilocalories (Filer & Martinez, 1964).

Kilocalories from carbohydrate reportedly increased because of supplemental food intake. In a study by Andrew et al. (1981) carbohydrate intake was increased in 15 of 40 infants, due to the proportion of supplemental foods in the diet. Results of the national survey by Filer and Martinez (1969) indicate that 50.0 percent of carbohydrate in the diets of six month old infants was from supplemental foods (25.0 percent from fruit, 10.0 percent from fruit juice and 15.0 percent from milk).

The percent of kilocalories from fat provided by supplemental foods varies. It was less than 30 percent

in infants who were followed from birth to 12 months (Andrew et al., 1981). This was attributed to the addition of supplemental foods that were rich in carbohydrate and low in fat. In contrast, for infants who were six months of age, fat intake varied according to how much cow's milk was ingested by the infants (Filer & Martinez, 1969).

Micronutrients. Several studies have provided information about micronutrient intake that changes by the addition of supplemental foods. In a study of six month old infants, Filer & Martinez (1969) reported that meat and vegetables contributed 80.0 percent of vitamin A intake; cereal contributed 30.0 percent of thiamine intake; meat contributed 15.0 percent of riboflavin intake; cereal contributed 23.0 percent of niacin intake; and fruit juice provided 55.0 percent of vitamin C intake. Similarly, Marlin et al. (1980) reported on the contribution of supplemental foods to the micronutrient intake. A maximum of 30.0 percent of calcium, sodium, potassium, chloride, thiamin, riboflavin, and pyridoxine intake was provided by supplemental foods given to 12 month old infants, who also received formula or human milk. This 30.0 percent increased to 40.0 percent in 12 month old infants who received cow's milk. Strained fruits, yellow vegetables, and orange juice were important sources of vitamin A and vitamin C in formula-fed infants participating in this study.

In regard to the major minerals, calcium intake was mostly supplied by milk and formula (Filer & Martinez, 1964; Marlin et al., 1980). Higher iron intake was attributed to the addition of iron enriched cereal to the infant's diet (Bowering et al., 1978; Filer & Martinez, 1969; Maslansky et al., 1974).

Summary. Thus, information about the nutrient contribution of supplemental foods to infants' diets varies. Researchers agree that cereal is among the lowest contributors of kilocalories. Kilocalorie contribution of fruit varied across the studies. The caloric contribution of protein is limited and the percent of kilocalories from fat varies. In contrast, carbohydrate intake of infants reportedly increases when supplemental foods are introduced. Micronutrient intake has been related to specific supplemental foods. These results have not been related to infant weight.

Incidence of Infant's Illnesses/Infant's Age When Supplemental Foods Introduced

The influence of the infant's age at introduction of supplemental foods on the reported incidence of infant illnesses was investigated as part of one study. Cushing

and Anderson (1982) investigated diarrhea in breast and formula fed infants. Breast fed infants who received supplemental foods before three months of age had no more diarrhea than those who did not receive supplemental foods. By age four months, all breast fed infants had received supplemental foods. These results offer limited insight into the potential relationship between incidence of illnesses and introduction of supplemental foods.

Summary/Implications For Future Research

This extensive review of literature can be best summarized by what is known and what is not known about the association between infant feeding practices and obesity. Some researchers have shown that infant weight gain during the first year, breast feeding/formula feeding, and caloric intake of breast/formula are related to later indicators of obesity (Binkin et al., 1988; Berkowitz et al., 1985; Butte et al., 1984, 1990; Dewey & Lonnerdal, 1983; Fomon et al., 1974; Fisch et al., 1975; Huenemann, 1974; Mack & Ipsen, 1974; Neumann & Alpaugh, 1976; Rueda-Williamson & Rose 1962). Other investigators have not found a relationship between infant weight gain and feeding modes (Dine et al., 1979; Heald & Hollander, 1965; Shapiro et al., 1984). Other researchers have not found the infant's weight to be related to age at introduction of supplemental foods (Huenemann et al., 1974; Lauver at al., 1981). There are no conclusive, longitudinal studies involving stratified sampling across various ethnic and socio-economic groups. Thus, the issues of infant obesity and feeding practices are not resolved.

Based on available research information, future research is needed to:

- examine whether or not age of the mother is important in the age of the infant when supplemental foods are added to the diet

- explore the association of mother's age and income to infant's age when supplemental foods are added to the diet

- investigate the relationship between mother's income and infant's age when supplemental foods are introduced

- determine if mothers less than 18 years of age compared to adult mothers ages 22-28 years feed infants differently and the relationship of feeding practices to infant weight

- examine the influence of breast feeding and the introduction of supplemental foods on frequency of infant illness and infant weight at six and 12 months

- determine the interrelationships among mother's responses to physical cues to add supplemental foods and mother's age, income and education and infant weight at six and 12 months.

APPENDIX B

RECRUITMENT TOOLS-ADOLESCENT MOTHERS

1. Copy of the postcard that accompanied publicity posters.

I am interested in hearing more about the survey of adolescents conducted by The University of Tennessee. Please contact me to discuss the study in more detail.

Name _____

Mailing Address _____

_____

Telephone # _____ Alternate Telephone # _____

APPENDIX B

RECRUITMENT TOOLS-ADOLESCENT MOTHERS

2. Copy of referral form sent to health departments and schools.

YOU ARE NEEDED

YOU ARE NEEDED TO TAKE PART IN A STUDY ABOUT FOOD HABITS OF TEENS DURING AND AFTER PREGNANCY. YOU WILL BE PAID $5.00 FOR EACH OF 4 INTERVIEWS (4 INTERVIEWS = $20). IF YOU ARE INTERESTED IN KNOWING MORE ABOUT THE STUDY, YOU NEED TO GIVE PERMISSION TO

_____ TO GIVE YOUR NAME TO TEACHERS AT THE
AGENCY/SCHOOL

UNIVERSITY OF TENNESSEE, KNOXVILLE. UTK TEACHERS WILL CONTACT YOU TO TELL YOU MORE ABOUT THE STUDY AND SET UP THE FIRST INTERVIEW.

I AGREE THAT MY NAME MAY BE GIVEN TO TEACHERS AT THE UNIVERSITY OF TENNESSEE.

_____
NAME

_____
ADDRESS

_____
PHONE NUMBER

UNIVERSITY OF TENNESSEE COPY

APPENDIX B

RECRUITMENT TOOLS-ADULT MOTHERS

3. Copy of referral poster sent to health departments and clinics.

We need your help?

Want to make $10?

We are studying how mothers feed their babies.



Are you 22-28 years old?

Is your baby 4 to 6 months old?

Send in the attached post card or contact W. Nevling, Dept. of Nutrition

University of Tennessee

Knoxville,TN 37996-1900

You will be paid $10 for each personal interview.

APPENDIX B

RECRUITMENT TOOLS-ADULT MOTHERS

4. Copy of the post card that accompanied referral poster.

When did you have your baby?(month,day,year)_____

What is your baby's sex?_____Male_____Female

Please answer the following questions by circling the response that best describes yourself:

Age: younger than 18 yrs. 18-21 yrs. 22-28 yrs. 29-40 yrs. older than 40 yrs.

Race: Am. Indian Asian Black Hispanic White

Education: less than 7th grade Jr. High School some High School High School Diploma greater than High School

Name_____

Mailing Address_____

_____

Telephone No._____ Alternate Telephone No._____

APPENDIX B

RECRUITMENT TOOLS-ADULT MOTHERS

5. Script for telephone interviews for newspaper leads.

SCRIPT FOR TELEPHONE INTERVIEWS FOR NEWSPAPER LEADS

Hello, my name is Wina Nevling. I am calling from the University of Tennessee about a study we are working on involving parents with young infants. I would like to come to your home to meet with you and your baby for about one hour two times in the next year. I will be asking you questions about what types of foods your baby has tried and what physical developments you have noted such as holding his/her head up. I will also weigh and measure your baby at each visit. Would you be willing to help us with this project?

If yes,

First, I would like to ask you a few questions.

What is your husband's occupation?
What is your occupation?
How many years of education does your husband have?
How many years of education do you have?

Record information on Phone Information Record.

Make an appointment.

I will be sending you a letter explaining more about the study and confirming this appointment. May I have your correct mailing address.

Record address on Phone Information Record.

Obtain directions to the home.

I will be calling you prior to the interview to confirm the appointment and directions. I will pay you $10 for two interviews.

APPENDIX B

RECRUITMENT TOOLS-ADULT MOTHERS

6. Copy of Phone Information Record used with telephone interviews.

PHONE INFORMATION RECORD

FATHER'S NAME:_____

MOTHER'S NAME:_____

INFANT'S NAME:_____

MAILING ADDRESS:_____

_____

PHONE NUMBER: _____

INFANT'S BIRTHDATE: _____

SEX: _____

BIRTH ORDER:_____

FATHER'S JOB TITLE:_____

MOTHER'S JOB TITLE:_____

FATHER'S EDUCATION:_____

MOTHER'S EDUCATION:_____

FIRST APPOINTMENT:_____

INTERVIEWER: _____

INTERVIEW MONTHS: _____

SUBJECT NUMBER: _____

SOURCE OF SUBJECT:_____

DATE CALLED: _____

CALLER: _____

LETTER SENT: _____

APPENDIX C

RECRUITMENT LETTERS-ADOLESCENT MOTHERS

1. Copy of letter sent to potential subjects.

September 20, 1989



College of
Human Ecology

Nutrition and
Food Science

Dear :

Thank you for your interest in hearing more about our research. We are conducting a study of teenage girls during and after pregnancy. We're looking at eating habit, food preferences, ideas about food, and TV viewing habits.

Girls participating in the study are interviewed twice during the last three months of pregnancy and twice one year after the baby is born. Each interview lasts between 45 minutes and one hour, and we pay $5.00 per session. Although we are based in Knoxville, we have a motor home and can meet you in your town at any place convenient for you.

There are no risks to you or your baby associated with the study. You may ask questions during the interview and you may contact us at The University of Tennessee (974-5445) at any time.

You are under no obligation to participate, but it is very important that we interview as many teenagers as possible. You can help us learn more about teens' eating habits during and after pregnancy. This information will be useful to health professionals who work with other girls in the future.

Please consider helping us! You can give us valuable information that we can't get anywhere else.

We are enclosing a description of the study for you to share with your parents or guardians if you so choose. We will be contacting you by phone within the next few days to discuss your participation.

Sincerely,

Jena Goldberg, M.S., R.D.
Graduate Student

Janet Pope, M.S., R.D.
Graduate Student

/jtl

1215 West Cumberland Avenue, Room 229 / Knoxville, Tennessee, 37996-1900 / (615) 974-5445, 974-3491

APPENDIX C

RECRUITMENT LETTERS-ADOLESCENT MOTHERS

2. Copy of letter sent to potential subjects to be shared with parents or guardians.

THE UNIVERSITY OF TENNESSEE
KNOXVILLE

College of Human Ecology

Nutrition and Food Science

Dear Parents:

Your daughter has expressed an interest in hearing more about a research study conducted by the Department of Nutrition and Food Sciences at The University of Tennessee. We are evaluating factors affecting the nutritional health of adolescents during and after pregnancy. These factors include things such as food intake patterns, food preferences, ideas about food, and television viewing habits. This is an important study, and we expect the results to be useful to health professionals counseling teens about appropriate nutrition.

Should your daughter decide to participate, she will be interviewed twice during the final trimester of pregnancy and twice one year after the baby is born. Each interview will last about 45 minutes to one hour, and we will pay $5.00 per interview. We have a mobile laboratory so we can meet your daughter at a location convenient to her.

There are no risks to your daughter or her baby associated with the study. Both you and your daughter are encouraged to ask questions. You may contact us at 974-5445. Your daughter is under no obligation to us; it is entirely up to her to decide whether she wishes to participate. In addition, she may quit at any time.

We think this is an important study, and we want to interview as many girls as possible. We hope that your daughter will elect to help us. We will be contacting her by phone within the next few days to discuss her participation. If you have questions or concerns about the study, we would be happy to discuss them with you then or at any other time. We are willing to work with you in any way possible.

Sincerely,

Janet Pope

Janet Pope, M.S., R.D.
Graduate Student

Dena Goldberg

Dena Goldberg, M.S., R.D.
Graduate Student

/jtl

1215 West Cumberland Avenue, Room 229 / Knoxville, Tennessee, 37996-1900 / (615) 974-5445, 974-3491

APPENDIX C

RECRUITMENT LETTERS-ADULT MOTHERS

3. Copy of survey letter sent after reading birth announcements.

THE UNIVERSITY OF TENNESSEE
KNOXVILLE

Department of Nutrition
1215 West Cumberland Avenue, Room 229
Knoxville, TN 37996-1900
(615) 974-5445
(615) 974-3491
FAX # (615) 974-2617

Dear

Hello! Through reading local newspaper birth anouncements and matching names to listings in the telephone directory, the University of Tennessee has identified you as a new mother.

We are gathering information about East Tennessee mothers and their babies. It would be helpful to us if you would take a few minutes to answer questions about you and your baby on the enclosed post card. Return in the mail to us. No postage is necessary.

Thank you for providing this information. Please excuse us if the wrong address and birth announcement were matched. If you know a new mother, please pass the information on to them.

Sincerely,

Wina Nevling, M.S., P.D.
Research Assistant

Betty Ruth Carruth, Ph.D., R.D.
Professor

APPENIDX C

RECRUITMENT LETTERS-ADULT MOTHERS

4. Copy of follow-up survey letter after reading birth announcements.

THE UNIVERSITY OF TENNESSEE
KNOXVILLE

Department of Nutrition
1215 West Cumberland Avenue, Room 229
Knoxville, TN 37996-1900
(615) 974-5145
(615) 971-3911
FAX # (615) 974-2647

Dear

Hello! As you may recall from a previous mailing from the University of Tennessee, we are gathering information about East Tennessee mothers and their babies. Through reading local newspaper birth anouncements and matching names to listings in the telephone directory, the University of Tennessee has identified you as a new mother.

It would be helpful to us if you would take a few minutes to answer questions about you and your baby on the enclosed post card. Return in the mail to us. No postage is necessary.

Thank you for providing this information. Please excuse us if the wrong address and birth announcement were matched. If you know a new mother, please pass the information on to them.

Sincerely,

Wina Nevling
Wina Nevling, M.S., R.D.
Research Assistant

Betty Ruth Carruth
Betty Ruth Carruth, Ph.D., R.D.
Professor

APPENDIX C

RECRUITMENT LETTERS-ADULT MOTHERS

5. Copy of post card returned by adult mothers.

When did you have your baby?(month,day,year)_____

What is your baby's sex?_____Male_____Female

Please answer the following questions by circling the response that best describes yourself:

Age: younger than 18 yrs. 18-21 yrs. 22-28 yrs. 29-40 yrs. older than 40 yrs.

Race: Am. Indian Asian Black Hispanic White

Education: less than 7th grade Jr. High School some High School High School Diploma greater than High School

Name_____

Mailing Address_____

_____

Telephone No._____ Alternate Telephone No._____

APPENDIX D

OTHER CORRESPONDENCE WITH SUBJECTS-ADOLESCENT MOTHERS

1. Copy of letter of confirmation for appointments.

College of
Human Ecology

Nutrition and
Food Science

Dear

This is a reminder for your interview for the Adolescent Pregnancy Project on _____ at _____ at _____. We look forward to seeing you then. If you can not keep this appointment, please call me collect any evening, Saturday or Sunday at 584-0717.

Sincerely,

Dena Goldberg, M.S., R.D.
Graduate Student

/jtl

1215 West Cumberland Avenue. Room 229/Knoxville. Tennessee. 37996-1900/(615) 974-5445, 974-3491

APPENDIX D

OTHER CORRESPONDENCE WITH SUBJECTS-ADOLESCENT MOTHERS

2. Copy of letter to those who missed appointments.

THE UNIVERSITY OF TENNESSEE
KNOXVILLE



College of Human Ecology

Nutrition and Food Science

August 22, 1989

Dear :

We're sorry we missed you last week. If you are still interested in participating in the adolescent pregnancy study, please call either Dena Goldberg (584-0717) or Janet Pope (588-4123) any evening or weekend. We would really like to meet with you and look forward to hearing from you.

Sincerely,

Dena Goldberg
Graduate Student

Janet Pope
Graduate Student

/itl

1215 West Cumberland Avenue, Room 229/Knoxville, Tennessee, 37996-1900/(615) 974-5445, 974-3491

APPENDIX D

OTHER CORRESPONDENCE WITH SUBJECTS-ADOLESCENT MOTHERS

3. Copy of letter sent to those not responding to telephone calls.

College of
Human Ecology

Nutrition and
Food Science

June 12, 1990

Dear :

I have been trying to reach you about continuing in the adolescent research study conducted by The University of Tennessee. It is important that we see you. We would like to talk with you abut the foods that you feed your baby, the health care of your baby, and weigh and measure your baby. The amount of time requested will not exceed one hour and you will help us learn more about how mothers feed their babies and provide health care.

Please contact me at 974-0824 or 531-6179 and reverse the charges to set up an appointment by ???????????, 1990. The interview will pay you $5.00.

Sincerely,

Wina Nevling, M.S., R.D.
Research Assistant

/jtl

APPENDIX D

OTHER CORRESPONDENCE WITH SUBJECTS-ADOLESCENT MOTHERS

4. Copy of three month follow-up survey.

Dear _____,

Hi! How are you and your new baby getting along? We hope that everything is going well for you both.

As you may recall, we talked about collecting more information from you at six months and one year after the baby was born. When your baby is about six months old, Wina Nevling, a graduate student at The University of Tennessee, will contact you to talk about your baby's growth and eating habits. She wants to see both you and the baby at that time. You will receive $5.00 for that interview.

So that we can keep in touch, please take a few minutes to answer the following questions about you and your baby. Please tear off this letter, and answer the questions. After you have finished, fold the paper on the dotted line so that your answers are on the inside. Seal the paper by wetting the glue on the free edge of the paper. Return in the mail to us. No postage is necessary.

Thank you for providing this information.

Sincerely,

Janet Pope — Lisa Varner — Dena Goldberg

Janet Pope, M.S., R.D.
Graduate Student

Lisa Varner, M.S., R.D.
Graduate Student

Dena Goldberg, M.S., R.D.
Graduate Student

Code Number _____

1. What is your current name and mailing address? _____

_____

_____

2. What is your current phone number? _____

3. When did you have your baby? (month, day, and year) _____

4. What is your baby's sex? _____ Male _____ Female

5. How much did your baby weigh at birth? _____Pounds _____ Ounces

6. How long was your baby at birth? _____ Inches

7. How much did you weigh <u>before</u> you got pregnant? _____ Pounds

8. How many pounds did you gain during your entire pregnancy?

_____ Pounds

9. If you are married, what is your husband's name? _____

APPENDIX D

OTHER CORRESPONDENCE WITH SUBJECTS-ADOLESCENT MOTHERS

5. Copy of letter sent to subjects at 10 months postpartum.

THE UNIVERSITY OF TENNESSEE
KNOXVILLE



College of Human Ecology

Department of Nutrition

Date

Name
Address

Dear

How are you? It's hard to believe that it's been almost a year since you had your baby. You may recall that when we saw you during your pregnancy, we agreed to contact you again after one year. It is now time to schedule your final interview with us.

We do have a motor home, and we're willing to meet you at a location convenient to you. The interview will last about 1 1/2 hours. We would like to see both you and the baby at that time. As before, you will be paid $5.00 for the interview. In addition, we will ask you to fill out a couple of questionnaires at home and mail them in. You will be paid $5.00 for this too.

We will contact you by phone within the next two weeks to set up an appointment. We are looking forward to talking with you again.

Sincerely,

Janet Pope
Graduate Student

/jtl

1215 West Cumberland Avenue, Room 229 / Knoxville, Tennessee 37996-1900 / (615) 974-5445, 974-3491 / FAX (615) 974-2617

APPENDIX D

OTHER CORRESPONDENCE WITH SUBJECTS-ADULT MOTHERS

6. Copy of appointment confirmation letter.

Dear ,

Thank you and baby's name for your willingness to help with our infant study at the University of Tennessee, College of Human Ecology. The purpose of this project is to study the development and eating patterns of infants, 0-12 months of age.

During the first year of baby's name life, I will come to your home two times. At each visit, I will ask questions about baby's name development and the foods and beverages consumed. I will bring a scale and measuring board to weigh and measure baby's name each time. Each interview will take about one hour. You will be paid $10.00 for each interview completed.

The information you provide will be confidential; your name, address and phone number will not be connected in any way to the information collected during the interviews. All data will be coded, analyzed, and reported as a group.

Your first appointment with me is on _____ at _____. If you are not able to meet at this time, please call 974-4205 and we will try to reschedule your interview.

Again, thank you for your contribution to this project and please do not hesitate to call if you have questions.

Wina Nevling,MS,RD
Research Assistant

Betty Ruth Carruth,PhD,RD
Professor

APPENDIX D

OTHER CORRESPONDENCE WITH SUBJECTS-ADULT MOTHERS

7. Copy of letter sent to subjects that could not be reached by telephone.

Dear

I have been trying to reach you about continuing in the infant study at the University of Tennessee. It is important that I see you. I would like to talk with you about the foods that you feed your baby, the health care of your baby, and weigh and measure your baby.

Please contact me at 974-4205 to set up an appointment by _____. The interviewer will pay you $10.00.

Wina Nevling,MS,RD
Research Assistant

APPENDIX E

STATEMENT OF INFORMED CONSENT-ADOLESCENT MOTHERS

1. Copy of original Statement of Informed Consent signed by adolescent mothers.

Code Number _____

Date _____

Statement of Informed Consent

I understand that I am being asked to participate in a research project focused on beliefs and practices of adolescent females. I have had the following explained to me:

1. I will be asked to respond to several questionnaires. These will contain questions about such things as my eating habits and food preferences, my ideas about food, and my television viewing habits. I also will be asked to keep a record of the food I eat for two days. The amount of time required for me to provide this information will be about five hours, divided into two sessions during pregnancy, and another three sessions after the baby is born.

2. I am also willing for the project personnel to get medical information about my pregnancy (e.g., pre-pregnancy weight, weight gain, infant weight and gestational age, APGAR scores).

3. If I participate in this project, I will get $5.00 for each of the interview sessions in which I complete all questionnaires.

4. I can choose whether I want to participate in the project, and I can quit at any time. If I do not participate or decide to quit, there will not be any penalty other than not receiving the $5.00 per session.

5. There are no specific risks to me or my baby anticipated from my participation in the project.

6. The results from this project are expected to be helpful to professionals who work with other teenagers.

7. If I participate in this project, **no one** other than project staff will be given any information about me. Nobody will be told anything in a way that would let them know I participated in this project.

8. If I have any questions, I can contact Dr. Betty Ruth Carruth or Dr. Jean Skinner, Department of Nutrition and Food Sciences, The University of Tennessee, Knoxville, Tennessee 37996-1900, 974-5445.

Based on this information, I agree to participate in this project.

Date _____ Signature _____

Witness _____

APPENDIX E

STATEMENT OF INFORMED CONSENT-ADOLESCENT MOTHERS

2. Copy of addendum to adolescent mother's Statement of Informed Consent.

Code Number_____

Date_____

Adolescent Mother's

Addendum to Statement of Informed Consent

1. I will be asked to respond to several questionnaires. These will contain questions about the foods that I feed my baby, and the health care of my baby at about six months and 12 months. The amount of time requested will not exceed one hour.

2. My baby will be weighed and measured.

3. There are no specific risks to me or my baby anticipated from my participation in the project.

4. The results from this project will be helpful to professionals who work with mothers about feeding their babies and providing health care.

5. If I have any other questions, I can contact Dr. Betty Ruth Carruth or Dr. Jean Skinner, Department of Nutrition and Food Sciences, The University of Tennessee, Knoxville,Tennessee 37996-1900, 974-5445.

Based on this information, I agree to continue to participate in this project.

Date_____ Signature_____

Witness_____

APPENDIX E

STATEMENT OF INFORMED CONSENT-ADULT MOTHERS

3. Copy of adult mother's Statement of Informed Consent.

Code Number_____

Adult Mother's

Statement of Informed Consent

I understand that I am being asked to participate in a research project focused on infant feeding practices. The participation is voluntary, refusal to participate will not involve penalty or loss of benefit to which the subject is otherwise entitled.
I have had the following explained to me:

1. I will be asked to respond to several questionnaires. These will contain questions about the foods that I feed my baby, a 24-hour food recall of my baby's food intake, and the health care of my baby at about six months and 12 months. The amount of time required should not exceed one hour for each of two visits.

2. I am willing to have my baby weighed and measured.

3. I am also willing for Wina Nevling to get medical information about my pregnancy (e.g. pre-pregnancy weight, weight gain, pregnancy and delivery complications, infant birth weight and length, gestational age, APGAR scores). The medical information may come from hospitals, physicians, or state records.

4. If I participate in this project, I will get $10.00 for each of the two interview sessions in which I complete all questionnaires and my baby is weighed and measured.

5. I can choose whether I want to participate in the project, and I can quit at any time. If I do not participate or decide to quit, there will not be any penalty other than not receiving the $10.00 per session.

6. There are no specific risks to me or my baby anticipated from my participation in the project.

7. The results from this project will be helpful to professionals who work with mothers about feeding their babies and providing health care.

8. If I participate in this project, no one other than project staff will be given any interview or health record information about me. No one outside the project will be told anything in a way that would let them know I participated in this project.

9. If I have any questions, I can contact Dr. Betty Ruth Carruth, Department of Nutrition, The University of Tennessee, Knoxville, Tennessee 37996-1900, 974-5445.

Based on this information, I agree to participate in this project.

Date_____ Signature_____

APPENDIX F

BACKGROUND AND INFORMATION FORMS

1. Existing form used for adolescent mothers.

TN860

Code Number 076

Date 10/18/89

Demographics and Background Information

Age 15 Date of Birth 2/20/74

Grade in school or last grade completed 10

Living Arrangements (check one):

____ live with one parent
____ live with both parents
____ live with spouse
____ live with parents and spouse
__✓__ live with other relative, specify: Grandmother
____ live in group home
____ other, specify: _____

Grand Mother's Education: (check highest level)

____ < 7th grade
____ junior high school
____ some high school
__✓__ high school graduate
____ some college or specialized training
____ college graduate
____ graduate school or professional training
____ not applicable

Father's Education: (check highest level

____ < 7th grade
____ junior high school
__✓__ some high school
____ high school graduate
____ some college or specialized training
____ college graduate
____ graduate school or professional training
____ not applicable

Spouse's Education:

____ < 7th grade
____ junior high school
____ some high school
____ high school graduate
____ some college or specialized training
____ college graduate
____ graduate school or professional training
__✓__ not applicable

Grand Mother's Occupation unemp.

Father's Occupation truck driver

Spouse's Occupation n/a

Estimated Date of Delivery Dec 17, 1989

Doctor's Name Dr Dean

Place of Delivery Fort Sanders (W) Loudon Hosp.

APPENDIX F

BACKGROUND AND INFORMATION FORMS

2. Form developed for adult mothers.

Code Number _____

Adult Women

Demographics and Background Information

Age_____ Date of Birth_____

Living Arrangements
_____live with one parent
_____Live with both parents
_____Live with spouse and children (ages)_____
_____live with parents and spouse
_____Live with other relative, specify:_____
_____Live alone with children (ages)_____

Adult Mother's Education
_____< 7th grade
_____junior high school
_____some high school
_____high school graduate
_____some college or specialized training
_____college graduate
_____graduate school or professional training

Spouse's Education
_____<7th grade
_____junior high school
_____some high school
_____high school graduate
_____some college or specialized training
_____college graduate
_____graduate school or professional training
_____not applicable

Adult Mother's Occupation_____

Spouse's Occupation_____

Do you work or have a job?_____
If yes, full-time(35 hours) _____
part-time(<35 hours)_____

What type of financial assistance do you receive? If you did receive financial assistance previously when did you receive it?
Medicaid_____
Medicare_____
Family_____
Food Stamps_____
Aid to Mothers of Dependent Children_____
W.I.C._____
If yes, did you receive W.I.C. when you were pregnant?____

2. Form developed for adult mothers (continued).

In which category does your household income last year fit best?

____Below $10,000
____Between $10,000 and $15,000
____Between $15,001 and $20,000
____Between $20,001 and $25,000
____Between $25,001 and $30,000
____Between $30,001 and $35,000
____Between $35,001 and $40,000
____Between $40,001 and $45,000
____Between $45,001 and $50,000
____Between $50,001 and $55,000
____Between $55,001 and $60,000
____Between $60,001 and $80,000
____Over $80,001

APPENDIX G

EXISTING 24 HOUR RECALL FORM

TN860

Code Number _____
Date _____
Record _____ Recall _____

Food Recall/Record Form

	Food and Description	Amount
1st time food was eaten: time _____ am ___ pm ___ where _____ who, if anyone ate with you? _____ watching TV, yes__ no __		
2nd time food was eaten: time _____ am ___ pm ___ where _____ who, if anyone ate with you? _____ watching TV, yes__ no__		
3rd time food was eaten: time _____ am ___ pm ___ where _____ who, if anyone ate with you? _____ watching TV, yes__ no__		
4th time food was eaten: time _____ am ___ pm ___ where _____ who, if anyone ate with you? _____ watching TV, yes__ no__		
5th time food was eaten: time _____ am ___ pm ___ where _____ who, if anyone ate with you? _____ watching TV, yes__ no__		

APPENDIX G

EXISTING 24 HOUR RECALL FORM

TN860

6th time food was eaten: time _____ am ___ pm ___ where _____ who, if anyone ate with you? _____ watching TV, yes__ no __		
7th time food was eaten: time _____ am ___ pm ___ where _____ who, if anyone ate with you? _____ watching TV, yes__ no__		
8th time food was eaten: time _____ am ___ pm ___ where _____ who, if anyone ate with you? _____ watching TV, yes__ no__		
9th time food was eaten: time _____ am ___ pm ___ where _____ who, if anyone ate with you? _____ watching TV, yes__ no__		

If you ate more than 9 times use the back of this sheet.

After completing this form, check yourself by answering the following questions:

1. Have you listed everything you ate and drank during the day?
2. Did you include the amount (i.e., 1 orange, 1 cookie, or 1 cup, 1 Tbsp., 1 tsp.) of each item consumed?
3. Did you describe the way the foods were prepared (i.e., egg - scrambled, fried, poached)?
4. Did you describe, in as much detail as possible, the ingredients in casseroles, salads, sandwiches, soups, and other mixed dishes?
5. Did you remember to list everything you added to your food before you ate it (i.e., sauces, gravies, butter, salad dressings)?
6. Did you add anything to your beverages (sugar, cream, milk, etc.)?

APPENDIX H

DEVELOPMENT AND PILOT TESTING OF INSTRUMENTS

1. Infant feeding practices questionnaires at six and 12 Months.

Infant Feeding Practices Questionnaire - Six Months

Instrument Development

The Infant Feeding Practices Questionnaire at six months (IFPQ-6 Months) was a modification of an existing screening questionnaire developed for infants from birth to one year (Fomon, 1977). For example, the breast feeding question was expanded for this study to obtain information about the number of weeks of breastfeeding and when the decision to breast feed was made. The yes/no boxes of Fomon's questionnaire (1977) became blanks to be completed by the interviewer, and a food frequency section asking about the consumption of table foods was changed to an open ended question. A question about infant cereals was added to determine every day consumption and which cereals mothers initially fed to infants. Although questions about fruits and vegetables were already on the questionnaire, specific questions about how mothers modified the consistency of table foods were included. These modifications became Part I of the interview format.

Part II was added to assess the infant's health status and health care practices. Mothers were asked when the infants were born how did they pay the hospital and physician bills, and where they took their babies for medical care and how the bill was paid. They also were asked about illnesses and hospitalizations of the infants, and the mothers' sources of information about infant feeding practices.

Pilot Testing

A pilot test of the IFPQ for infants at the six month interview included a convenience sample of six mothers. Based on the results, each of the questions provided appropriate information, but information about milk and formula consumption was duplicated in questions three and four of Part I. Therefore, question four was revised to eliminate a repeated question about the amount of milk and formula consumed per day (page 209).

ORIGINAL QUESTIONNAIRE

TN 860

Code Number_____

Date_____

QUESTIONNAIRE: INFANT FEEDING PRACTICES

PART I INFANT FEEDING PRACTICES

1. Did you ever breast-feed?_____
   When did you decide to breast-feed or formula-feed?_____
   How long did you breast-feed?
   If breast-feeding, is milk or formula also given?_____
      If yes, what kind?_____
      amount/day_____

2. Does the infant receive formula?_____
   If yes, ready-to-feed_____
           concentrated liquid_____
           other_____
   How is formula prepared(dilution)?_____
   amount/day_____

3. Does the infant drink milk?_____
   If yes, 2% milk_____
           whole milk_____
           skim milk_____
           other_____
           amount/day_____

4. How many times a day does he drink the following:
   milk _____amount_____
   formula_____amount_____
   Kool-aid_____amount_____
   juices_____amount_____
   soda pop_____amount_____

5. Does the infant take a bottle to bed?_____
   If yes, what is in the bottle_____
   amount_____

6. If the infant eats fruits or drinks fruit juices every day or nearly every day, which ones are consumed most often?
   (Not more than three)

_____

_____

7. If the infant eats vegetables every day or nearly every day, which ones does he eat most often? (Not more than three)

_____

_____

8. Does the infant receive table or baby food that you buy in the store?
   If table food, how do you change the texture of foods for your infant?
   food processor_____
   blender_____
   food mill_____

9. Does the infant receive vitamin or iron drops?_____
   If yes, how often_____
   What kind?_____

10. Is the infant on a special diet now?
    allergy_____
    weight reduction_____
    other_____

11. Does the baby eat clay, paint chips,dirt or anything else?
    _____

PART II HEALTH STATUS AND HEALTH CARE PRACTICES

12. When the infant was born how did you pay for the hospital bill?_____
    M.D. bill_____

13. Currently, where do you take the infant for medical care?
    _____
    How is the bill paid?_____

14. Who talked to you about infant feeding
    practices??_____ When?
    family_____ _____
    friends_____ _____
    health professional_____ _____
    others_____ _____
    television_____ _____
    newspapers_____ _____
    magazines_____ _____
    others_____ _____
    Were the recommendations followed?_____

15. Has the infant experienced any of the following?
    Prolonged illness_____
    Hospitalization_____
    Harelip_____
    Deficient palate_____
    Excessive gag reflex_____
    Jaw hangs_____

REVISED QUESTIONNAIRE

TN 860

Code Number _____

Date _____

QUESTIONNAIRE: INFANT FEEDING PRACTICES (Infant 6 months old)
PART 1

PART I INFANT FEEDING PRACTICES

1. Did you ever breast-feed?_____
   When did you decide to breast-feed?_____
   How long did you breast-feed?_____
   If breast-feeding, is milk or formula also given?_____
      If yes, what kind?_____
      amount/day_____

2. Does the infant receive formula?_____
   When did you decide to formula-feed?_____
   If yes, ready-to-feed_____
           concentrated liquid_____
           other_____
   How is formula prepared(dilution)?_____
   amount/day_____

3. Does the infant drink milk?_____
   If yes, 2% milk_____
           whole milk_____
           skim milk_____
           other_____
           amount/day_____

4. How many times a day does he drink the following:
Kool-ade_____amount_____
juices_____amount_____
soda pop_____amount_____

5. Does the infant take a bottle to bed?_____
   If yes, what is in the bottle_____
   amount_____

6. If the infant eats cereal every day or nearly every day, which ones are consumed most often?

_____

_____

7. If the infant eats fruits every day or nearly every day, which ones are consumed most often?

_____

_____

REVISED QUESTIONNAIRE

8. If the infant eats vegetables every day or nearly every day, which ones does he eat most often? (Not more than three)

_____

_____

9. Does the infant receive table food? _____
Which table foods?

If table food, how do you change the texture of foods for your infant?

food processor _____
blender _____
food mill _____
other kitchen utensil _____

10. Does the infant receive vitamin or iron drops? _____
If yes, how often _____
What kind? _____

11. Is the infant on a special diet now?
allergy _____
weight reduction _____
other _____

12. Does the baby eat clay, paint chips, dirt or anything else?
_____

PART II HEALTH STATUS AND HEALTH CARE PRACTICES

13. Currently, where do you take the infant for medical care?
_____
How is the bill paid? _____

14. When the infant was born how did you pay for the hospital bill? _____
M.D. bill _____

15. Who talked to you about infant feeding practices? _____ When?
family _____ _____
friends _____ _____
health professional _____ _____
others _____ _____
television _____ _____
newspapers _____ _____
magazines _____ _____
others _____ _____
Were the recommendations followed? _____

16. Has the infant experienced any of the following?
    Prolonged illness_____
    Hospitalization_____
    Harelip_____
    Deficient palate_____
    Excessive gag reflex_____
    Jaw hangs_____

APPENDIX H

DEVELOPMENT AND PILOT TESTING OF INSTRUMENTS

1. Infant feeding practices questionnaires at six and 12 Months (continued).

Infant Feeding Practices Questionnaire at 12 Months

Instrument Development

The Infant Feeding Practices Questionnaire for the 12 month interviews (IFPQ-12 months) was developed to assure uniformity in content and sequence of questions asked of the mothers during personal interviews. As noted for the 6 month interviews, the 12 month questionnaire was a modification of an existing screening questionnaire developed for infants from birth to one year (Fomon, 1977). Questions about breastfeeding, infant formula, and milk consumption were retained as modified for the IFPQ-6 Months. Those questions concerning cereal, fruit, vegetable, and meat consumption were expanded to obtain information about the intake of regular dry cereal, regular cooked cereal, canned and raw fruits and vegetables, and meats from the table, and if mothers added other foods or spices to the foods that were fed to infants. Additional questions were added to obtain data about infant feeding practices by babysitters and those practiced in day care centers. Question nine was included to obtain information about other foods such as custard, ice cream, and crackers that infants were fed. Question 10 was added to assess infant feeding in restaurants. Part II of the IFPQ-12 months questionnaire employed the same questions about the infant's health status and illnesses as the IFPQ-6 Months protocol.

Pilot Testing

Pilot testing of the IFPQ-12 Months (page 218) employed a convenience sample of six mothers. The information obtained was appropriate, but some probes were added to the questions, words and phrases underlined to guide the interviewer, and writing space added. For instance, question one (1) did provide information about who fed the infants (day care workers, baby sitters, mother), but a probe was added so that information about foods sent from home and eaten at day care centers and baby sitters could be consistently obtained. Also some of the words in this question were underlined to prompt the interviewer to ask the needed probe question about specific foods. Another revision was to separate the question about milk intake from question two (2) and make it a separate inquiry or question three (3). This changed the numbering sequence of the questionnaire from

the version used in the pilot test. Also space to write the kinds of juices consumed was added to the new question four. The wording of questions five through eight was changed so that the type of cereal e.g. dry or cooked, fruit, vegetables, and meats were asked first. Then, the kinds of foods, the usual serving size of the food, and the addition of other foods or seasoning to the kinds of foods were asked. Question nine was revised to provide more space for the interviewer to write and the category of "Other Foods" was added. Question 10 was revised to explain that the specific restaurant was McDonald's or Hardees. To obtain specific information about other kitchen utensils used to change food texture, the words knife, fork, and spoon were added to question 11. A question regarding the number of times the infant was taken to the medical doctor in the past year was included in Part II of IFPQ-12 months.

ORIGINAL QUESTIONNAIRE

TN 860

Code Number_____

Date_____

QUESTIONNAIRE: INFANT FEEDING PRACTICES (Infant 1 year old)

PART I INFANT FEEDING PRACTICES

1. Who usually feeds your infant?_____
_____

2. Does your infant receive breast milk or formula?
   If yes, breast milk_____amount_____
   What age was your baby when you stopped breast feeding?_____
   formula_____
   kind_____
   amount mixed per day_____
   amount drinks from bottle_____ cup_____
   What age was your baby when you stopped giving formula?_____
   2% milk_____amount from bottle_____cup_____
   whole milk_____amount from bottle_____cup_____
   skim milk_____amount from bottle_____cup_____

3. How many times a day does your infant drink the following:
Kool-ade_____amount from bottle _____or cup_____
juices_____amount from bottle_____or cup_____
soda pop_____amount from bottle_____or cup_____
other beverages_____

4. Does your infant take a bottle to bed at night?_____
   If yes, what is in the bottle_____
   amount consumed_____

5. If the infant eats cereal every day or nearly every day, which ones are consumed most often? What amount is eaten each day?
_____
_____
   Is this dry infant cereal_____
   jar infant cereal_____
   regular dry cereal___ _____

What is added to the cereal?
   sugar_____amount_____
   fruit_____amount_____
   formula_____amount_____
   milk_____amount_____

6. If the infant eats fruits every day or nearly every day, which ones are consumed most often? What amount is eaten each day?

_____

_____

Is this strained baby food_____
junior baby food_____
table food_____
raw_____
cooked or canned_____
Is anything added to the fruit that your baby eats?
cereal_____
vegetables_____

7. If the infant eats vegetables every day or nearly every day, which ones does he eat most often? What amount is eaten each day?

_____

_____

Is this strained baby food_____
junior baby food_____
table food_____
raw_____
cooked_____
Is anything added to the vegetables that your baby eats?
cereal_____
vegetables_____

8. If the infant eats meat every day or nearly every day, which meats does he eat most often? What amount is eaten each day?

_____

_____

Is this strained baby food_____
junior baby food_____
table food_____
Is anything added to the meat that your baby eats?
cereal_____
fruit_____
gravy_____
mashed potatoes_____

9. What other foods does the infant eat? What amount per day?
custard_____pudding_____
crackers_____teething biscuits_____
ice cream_____candy_____
potato chips_____french fries_____

10. What foods do you feed your baby when you are in away from home:
restaurant_____
fast food chain_____
relatives_____

11. If any table food is given, how do you change the food so that your infant can eat it?
    food processor_____
    blender_____
    food mill_____
    other kitchen utensil_____

12. Does the infant receive a multi-purpose vitamin and mineral supplement?
    If yes, how often_____
    What brand name?_____
    Who prescribed them?_____

13. Does the infant receive a iron supplement?_____
    If yes, how often_____
    What brand name?_____
    Who prescribed them?_____

14. Have you been told that your infant has:
    allergies_____
    needs to lose weight_____
    needs to gain weight_____
    Who advised this change in diet?_____
    What happened to cause them to be on a special diet?
    _____

15. Have you seen your baby eat clay, paint chips,dirt or anything else?
    _____
What were the circumstances (home, relatives, daycare.)?
_____

PART II HEALTH STATUS AND HEALTH CARE PRACTICES

16. Has the infant experienced any of the following since we last talked?
    Prolonged illness_____
    Hospitalization_____
    Harelip_____
    Deficient palate_____
    Excessive gag reflex_____
    Jaw hangs_____

17. If so, describe the circumstances_____
_____

Did the baby's weight go up or down at that time?_____

REVISED QUESTIONNAIRE

TN 860

Code Number_____

Date_____

QUESTIONNAIRE: INFANT FEEDING PRACTICES (Infant 12 months old)

PART I INFANT FEEDING PRACTICES

1. Who usually feeds your baby?_____
   If in daycare/baby sitting, do you send food for your baby to eat or is food served at the daycare or baby sitters?_____
   If you send foods, what foods do you send_____
   _____

Are these foods eaten?_____

   If your baby is fed at the daycare/babysitters what foods are served,_____

2. Did you breast feed or formula feed your baby?_____
   If breast milk,
   What age was your baby when you stopped breast feeding?_____
   If formula,
   What kind_____
   amount mixed per day_____
   amount drinks from bottle_____ cup_____
   What age was your baby when you stopped giving formula?_____

3. Does your baby receive cow's milk?_____
   2% milk_____amount from bottle_____cup_____
   whole milk_____amount from bottle_____cup_____
   skim milk_____amount from bottle_____cup_____

4. How many times a day does your baby drink the following:
   Kool-ade_____amount from bottle _____or cup_____
   juices_____amount from bottle_____or cup_____
   Kind of juices given_____
   _____
   soda pop_____amount from bottle_____or cup_____
   other beverages_____

5. Does your baby take a bottle to bed at night?_____
   If yes, what is in the bottle_____
   amount consumed_____

REVISED QUESTIONNAIRE

6. What type of cereal does your baby eat?
   dry infant cereal_____
   jar infant cereal_____
   regular dry cereal_____
   regular cooked cereal_____

   What kinds of cereal does your baby eat?_____
_____
   What is the usual serving size of the cereal given?_____
_____
   What is added to the cereal?
   sugar_____amount_____
   fruit_____amount_____
   formula_____amount_____
   milk_____amount_____

7. What type of fruits does your baby eat?
   strained baby food_____
   junior baby food_____
   raw_____
   cooked or canned_____
   What kinds of fruit does your baby eat?_____
_____
   What is the usual serving size of fruit given?_____
_____

   What is added to the fruit that your baby eats?
   cereal_____
   vegetables_____
   other_____

8. What type of vegetables does your baby eat?
   strained baby food_____
   junior baby food_____
   raw_____
   cooked_____
   What kinds of vegetables does your baby eat?_____
_____
   What is the usual serving of vegetables given?_____
_____
   What is added to the vegetables that your baby eats?
   cereal_____
   vegetables_____
   other_____

9. What type of meat does your baby eat?
   strained baby food_____
   junior baby food_____
   table food_____
   What kinds of meats does your baby eat?_____
_____
   What is the usual serving of meat given?_____
_____

REVISED QUESTIONNAIRE

What is added to the meat that your baby eats?
cereal_____
fruit_____
gravy_____
mashed potatoes_____

10. What other foods does your baby eat? What amount per day?
custard_____
pudding_____
crackers_____
teething biscuits_____
ice cream_____
candy_____
potato chips_____
french fries_____
other foods_____
_____

11. What foods do you feed your baby when you eat in a:
restaurant like McDonalds or Hardies? _____
_____
other restaurants_____
at relatives' homes_____

12. If any table food is given, how do you change the food so that your baby can eat it?
food processor_____
blender_____
food mill_____
other kitchen utensil_____
knife_____
fork_____
spoon_____

13. Does the baby receive a multi-purpose vitamin and mineral supplement?
If yes, how often_____
What brand name?_____
Who prescribed them?_____

14. Does the baby receive a iron supplement?_____
If yes, how often_____
What brand name?_____
Who prescribed them?_____

15. Have you been told that your baby has:
allergies_____
needs to lose weight_____
needs to gain weight_____
Who advised this change in diet?_____
What happened to cause them to be on a special diet?
_____

16. Have you seen your baby eat clay, paint chips,dirt or anything else?

_____

How many times did you observe this?_____
What were the circumstances (home, relatives, daycare.)?
_____

PART II HEALTH STATUS AND HEALTH CARE PRACTICES

17. How many times has your baby been to the doctor in the past year?_____
_____

18. Has your baby experienced any of the following since we last talked?

Prolonged illness_____
Hospitalization_____
* Harelip_____
* Deficient palate_____
* Excessive gag reflex_____
* Jaw hangs_____

19. If so, describe the circumstances_____
_____

Did your baby's weight go up or down at that time?_____
_____
_____

* observed by interviewer

APPENDIX H

DEVELOPMENT AND PILOT TESTING OF INSTRUMENTS

2. Instrument to assess developmental readiness to feed at six months (IFTL-6 Months).

Instrument Development

An Infant Feeding Time Line for 6 Month Interviews (IFTL-6 Months) (page 227) was developed using recommendations of the American Academy of Pediatrics (1980) and the W.I.C. Program (D.H.H.S., 1982). The IFTL-6 Months contains two major sections (Parts I and II) that are presented on page 227. Part One of the IFTL-6 Months involved each mother responding to what age her baby could control his/her head and neck and sit with support. The American Academy of Pediatrics (American Academy of Pediatrics, 1980) designates these motor skills as essential for the infant to be able to indicate desire or disinterest in food. The age at which the infant slept through the night was incorporated in the IFTL-6 Months to assess whether adding supplemental foods was related to infant sleeping patterns. The action of picking up and holding a spoon also was included in the IFTL-6 Months to determine if any infants were advanced beyond six months in their motor development.

Part Two of the IFTL-6 Months included questions about the mother's observation of responses when specific foods were fed to the infant for the first time. This section of the IFTL-6 Months was developed using the American Academy of Pediatrics (1980) recommendations that if developmental readiness has occurred, an infant will have the ability to indicate (a) a desire for food by leaning forward and opening his mouth and (b) satiety or disinterest by turning his/her head away and leaning back. That is, when infants were fed cereal, vegetables, fruits, meats, or table foods for the first time, did they lean back and turn away from the spoon, or did they lean forward and open the mouth (American Academy of Pediatrics, 1980). The action of swallowing the food, not swallowing the food, or choking were added to IFTL-6 Months to determine if the extrusion reflex was present when the food was introduced. When the questionnaire was administered, each mother was asked an open ended question about her response to her infant's developmental readiness. For example, when a mother reported that her infant did not swallow cereal, then the mother was asked what she did after that event.

Pilot Testing

The IFTL-6 Months (page 227) was pretested with a

convenience sample of six mothers to determine if questions were easily understood and if responses given in the pilot test provided information that was needed to support the hypotheses of the study. Appropriate information was obtained from each question, but some duplication needed to be eliminated on Part Two. In this section, subjects also were asked about specific kinds of cereal, fruits, and vegetables that they fed their baby. This had been asked previously on the IFPQ-6 Months (page 213) and thus was omitted.

CODE NUMBER_____

DATE OF BIRTH_____ DATE_____

INFANT FEEDING TIME LINE (Infant 6 months)

AGE						
CONTROL HEAD AND NECK						
SIT WITH SUPPORT						
SLEEP THROUGH THE NIGHT						
PICK UP AND HOLD A SPOON						
	1 month (4 weeks)	2 months (8 weeks)	3 months (12 weeks	4 months (16 weeks)	5 months '20 weeks	6 months (24 weeks)
CEREAL						
VEGETABLES						
FRUIT						
MEAT PRODUCTS						
OTHER FOODS						

ORIGINAL QUESTIONNAIRE

TN 860

Code Number_____

Date_____

INFANT FEEDING TIME LINE

NARRATIVE

Here is an infant feeding time line that represents the life of your infant. We want you to mark down things that have occurred to your baby during various times since birth.

A. How old is your baby now? On the time line make an "X" in the block that reflects how old the baby is now.

B. How old was your baby when he/she could control their head and neck? On that line place an "X" in the age block.

C. How old was your baby when he/she could sit with support? On that line place an "X" in the age block.

D. How old was your baby when he/she slept consistently through the night?

Now go back to the "X"s that you marked and indicate with a letter C when you first gave your baby cereal, a letter V when you first gave your baby vegetables, and a letter F when you first gave your baby fruit.

Specifically what kind of cereal did you feed your baby?

What was the baby's response when you attempted to feed cereal the first time?

Did not swallow_____
swallowed readily_____
choked_____
leaned back and turned away_____
opened mouth and leaned forward_____

Specifically, what kind of vegetables did you feed your baby?

What was the baby's response when you attempted to feed vegetables?

ORIGINAL QUESTIONNAIRE

Did not swallow_____
swallowed readily_____
choked_____
leaned back and turned away_____
opened mouth and turned away_____

Specifically, what kind of fruits did you feed your baby?

What was the baby's response when you attempted to feed fruit?

Did not swallow_____
swallowed readily_____
choked_____
leaned back and turned away_____
opened mouth and turned away_____

Specifically, what other foods did you feed your baby?

What was the baby's response when you attempted to feed them?

Did not swallow_____
swallowed readily_____
choked_____
leaned back and turned away_____
opened mouth and turned away_____

DATE OF BIRTH_____

CODE NUMBER_____

DATE_____

INFANT FEEDING TIME LINE (Infant 6 months)

AGE						
CONTROL HEAD AND NECK						
SIT WITH SUPPORT						
SLEEP THROUGH THE NIGHT						
PICK UP AND HOLD A SPOON						
	1 month (4 weeks)	2 months (8 weeks)	3 months (12 weeks	4 months (16 weeks)	5 months '20 weeks	6 months (24 weeks)
CEREAL						
VEGETABLES						
FRUIT						
MEAT PRODUCTS						
OTHER FOODS						

REVISED QUESTIONNAIRE

TN 860

Code Number_____

Date_____

INFANT FEEDING TIME LINE (Infant 6 months old)

PART 2

NARRATIVE

Here is an infant feeding time line that represents the life of your infant. We want you to mark down things that have occurred to your baby during various times since birth.

A. How old is your baby now? On the time line make an "X" in the block that reflects how old the baby is now.

B. How old was your baby when he/she could control their head and neck? On that line place an "X" in the age block.

C. How old was your baby when he/she could sit with support? On that line place an "X" in the age block.

D. How old was your baby when he/she slept consistently through the night?

Now go back to the "X"s that you marked and indicate with a letter C when you first gave your baby cereal, a letter V when you first gave your baby vegetables, and a letter F when you first gave your baby fruit.

What was the baby's response when you attempted to feed cereal the first time?

Did not swallow_____
swallowed readily_____
choked_____
leaned back and turned away_____
opened mouth and leaned forward_____

What was the baby's response when you attempted to feed vegetables?

Did not swallow_____
swallowed readily_____
choked_____
leaned back and turned away_____
opened mouth and turned away_____

REVISED QUESTIONNAIRE

What was the baby's response when you attempted to feed fruit?

Did not swallow_____
swallowed readily_____
choked_____
leaned back and turned away_____
opened mouth and turned away_____

What was the baby's response when you attempted to feed meat?

Did not swallow_____
swallowed readily_____
choked_____
leaned back and turned away_____
opened mouth and turned away_____

What was the baby's response when you attempted to feed table food?

Did not swallow_____
swallowed readily_____
choked_____
leaned back and turned away_____
opened mouth and turned away_____

APPENDIX H

INSTRUMENT DEVELOPMENT AND TESTING

3. Instrument to assess physical growth and acceptance of food textures at 12 months (IFTL-12 Months).

Instrument Development

The Infant Feeding Time Line (IFTL-12 Months) for the 12 month interviews was different than that used at the 6 month interviews and consisted of two parts as shown on page 235. Part I of the IFTL-12 Months was developed using knowledge of gross and fine motor skills of infants at 12 months of age. Mothers were asked when their babies sat alone without support, took a bottle when sitting, but could not tip the bottle to receive formula, could take a bottle when sitting and could tip that bottle to receive formula, hold a spoon by themselves, and drink alone from a regular cup. Mothers also reported on foods eaten which included: dry ready-to-eat cereal, cooked cereal, strained meat, junior foods, meat from the table, raw vegetables, canned vegetables, and canned fruit. When mothers were shown an age line (7 months to 12 months or 28 weeks to 48 weeks), they responded by indicating when landmarks of growth and development occurred and when specific foods were added to their baby's diet (page 235). The interviewer recorded responses by infant age on the IFTL-12 Months form.

In Part II of the IFTL-12 Months, mothers indicated their babies acceptance of changes in food texture. This component of the IFTL-12 Months involved the American Academy of Pediatrics' recommendations about the infant's response if he/she is developmentally ready to indicate interest or disinterest in food. Mothers were asked if their babies did not swallow the food, swallowed the food, choked, leaned back and turned away, leaned forward to receive the food, or had enough teeth to chew the food (American Academy of Pediatrics, 1980). The interviewer recorded responses by infant age on the IFTL-12 Months.

Pilot Testing

The IFTL-12 month (page 235) was pretested utilizing a convenience sample of six mothers. The order of the questions in Part I:Section 1 was difficult for the interviewer; therefore questions were revised to reflect a more logical order by grouping certain food groups together. The age range was increased to 13 months or 52 weeks since at the time of the interview some of the infants would be over 12 months or 48 weeks of age.

Study criteria for the 12 month interviews allowed for infants interviews to be conducted from 11 to 13 months postpartum. Mothers were having difficulty remembering when their baby could hold a bottle and needed the bottle tipped to receive formula. Thus, this question was deleted and when their baby started to walk alone was added. Also the baby's ability to hold a regular cup was changed to his/her ability to hold a trainer cup. Part I:Section 2 did not need to be revised.

Results of the pilot test showed that Part II of the IFTL-12 did not sequence questions about specific foods eaten in the same order as Part I:Section 1 or specify foods as cooked or raw. Therefore, the order of questions was changed to the order used in Part I:Section 2 and specific descriptions of foods were added. Mothers were specifically asked what was the first food in each category that was fed. Therefore, blank spaces were added for this response (page 239).

DATE OF BIRTH_____ CODE NUMBER_____

DATE_____

INFANT FEEDING TIME LINE(1 YEAR OLD INFANTS)

REPORTED AGE

	7 months (28 weeks)	8 months (32 weeks)	9 months (36 weeks)	10 months (40 weeks)	11 months (44 weeks)	12 months (48 weeks)
CURRENT AGE						
DRINKS ALONE FROM A REGULAR CUP						
HOLDS SPOON BY SELF						
TAKES BOTTLE WHEN SITTING AND TIPS BOTTLE TO RECEIVE FORMULA						
TAKES BOTTLE WHEN SITTING, BUT NOT TIP BOTTLE TO RECEIVE FORMULA						
FOODS EATEN						
CEREAL, DRY READY TO EAT						
CEREAL, COOKED						
RAW VEGETABLES						
CANNED VEGETABLES						
RAW FRUIT						
CANNED FRUIT						
MEAT FROM THE TABLE						
JUNIOR FOODS						
STRAINED MEAT						

ORIGINAL QUESTIONNAIRE

TN 860

Code Number_____

Date_____

INFANT FEEDING TIME LINE (Infant 1 year)

NARRATIVE

Here is an infant feeding time line that represents the life of your infant. While we read this together I will be marking X's in the blocks that represent how old your infant was when various things occurred.

A. How old is your baby now? On the time line make an "X" in the block that reflects how old the baby is now.

B. How old was your baby when he/she could sit alone without support? On that line place an "X" in the age block.

C. How old was your baby when he/she could take their bottle when sitting, but not tip the bottle to receive formula? On that line place an "X" in the age block.

D. How old was your baby when he/she could hold their bottle with both hands, and tip the bottle to receive formula? On that line place an "X" in the age block.

E. How old was your baby when he/she could drink from a regular cup? On that line place an "X" in the age block.

F. How old was your baby when he/she could hold a spoon by self? On that line place an "X" in the age block.

Now go back to the "X"s that I marked and indicate with a X when you first gave your baby regular cereal, strained meat, junior foods, table meat, raw vegetables, regular canned vegetables, regular canned fruit.

What was the baby's response when you attempted to feed regular cereal?

Did not swallow_____
choked_____
leaned back and turned away_____
leaned forward to receive_____

ORIGINAL QUESTIONNAIRE

What was the baby's response when you attempted to feed strained meat for the first time?

Did not swallow_____
choked_____
leaned back and turned away_____
leaned forward to receive_____

What was the baby's response when you attempted to feed meat from the table for the first time?

Did not swallow_____
choked_____
leaned back and turned away_____
leaned forward to receive_____

What was the baby's response when you attempted to feed junior foods for the first time?

Did not swallow_____
choked_____
leaned back and turned away_____
leaned forward to receive_____

What was the baby's response when you attempted to feed raw vegetables for the first time?

Did not swallow_____
choked_____
leaned back and turned away_____
leaned forward to receive_____

What was the baby's response when you attempted to feed canned vegetables for the first time?

Did not swallow_____
choked_____
leaned back and turned away_____
leaned forward to receive_____

What was the baby's response when you attempted to feed canned fruit for the first time?

Did not swallow_____
leaned back and turned away_____
opened mouth and turned away_____
leaned forward to receive_____

D. OF BIRTH_____ CODE NUMBER_____ __

DATE_____

INFANT FEEDING TIME LINE(1 YEAR OLD INFANTS)

	REPORTED AGE					
	8 months (32 weeks)	9 months (36 weeks)	10 months (40 weeks)	11 months (44 weeks)	12 months (48 weeks)	13 months (48 weeks)
			DEVELOPMENT			
CURRENT AGE						
BEGAN TO WALK ALONE						
DRINKS ALONE FROM A TRAINER CUP						
HOLDS SPOON BY SELF						
TAKES BOTTLE WHEN SITTING AND TIPS BOTTLE TO RECEIVE FORMULA						
			FOODS EATEN			
CEREAL,READY-TO-EAT						
CEREAL, COOKED						
RAW VEGETABLES						
CANNED VEGETABLES						
RAW FRUIT						
CANNED FRUIT						
MEAT FROM THE TABLE						
JUNIOR FOODS						
STRAINED FOODS						

REVISED QUESTIONNAIRE

TN 860

Code Number_____

Date_____

INFANT FEEDING TIME LINE (Infant 12 months)

PART 2

NARRATIVE

Here is an infant feeding time line that represents the life of your infant. While we read this together I will be marking X's in the blocks that represent how old your infant was when she/he could do things, such as sitting alone or holding a spoon.

A. How old is your baby now? On the time line make an "X" in the block that reflects how old the baby is now.

B. How old was your baby when he/she could drink from a regular cup? On that line place an "X" in the age block.

C. How old was your baby when he/she could hold a spoon by self? On that line place an "X" in the age block.

D. How old was your baby when he/she could hold their bottle with both hands, and tip the bottle to receive formula? On that line place an "X" in the age block.

E. How old was your baby when he/she could take their bottle when sitting, but not tip the bottle to receive formula? On that line place an "X" in the age block.

Now go back to the "X"s that I marked and indicate with a X when you first gave your baby dry cereal, cooked regular cereal, meat from the table, regular canned vegetables, regular canned fruit, junior foods, strained meat.

What was the baby's response when you attempted to feed _____ dry,ready-to-eat cereal for the first time?

Did not swallow_____
Swallowed_____
Choked_____
Leaned back and turned away_____
Leaned forward to receive_____
Reported teething_____

REVISED QUESTIONNAIRE

What was the baby's response when you attempted to feed_____ regular cooked cereal for the first time the first time?

Did not swallow_____
Swallowed_____
Choked_____
Leaned back and turned away_____
Leaned forward to receive_____
Reported teething_____

What was the baby's response when you attempted to feed_____ canned vegetables the first time?

Did not swallow_____
Swallowed_____
Choked_____
Leaned back and turned away_____
Leaned forward to receive_____
Reported teething_____

What was the baby's response when you attempted to feed _____fresh fruit for the first time?

Did not swallow_____
Swallowed_____
Choked_____
Leaned back and turned away_____
Leaned forward to receive_____
Reported teething_____

What was the baby's response when you attempted to feed _____ canned fruit for the first time?

Did not swallow_____
Swallowed_____
Choked_____
Leaned back and turned away_____
Leaned forward to receive_____
Reported teething_____

What was the baby's response when you attempted to feed _____meat from the table for the first time?

Did not swallow_____
Swallowed_____
Choked_____
Leaned back and turned away_____
Leaned forward to receive_____
Reported teething_____

REVISED QUESTIONNAIRE

What was the baby's response when you attempted to feed _____ junior foods for the first time?

Did not swallow_____
Swallowed_____
Choked_____
Leaned back and turned away_____
Leaned forward to receive_____
Reported teething_____

What was the baby's response when you attempted to feed strained foods for the first time?

Did not swallow_____
Swallowed_____
Choked_____
Leaned back and turned away_____
Leaned forward to receive_____

How do you feel about the way your baby eats?

How do you feel about your baby's health?

APPENDIX I

INFANT ANTHROPOMETRIC FORM

CODE NUMBER_____

DATE_____

INFANT ANTHROPOMETRY FORM

Weight(4 1/2 to 6 1/2 months)

1._____ounces

2._____ounces

3._____ounces

Weight(11 to 13 months)

1._____ounces

2._____ounces

3._____ounces

Recumbent Length(4 1/2 to 6 1/2 months)

1._____inches

2._____inches

3._____inches

Recumbent Length(11 to 13 months)

1._____inches

2._____inches

3._____inches

Head circumference(4 1/2 to months)

1._____cm.

2._____cm.

3._____cm.

Head circumference (11 to 13 1/2 months)

1._____cm.

2._____cm.

3._____cm.

APPENDIX J

CODING OF RESEARCH DATA COLLECTED FROM ADOLESCENT AND ADULT MOTHERS

1. Coding of Infant Feeding Practice Questionnaire-Six Months (IFPQ-6).

Feeding Practice	Code
Fluids provided by mother:	
breast milk	0=no 1=yes
duration	weeks
formula	0=no 1=yes
ready-to-feed	1
concentrate	2
powdered	3
Enfamil	1
Prosobee	2
Nutramagen	3
Other	4
amount of formula/day	ounces
dillution of formula	
no mixing	0
equal amounts of water and formula	1
other mixture	2
milk	0=no 1=yes
2%	0=no 1=yes
whole	0=no 1=yes
skim	0=no 1=yes
other milk	0=no 1=yes
amount of milk/day	ounces
Koolaide	0=no 1=yes
amount of Koolaide/day	ounces
juices	0=no 1=yes
amount of juice/day	ounces
soda pop	0=no 1=yes
amount of soda pop/day	ounces

Feeding Practice	Code
bottle taken to bed	0=no 1=yes
infant formula	1
another beverage	2
infant formula plus food/foods	3
amount in bottle taken to bed	ounces
<u>Foods provided by mother:</u>	
cereal	0=no 1=yes
dry	1
strained/jar	2
dry and strained/jar	3
amount served/day	ounces/jar or Tablespoons
specific kinds of cereal served:	
oatmeal	0=no 1=yes
rice	0=no 1=yes
mixed	0=no 1=yes
other	0=no 1=yes
strained fruit	0=no 1=yes
size jars typically used	ounces
specific kinds of fruit served:	
peaches	0=no 1=yes
pears	0=no 1=yes
applesauce	0=no 1=yes
appricots	0=no 1=yes
other	0=no 1=yes
strained vegetables	0=no 1=yes
size jars typically used	ounces
specific kinds of vegetables served:	
carrots	0=no 1=yes
sweet potatoes	0=no 1=yes
green beans	0=no 1=yes
green peas	0=no 1=yes
garden vegetables	0=no 1=yes
squash	0=no 1=yes
creamed spinach	0=no 1=yes
creamed corn	0=no 1=yes
other	0=no 1=yes

Feeding Practice	Code	
table food	0=no	1=yes
specific table foods served:		
mashed potatoes	0=no	1=yes
canned vegetables	0=no	1=yes
fresh vegetables	0=no	1=yes
canned fruit	0=no	1=yes
fresh fruit	0=no	1=yes
other	0=no	1=yes
Methods of changing food texture:		
food processor	0=no	1=yes
blender	0=no	1=yes
food mill	0=no	1=yes
other kitchen utensil	0=no	1=yes
Other practices:		
vitamins and iron	0=no	1=yes
special diet	0=no	1=yes
allergies to food	0=no	1=yes
weight reduction	0=no	1=yes
other diet regimes	0=no	1=yes
Health care:		
medical care provider		
Medicaid		1
private insurance		2
other		3
payment of childbirth		
Medicaid		1
private insurance		2
other		3

Feeding Practice	Code
Sources of information about infant feeding:	
most important	
mother	1
grandmother	2
friend	3
health care provider	4
mother-in-law	5
experience with other children	6
stepmother	7
other	8
family	0=no 1=yes
when information received	
during pregnancy	1
after pregnancy	2
during and after pregnancy	3
friends	0=no 1=yes
when information received	
during pregnancy	1
after pregnancy	2
during and after pregnancy	3
health professionals	0=no 1=yes
when information received	
during pregnancy	1
after pregnancy	2
during and after pregnancy	3
others	0=no 1=yes
when information received	
during pregnancy	1
after pregnancy	2
during and after pregnancy	3
television	0=no 1=yes
when information received	
during pregnancy	1
after pregnancy	2
during and after pregnancy	3
newspapers	0=no 1=yes
when information received	
during pregnancy	1
after pregnancy	2
during and after pregnancy	3

Feeding Practice	Code
magazines	0=no 1=yes
when information received	
during pregnancy	1
after pregnancy	2
during and after pregnancy	3
others	0=no 1=yes
when information received	
during pregnancy	1
after pregnancy	2
during and after pregnancy	3
Reported illnesses/health care practices:	
prolonged illness	0=no 1=yes
hospitalization	0=no 1=yes
duration	weeks
harelip	0=no 1=yes
deficient palate	0=no 1=yes
excessive gag reflex	0=no 1=yes
jaw hangs	0=no 1=yes
Use of Women Infants and Children Program:	
during pregnancy	0=no 1=yes
after delivery	0=no 1=yes

APPENDIX J

CODING OF RESEARCH DATA COLLECTED FROM ADOLESCENT AND ADULT MOTHERS

2. Coding of Infant Feeding Practice Questionnaire-12 Months.

Feeding Practice	Code
Person/persons feeding baby	
mother	1
father	2
grandmother	3
babysitter	4
Fluids provided by person/persons	
breast milk	0=no 1=yes
duration	weeks
formula	0=no 1=yes
duration	weeks
ready-to-feed	1
concentrate	2
powdered	3
Enfamil	1
Prosobee	2
Nutramagen	3
Other	4
amount/day	ounces
dillution of formula	
no mixing	0
equal amounts of water and formula	1
other mixture	2
milk	0=no 1=yes
2%	0=no 1=yes
whole	0=no 1=yes
skim	0=no 1=yes
other milk	0=no 1=yes
amount/day	ounces
Koolaide	0=no 1=yes
amount/day	ounces

Feeding Practice	Code
juices	0=no 1=yes
amount/day	ounces
kind of juice served:	
apple	0=no 1=yes
pear	0=no 1=yes
peach	0=no 1=yes
orange	0=no 1=yes
mixed	0=no 1=yes
apple/cherry	0=no 1=yes
apple/grape	0=no 1=yes
other	0=no 1=yes
soda pop	0=no 1=yes
amount/day	ounces
bottle taken to bed	0=no 1=yes
infant formula	1
another beverage	2
infant formula plus food/foods	3
amount in bottle taken to bed	ounces
Foods provided by mother:	
cereal	0=no 1=yes
dry	1
strained/jar	2
dry and strained/jar	3
regular adult dry cereal	4
regular adult cooked cereal	5
sugar added	0=no 1=yes
fruit added	0=no 1=yes
formula added	0=no 1=yes
milk added	0=no 1=yes
kinds of cereal served:	
oatmeal	0=no 1=yes
rice	0=no 1=yes
mixed	0=no 1=yes
cherrios	0=no 1=yes
fruit loops	0=no 1=yes
kix	0=no 1=yes
typical amount served	cups

Feeding Practice	Code
fruit	0=no 1=yes
strained/jar	1
junior baby food	2
raw fruit	3
canned fruit	4
combination	5
cereal added	0=no 1=yes
vegetables added	0=no 1=yes
other foods added	0=no 1=yes
kinds of fruit served:	
bananas	0=no 1=yes
applesauce	0=no 1=yes
peaches	0=no 1=yes
pears	0=no 1=yes
other	0=no 1=yes
typical serving	cups
vegetables	0=no 1=yes
strained/jar	1
junior baby food	2
raw vegetables	3
canned vegetables	4
combination	5
cereal added	0=no 1=yes
other vegetables added	0=no 1=yes
other foods added	0=no 1=yes
kinds of vegetables served:	
mashed potatoes	0=no 1=yes
sweet potatoes	0=no 1=yes
squash	0=no 1=yes
green beans	0=no 1=yes
green peas	0=no 1=yes
other	0=no 1=yes
typical serving	cups

Feeding Practice	Code
meat	0=no 1=yes
strained/jar	1
junior baby food	2
regular meats	3
cereal added	0=no 1=yes
fruit added	0=no 1=yes
gravy added	0=no 1=yes
mashed potatoes added	0=no 1=yes
kinds of meat served:	
beef	0=no 1=yes
chicken	0=no 1=yes
fish	0=no 1=yes
hot dogs	0=no 1=yes
typical serving	ounces
custard	0=no 1=yes
no. of times served/week	
pudding	0=no 1=yes
no. of times served/week	
crackers	0=no 1=yes
no. of times served/week	
teething biscuits	0=no 1=yes
no. of times served/week	
ice cream	0=no 1=yes
no. of times served/week	
candy	0=no 1=yes
no. of times served/week	
potato chips	0=no 1=yes
no. of times served/week	
french fries	0=no 1=yes
no. of times served/week	
Methods of changing food texture:	
food processor	0=no 1=yes
blender	0=no 1=yes
food mill	0=no 1=yes
other kitchen utensil	0=no 1=yes

Feeding Practice	Code
Other practices:	
vitamins and iron	0=no 1=yes
special diet	0=no 1=yes
allergies to food	0=no 1=yes
weight reduction	0=no 1=yes
other diet regimes	0=no 1=yes
Reported illnesses/health care practices:	
illnesses in past year cold ear infection pneumonia rashes other illness	number of illnesses 1 2 3 4 5
prolonged illness	0=no 1=yes
hospitalization duration	0=no 1=yes weeks
harelip	0=no 1=yes
deficient palate	0=no 1=yes
excessive gag reflex	0=no 1=yes
jaw hangs	0=no 1=yes
weight lost when sick amount of weight loss	0=no 1=yes pounds

APPENDIX J

CODING OF RESEARCH DATA COLLECTED FROM ADOLESCENT AND ADULT MOTHERS

3. Coding of Infant Feeding Time Line-Six Months (IFTL-6).

Developmental Skill/ Food Category	Code
Part I	
Developmental skill	
control head and neck	months of age
skill not reported	.....
sit with support	months of age
skill not reported	.....
sleep through the night	months of age
skill not reported	.....
hold a spoon	months of age
skill not reported	.....
Infant age when introduced specific foods:	
cereal	months of age
not introduced	.....
vegetables	months of age
not introduced	.....
fruits	months of age
not introduced	.....
meat	months of age
not introduced	.....
table food	months of age
not introduced	.....
Part II	
Infant response when specific foods introduced:	
cereal	
did not swallow	0=no 1=yes
swallowed	0=no 1=yes
choked	0=no 1=yes
leaned back and turned away	0=no 1=yes
leaned forward to receive	0=no 1=yes
food not introduced	.....

Developmental Skill/ Food Category	Code

Part II (continued)

vegetables	
did not swallow	0=no 1=yes
swallowed	0=no 1=yes
choked	0=no 1=yes
leaned back and turned away	0=no 1=yes
leaned forward to receive	0=no 1=yes
food not introduced	.....
fruit	
did not swallow	0=no 1=yes
swallowed	0=no 1=yes
choked	0=no 1=yes
leaned back and turned away	0=no 1=yes
leaned forward to receive	0=no 1=yes
food not introduced	.....
meat	
did not swallow	0=no 1=yes
swallowed	0=no 1=yes
choked	0=no 1=yes
leaned back and turned away	0=no 1=yes
leaned forward to receive	0=no 1=yes
food not introduced	.....
table food	
did not swallow	0=no 1=yes
swallowed	0=no 1=yes
choked	0=no 1=yes
leaned back and turned away	0=no 1=yes
leaned forward to receive	0=no 1=yes
food not introduced	.....

APPENDIX J

CODING OF RESEARCH DATA COLLECTED FROM ADOLESCENT AND ADULT MOTHERS

4. Coding of Infant Feeding Time Line-12 Months (IFTL-12).

Developmental Skill/ Food Category	Code
Part I	
Development	
began to walk alone	months of age
not reported	.....
drank alone from a trainer cup	months of age
not reported	.....
held a spoon by self	months of age
not reported	.....
took bottle when sitting and tipped bottle to receive formula	months of age
not reported	.....
Infant age when foods introduced:	
cereal,ready-to-eat	months of age
not introduced	.....
cereal, cooked	months of age
not introduced	.....
raw vegetables	months of age
not introduced	.....
canned vegetables	months of age
not introduced	.....
raw fruit	months of age
not introduced	.....
canned fruit	months of age
not introduced	.....
meat from the table	months of age
not introduced	.....
junior foods	months of age
not introduced	.....

Developmental Skill/ Food Category	Code

Part II

Infant's response when foods introduced for the first time:

ready-to-eat cereal	
did not swallow	0=no 1=yes
swallowed	0=no 1=yes
choked	0=no 1=yes
leaned back and turned away	0=no 1=yes
leaned forward to receive	0=no 1=yes
reported teething	0=no 1=yes
not introduced	.....
regular cooked cereal	
did not swallow	0=no 1=yes
swallowed	0=no 1=yes
choked	0=no 1=yes
leaned back and turned away	0=no 1=yes
leaned forward to receive	0=no 1=yes
reported teething	0=no 1=yes
not introduced	.....
raw vegetables	
did not swallow	0=no 1=yes
swallowed	0=no 1=yes
choked	0=no 1=yes
leaned back and turned away	0=no 1=yes
leaned forward to receive	0=no 1=yes
reported teething	0=no 1=yes
not introduced	.....
canned vegetables	
did not swallow	0=no 1=yes
swallowed	0=no 1=yes
choked	0=no 1=yes
leaned back and turned away	0=no 1=yes
leaned forward to receive	0=no 1=yes
reported teething	0=no 1=yes
not introduced	.....
fresh fruit	
did not swallow	0=no 1=yes
swallowed	0=no 1=yes
choked	0=no 1=yes
leaned back and turned away	0=no 1=yes
leaned forward to receive	0=no 1=yes
reported teething	0=no 1=yes
not introduced	.....

Developmental Skill/ Food Category	Code

Part II (continued)

canned fruit	
did not swallow	0=no 1=yes
swallowed	0=no 1=yes
choked	0=no 1=yes
leaned back and turned away	0=no 1=yes
leaned forward to receive	0=no 1=yes
reported teething	0=no 1=yes
not introduced	.....
meat from the table	
did not swallow	0=no 1=yes
swallowed	0=no 1=yes
choked	0=no 1=yes
leaned back and turned away	0=no 1=yes
leaned forward to receive	0=no 1=yes
reported teething	0=no 1=yes
not introduced	.....
junior foods	
did not swallow	0=no 1=yes
swallowed	0=no 1=yes
choked	0=no 1=yes
leaned back and turned away	0=no 1=yes
leaned forward to receive	0=no 1=yes
reported teething	0=no 1=yes
not introduced	.....
Mother's feeling about:	
the way baby eats	qualitative analysis
baby's health	qualitative analysis

APPENDIX J

CODING OF RESEARCH DATA COLLECTED FROM ADOLESCENT AND ADULT MOTHERS

5. Coding of other research data collected.

Variable	Coding
Demographic and background information	Mother's age (years) Mother's education (years) Categories of employment[a]
Anthropometric data	Three measurements averaged to provide one measurement each for weight, length, and head circumference of each infant at six and 12 months

[a] Hollingshead Four Factor Index of Social Status (Hollingshead, 1976).

APPENDIX K

INFANT ILLNESS INDEX

SCORE AND CATEGORIES BY INFLUENCE ON FOOD INTAKE

Score	Illness Category
1	skin infection/rashes/thrush
2	cold
3	eye/ear infections
4	respiratory/allergies
5	gastrointestinal problems/colic/diarrhea
6	injury that immobilizes and influences food intake

Each day of hospitalization adds one point to the score.

_____days in hospital=_____score

Total score_____

APPENDIX L

SAMPLE ENROLLMENT/RETENTION

1. Enrollment of adolescent mothers[a].

Sample Enrollment/Retention	Number of Adolescent Mothers	
Total number of adolescent mothers interviewed during last trimester of pregnancy		115
Minus those individuals at six months postpartum who:		
Were without telephones and failed to respond to letters and messages	14	
Were not reached due to incorrect addresses and telephone numbers	10	
Were living out of state at six months postpartum	4	
Declined to continue with the study	8	
Placed her infant in foster care	1	
Had infants that were ineligible for this study[b]	3	
Total	40	
Total number of adolescent mothers interviewed six months postpartum		75

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Healh of Adolescents During and Post Pregnancy."

[b] Two of the infants were low birth weight and one infant had a five minute Apgar score of six.

APPENDIX L

SAMPLE ENROLLMENT/RETENTION

2. Retention of adolescent mothers[a] at 12 months postpartum.

Sample Retention	Number of Adolescent Mothers	
Total number of adolescent mothers interviewed six months postpartum		75
Minus those individuals at 12 months postpartum who:		
Were without telephones and failed to respond to letters and messages	3	
Were not reached due to incorrect addresses and telephone numbers	4	
Were living out of state at twelve months postpartum	2	
Declined to continue with the study	4	
Failed to keep her scheduled appointments	1	
Total	14	
Total number of adolescent mothers interviewed at both six and twelve months postpartum		61

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy."

APPENDIX L

SAMPLE ENROLLMENT/RETENTION

3. Enrollment/recruitment of adult mothers[a].

Sample Enrollment/Recruitment		Number of Adult Mothers	
Number of contacts/referrals			401
Method I[b]		91	
Method II[c]		271	
Referrals[d]		39	
Reasons for exclusion from the study:			
Did not meet criteria for inclusion in the study		242	
mother's age not 22-28 years	48		
mother's education <2 years college	87		
infant's age not 4 1/2 to 6 1/2 months	10		
combination of above	97		
Did not return mailed postcard		49	
Could not be contacted by telephone or letter		9	
Declined to participate		33	
Total		335	
Total number of participants who completed six month interviews			66

[a] Adult mothers recruited from same geographic region and of similar socioeconomic status as the adolescent mothers.

[b] Identified through birth records in local newspapers and contacted by letter with a return postcard.

[c] Identified through birth records in local newspapers and contacted by telephone.

[d] Referrals from private and public medical clinics who returned a postcard and referrals from other participants in the study.

APPENDIX L

SAMPLE ENROLLMENT/RETENTION

4. Retention of adult mothers[a] at 12 months postpartum.

Sample Retention		Number of Adult Mothers
Total number of adult mothers interviewed at six months		66
Minus those individuals at 12 months postpartum who:		
Were without telephones and failed to respond to letters and messages	2	
Were not reached due to incorrect addresses and telephone numbers	2	
Declined to continue with the study	2	
Total	6	
Total number of adult mothers interviewed at six and twelve months		60

[a] Adult mothers recruited from same geographic region and of similar socioeconomic status as the adolescent mothers.

APPENDIX M

INFANT FEEDING PRACTICE DATA

1. Infant feeding practices of adolescent[a] mothers (n=61) at six month interviews.

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Breast feeding	
provided breast milk to infants at six month interviews	0
ever breast fed	12 (20)
duration of breast feeding	0.3 to 16 weeks
when decided to breast feed	
during pregnancy	12 (100)
after pregnancy	0
gave formula also	2
kind of formula	
concentrate	2
average amount of formula given with breast milk	8 ± 5.7 fluid ounces
Formula feeding	
mothers providing	
formula at six month interviews	58 (95 percent)
fed formula only (never breast fed)	46
fed formula after breast feeding	12
fed formula then changed to milk	3
when decided to fed formula	
during pregnancy	41
after pregnancy	5
after breast feeding	12
kind of formula given	
ready-to-feed	15
concentrate	42
powdered	1

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Formula feeding (continued)	
dillution of the formula	
half formula and half water	42
no mixing	4
mixed formula with milk	12
average amount of formula provided	32.3 ± 10.6 fluid ounces
Cow's milk	
mothers providing cow's milk at the six month interviews	15 (26 percent)
provided cow's milk and no formula	3
provided cow's milk with formula	12
kind of cow's milk provided	
2 percent	4
whole	10
chocolate	1
average/daily amount of milk provided	10.1 ± 12.0 fluid ounces
Bottles taken to bed	
mothers providing bottles in bed	30
kind of fluid provided in bottles	
formula	23
2 percent milk, juice, baby food,	5
formula plus other food (cereal, fruit)	2
average/daily amount of fluid provided	6.1 ± 1.0 fluid ounces

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Other beverages provided	
Juice	
total number of mothers who provided juice at 6 month interviews	59 (97)
kind of juice provided	
infant	58
adult	1
types of infant juice provided	
apple	39
apple/cherry	22
apple/grape	18
mixed fruit	12
apple/banana	8
orange	5
pear	4
apple/prune	3
grape	3
cranapple	2
apple/cranberry	2
prune	2
others[b]	3
average/daily serving of juice	6.5 ± 4.6 fluid ounces
Koolaide	
total number of mothers who provided koolaide	10 (16)
average/daily serving	3.5 ± 4.8 fluid ounces
Carbonated beverages	
total number of mothers who provided soda pop	29 (48)
average/daily serving	1.2 ± 1.4 fluid ounces

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Cereal	
total number of mothers who provided cereal	61 (100)
kind of cereal provided	
dry infant cereal	42 (69)
strained infant cereal	12 (20)
dry and strained infant cereal	7 (11)
average typical serving of dry infant cereal	6.1 ± 4.3 Tablespoons
average typical serving of strained infant cereal	4.2 ± 1.0 ounces
types of dry infant cereal provided	
rice	34
oatmeal	16
mixed	11
barley	3
rice with bananas	2
types of strained infant cereal provided	
rice	13
oatmeal	9
mixed	7
Strained fruit	
total number of mothers who provided strained fruit	58 (95)
average/typical serving	4.1 ± 1.6 ounces
types of strained fruit provided	
peaches	44
pears	36
applesauce	33
bananas	30
apricots	7
prunes	4
mixed fruit	4

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Strained fruit (continued)	
types of strained fruit provided (continued)	
plums	4
pineapple	2
others[c]	2
Strained vegetables	
total number of mothers who provided strained vegetables	50 (82)
average/typical serving	3.6 ± 1.2 ounces
types of strained vegetables provided:	
green beans	35
green peas	34
carrots	32
sweet potatoes	24
squash	23
mixed	6
corn	4
garden	4
creamed corn	4
vegetable/bacon	4
spinach	3
beets	3
vegetable/beef	8
others[d]	
Strained meat	
total number of mothers who provided strained meat	14 (23)
kind of strained meat provided	
ham	4
chicken	4
lamb	2
turkey	2
beef	2
veal	2

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Table food	
total number of mothers who provided table food	48 (79)
kind of table food provided	
mashed potatoes	39
gravy	23
eggs	7
ice cream	7
beans	6
soup	3
green peas	3
green beans	3
crackers	3
bread	3
biscuits	3
cottage cheese	2
pizza	2
cheese	2
cookies	2
gelatin	2
suckers	2
popsickles	2
other miscellaneous table foods provided[e]	32
how mothers modified table food	
food processor	0
blender	1
food mill	0
other kitchen utensil	25
no modification	22

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Other feeding practices	
provided vitamin and mineral drops	7
infant received a special diet	4
infant had food allergies	4
infant needed to lose weight	3
infant needed to gain weight	1

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

[b] Other juices mothers reported feeding were apple/orange, apple/prune, grapefruit.

[c] Other strained fruits mothers reported feeding were banana/pineapple, pear/pineapple.

[d] Other strained vegetables mothers reported feeding were vegetable/ham, vegetable/turkey, vegetable/chicken.

[e] Other table foods mothers reported feeding were green peas, oatmeal, corn, french fries, sweet potatoes, carrots, spaghetti sauce, bread soaked in milk, peanut butter fudge, butter, sour cream, cottage cheese, cheese, balogna, peach juice, chocolate pudding, chocolate ice cream, chicken noodle soup.

APPENDIX M

INFANT FEEDING PRACTICE DATA

2. Infant feeding practices of adult[a] mothers (n=60) at six month interviews.

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Breast feeding	
provided breast milk to infants at six month interviews	10 (17)
ever breast fed	21 (35)
duration of breast feeding	1 to 24 weeks
when decided to breast feed	
during pregnancy	21 (100)
after pregnancy	0
gave formula also	5
kind of formula	
concentrate	5
average amount of formula given with breast milk	10.3 ± 10.3 fluid ounces
Formula feeding	
mothers providing	
formula at six month interviews	50 (83 percent)
fed formula only (never breast fed)	39
fed formula after breast feeding	11
when decided to fed formula	
during pregnancy	36
after pregnancy	3
after breast feeding	11
kind of formula given	
ready to feed	3
concentrate	40
powdered	7

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Formula feeding (continued)	
dillution of the formula	
half formula and half water	41
no mixing	3
mixed formula with milk	6
average amount of formula provided	30.7 ± 8.3 fluid ounces
Cow's Milk	
mothers providing cow's milk at the six month interviews	5 (8.3 percent)
mothersproviding cow's milk with formula	5
kind of cow's milk provided	
2 percent milk	3
whole milk	1
skim milk	1
other	1
average/daily amount of milk provided	7.2 ± 9.9 fluid ounces
Bottles taken to bed	
mothers providing bottles in bed	2
kind of fluid provided in bottles	
formula	2
average/daily amount of fluid provided	7.0 ± 1.4 fluid ounces

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Other beverages provided	
Juice	
total number of mothers who provided juice at 6 month interviews	53 (88)
kind of juices provided	
infant	48
adult	5
types of infant juices provided	
apple	47
apple/cherry	22
apple/grape	20
pear	18
white grape	15
grape	3
mixed fruit	2
apple/banana	2
orange	2
other juices provided[b]	
average/daily serving of juice	4.4 ± 3.0 fluid ounces
Koolaide	
total number of mothers who provided Koolaide	3 (5)
average/daily serving	4.0 ± 3.6 fluid ounces
Carbonated beverages	
total number of mothers who provided soda pop	5 (8)
average/daily serving	3.0 ± 5.1 fluid ounces

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Cereal	
total number of mothers who provided cereal	60 (100)
kind of cereal provided	
dry infant cereal	42 (70)
strained infant cereal	11 (18)
dry and strained infant cereal	4 (7)
average typical serving of dry infant cereal	4.6 ± 2.3 Tablespoons
average typical serving of strained infant cereal	3.6 ± 1.2 ounces
types of dry infant cereal provided	
rice	46
oatmeal	22
mixed	9
barley	3
rice with bananas	3
types of strained infant cereal provided	
rice	11
oatmeal	4
mixed	4
Strained fruit	
total number of mothers who provided strained fruit	51 (85)
average/typical serving	3.5 ± 1.1 ounces
types of strained fruit provided	
applesauce	49
pears	41
peaches	37
bananas	33
apricots	12

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Strained fruit (continued)	
types of strained fruit provided (continued)	
plums	8
prunes	7
mixed fruit	5
others[c]	6
Strained vegetables	
total number of mothers who provided strained vegetables	44 (73)
average/typical serving	3.4 ± 0.9 ounces
types of strained vegetables provided	
carrots	36
squash	34
green beans	33
green peas	33
sweet potatoes	22
vegetable/bacon	8
corn	8
mixed	7
garden	7
vegetable/ham	6
vegetable/beef	6
beets	5
vegetable/turkey	4
spinach	3
vegetable/chicken	2
others[d]	3

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Strained meat	
total number of mothers who provided strained meat	7 (12)
kind of strained meat provided	
chicken	4
ham	3
turkey	3
beef	2
lamb	1
Table food	
total number of mothers who provided table food	19 (32)
kind of table food provided	
mashed potatoes	17
gravy	6
biscuits	6
green beans	4
beans	2
green peas	2
bread	2
other miscellaneous table foods provided[e]	9
how mothers modified table food	
food processor	0
blender	0
food mill	0
other kitchen utensil	12
no modification	7

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Other feeding practices	
provided vitamin and mineral drops	3
infant received a special diet	4
infant had food allergies	6
infant needed to lose weight	1
infant needed to gain weight	3

[a] Infants of adult mothers (ages 22-28 years) recruited from same geographic region and similar socioeconomic status as the adolescent mothers.

[b] Other juices that one mother reported feeding were apple/prune, cranapple, prune, apple/orange, apple/peach, apple/pineapple, carrot, juicy juice, apple/prune.

[c] Other strained fruits that one mother reported feeding were mango, pappya, orange/pineapple, apple/banana, apple/pears, apple/apricot.

[d] Other strained vegetables that one mother reported feeding were vegetable/beef, carrots/beef, carrots/peas.

[e] Other table foods that one mother reported feeding were eggs, crackers, french fries, frosted flakes, raisin bran, egg yolk, rice, pudding.

APPENDIX M

INFANT FEEDING PRACTICE DATA

3. Infant feeding practices of adolescent[a] mothers (n=61) at 12 month interviews.

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Breast Feeding	
provided breast milk to infants at 12 month interviews	0
Formula Feeding	
mothers providing formula at 12 month interviews	26 (43)
formula provided by	
bottle	17
cup	4
bottle and cup	5
average amount of formula provided	
bottle	26.6 ± 11.5 fluid ounces
cup	13.8 ± 8.8 fluid ounces
Formula feeding discontinued	
infant age when mothers stopped providing formula	9.2 ± 2.7 months
Cow's Milk	
mothers providing cow's milk at the 12 month interviews	59 (97)
provided cow's milk only	39 (64)
provided cow's milk and formula	20 (33)

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Cow's milk (continued)	
kind of milk provided	
2 percent milk	
bottle	5
cup	14
bottle and cup	3
whole milk	
bottle	16
cup	24
bottle and cup	10
nutrish	1
chocolate	1
sweet acidopholous	1
average/daily amount of milk provided	
bottle	19.0 ± 9.9 fluid ounces
cup	10.0 ± 7.4 fluid ounces
Bottles taken to bed	
mothers providing bottles in bed	38 (62)
kind of fluid provided in bottles	
formula	21
milk	15
orange drink	1
water	1
average/daily amount of fluid provided	7.1 ± 7.5

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Other beverages provided	
Juice	
total number of mothers who provided juice at 12 month interviews	58 (95)
juices provided by	
bottle	33
cup	15
bottle and cup	10
kind of juices provided	
infant	35
adult	13
infant and adult	10
types of infant juices provided	
apple	33
apple/cherry	19
orange	25
apple/grape	22
pear	5
apple/banana	5
apple/cranberry	5
mixed	6
prune	3
grape	13
others[b]	5
types of adult juices provided	
apple	12
cranberry	2
grape	5
orange	4
pineapple	4
average/daily amount of juice provided	
cup	5.2 ± 2.0 fluid ounces
bottle	5.9 ± 3.4 fluid ounces

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Koolaide	
total number of mothers who provided Koolaide	27 (44)
provided by	
bottle	3
cup	20
bottle and cup	4
average/daily amount of Koolaide provided	6.5 ± 5.1 fluid ounces
Carbonated beverages	
total number of mothers who provided carbonated beverages	48 (79)
provided by	
bottle	11
cup	33
bottle and cup	4
average/daily amount of soda pop provided	4.6 ± 2.8 fluid ounces
Cereal	
total number of mothers who provided cereal	57 (93)
total number of mothers who did not provided cereal	4
kind of cereal provided	
dry infant cereal	7
strained infant cereal	1
regular dry cereal	13
regular cooked cereal	3
combinations of the above	
dry and jar infant cereal	2
regular dry and cooked cereal	15
dry infant and regular dry	3
jar infant and regular cooked	4
dry infant and rerular cooked	3

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Cereal (continued)	
kind of cereal provided (continued)	
dry infant, regular dry and regular cooked	3
jar and regular dry cereal	2
dry and strained infant and regular dry and cooked	1
type of infant cereal provided	
dry infant cereal	
rice	18
oatmeal	12
mixed	12
barley	4
others[c]	2
strained infant cereal	
rice	8
oatmeal	7
mixed	5
regular dry cereal	
Cherrios	22
Fruit Loops	7
Rice Krispies	6
Cornflakes	6
Fruity Pebbles	4
Lucky Charms	4
Golden Grams	2
Honey-Nut Cherrios	2
Others[d]	17
regular cooked cereal	
oatmeal	20
grits	2
cream of rice	6
cream of wheat	6
average/typical serving of	
dry infant cereal	5.8 ± 3.7 Tablespoons
strained infant cereal	4.5 ± 3.5 ounces
regular dry cereal	0.8 ± 0.2 cups
regular cooked cereal	0.4 ± 0.3 cups
what mothers added to cereal	
sugar	11
fruit	6
formula	4
milk	23

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Fruit	
total number of mothers who provided fruit	61 (100)
kind of fruit provided	
strained baby food	3
junior baby food	0
raw	7
cooked or canned	2
combinations of the above	
raw and canned	20
strained baby food, raw, and canned	7
strained baby food, and raw	10
junior baby food, and raw	4
junior baby food, raw, and cooked	1
strained and junior baby food, and raw and cooked or canned	3
strained baby food, and cooked	3
strained and junior baby food	1
types of strained/junior fruit provided	
bananas	15
peaches	19
applesauce	16
pears	21
apricots	6
dutch apple dessert	3
fruit dessert	2
hawaiian delight	3
others[e]	4

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Fruit (continued)	
types of raw fruit provided	
bananas	43
apples	25
grapes	7
peaches	5
pears	3
cantaloupe	2
watermelon	5
plums	2
oranges	5
strawberries	5
nectarines	4
types of canned fruit provided	
applesauce	13
pineapple	4
peaches	19
pears	4
fruit cocktail	12
average/daily serving	
strained/junior fruit	4.5 ± 1.8 ounces
raw fruit	1 to 1.5 whole
cooked or canned fruit	0.8 ± 0.3 cup
what mothers added to fruit	
infant dry oatmeal	2
cinnamon	1
sweet and low	1
Vegetables	
total number of mothers who provided vegetables	61 (100)

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Vegetables (continued)	
kind of vegetables provided	
strained baby food	3
junior baby food	0
raw	0
cooked	18
combinations of the above	
strained baby food and cooked	17
raw and cooked	7
junior baby food and cooked	4
strained baby food and raw	1
strained and junior baby food and cooked	3
strained baby food and raw and cooked	2
junior baby food and raw and cooked	2
strained and junior baby food and raw and cooked	4
types of vegetables provided	
strained/junior	
green beans	20
carrots	17
green peas	19
corn	10
sweet potatoes	8
squash	3
spinach	2
mixed	2
beets	1
raw/cooked	
potatoes	45
green beans	42
carrots	21
sweet potatoes	9
green peas	30
corn	26
pinto beans	15
broccoli	11
mixed	3
cauliflower	3
squash	3
others[f]	9

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Vegetables (continued)	
average/typical serving	
strained vegetables	4.2 ± 2.1 ounces
raw and cooked	0.7 ± 1.8 cups
what mothers added to vegetables	
meats	1
strained meat	1
butter	7
gravy	3
salt	7
Meat	
total number of mothers who provided meat	56 (92)
kinds of meat provided	
strained baby food	4
junior baby food	3
table food	34
combinations of above	
strained baby food and table food	6
junior baby food and table food	6
strained and junior baby food and table food	3
types of meat provided	
strained/junior baby food	
turkey	8
beef	9
ham	5
chicken	7
table food	
chicken	37
hamburger	26
ham	11
steak	13
meatloaf	2
pork chops	6
fish	10
bacon	3

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Meat (continued)	
table food (continued)	
sausage	5
balogna	2
hot dogs	10
others[g]	7
average/typical serving	
strained baby food	2.4 ± 0.7 ounces
junior baby food	6.0 ± 0.0 ounces
table food	3.8 ± 1.2 Tablespoons
what mothers added to meat	
fruit	1
gravy	6
mashed potatoes	5
vegetables	3
Other foods provided	
custard	15
pudding	32
saltine crackers	57
teething biscuits	26
ice cream	53
candy	28
potato chips	30
french fries	51
other foods[h]	25
Foods provided at fast food restaurants	
mothers providing food at fast food restaurants	56 (92)
mothers who did not take their baby to fast food restaurants	5 (08)
foods provided:	
hamburgers	34
french fries	47
chicken nuggets	5
cheeseburgers	4
pop	14
brings baby food and formula	6
other foods[i]	5

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Other restaurants	
mothers providing food at other restaurants	54 (88)
mothers that did not take their baby to other restaurants	7 (12)
foods provided:	
table food	2
mashed potatoes	15
green beans	5
vegetables	5
vegetable bar	3
salad bar	1
steak	3
crust of pizza	4
pizza	3
chicken	2
macaroni and cheese	2
french fries	3
others[J]	15
Modification of table food	
mothers who modified table food	48 (79)
mothers who did not modify table food	13 (21)
method of modification:	
food processor	1
blender	2
food mill	1
knife	22
fork	26
spoon	15
Other feeding practices	
vitamin and mineral supplements	10 (16)
Daily vitamin	3
Polyvisol	4
Navisol	1
Flouride	2

Feeding Practice	Number of Adolescent Mothers (Percent of n=61 Mothers)
Other feeding practices (continued)	
who fed the baby?	
mother only	14 (23)
mother and grandmother	24 (39)
mother and day care	3
mother and babysitter	10
mother and sister	2
mother and dad	6
mother and aunt	1
mother and uncle, aunt and cousin	1

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

[b] Other juices mothers reported feeding were cherry, apple/peach, white grape, apple/peach, apple/pear, Five-Alive, banana, and yogurt juice.

[c] Other dry infant cereals mothers reported feeding were rice and bananas, oatmeal and bananas, and high protein.

[d] Other regular dry cereals mothers reported feeding were bran flakes, wheat chex, fruit rings, corn chex, raisin bran, frosted flakes, sugar pops, apple jacks, count dracula, corn pops, and coca puffs.

[e] Other strained fruits mothers reported feeding were cherry cobbler, pear/pineapple, and tuti fruti.

[f] Other raw/cooked vegetables mothers reported feeding were yams, celery, cabbage, green peppers, onion, and tomatoes.

[g] Other regular table food/meats that mothers reported feeding were turkey hot dogs, ribs, venison, turkey, pepperoni, and sloppy joe.

[h] Other foods that mothers reported feeding were graham crackers, fudge sickles, vanilla wafers, cookies, biscuits, Tic Tacs, spaghetti, sour cream, pancakes, toast, sauerkraut, and enchilatas.

[i] Other foods mothers reported feeding at fast food restaurants were cookies, fish, ice cream, and milk.

[j] Other foods that mothers fed in other restaturants were soup, eggs, crackers, fish, salad, ice cream, tacos, hush puppies, cheese, corn bread, and lasagna.

APPENDIX M

INFANT FEEDING PRACTICE DATA

4. Infant feeding practices of adult[a] mothers (n=60) at 12 month interviews.

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Breast Feeding	
provided breast milk to infants at 12 month interviews	9
Formula Feeding	
mothers providing formula at 12 month interviews	25 (41)
formula provided by	
bottle	22
cup	2
bottle and cup	1
average amount of formula provided	
bottle	28.7 ± 10.2 fluid ounces
cup	8.0 ± 0.0 fluid ounces
Formula feeding discontinued	
infant age when fomrula feeding discontinued	10.7 ± 1.5 months
Cow's Milk	
mothers providing cow's milk at the 12 month interviews	57 (95)
provided cow's milk only	35 (58)
provided cow's milk and formula	22 (37)

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Cow's milk (continued)	
kind of milk provided	
2 percent milk	
bottle	12
cup	18
bottle and cup	3
whole milk	
bottle	12
cup	10
bottle and cup	4
nutrish	1
average/daily amount of milk provided	
bottle	15.2 ± 9.4 fluid ounces
cup	14.7 ± 7.2 fluid ounces
Bottles taken to bed	
mothers providing bottles in bed	4 (7)
kind of fluid provided in bottles	
formula	1
milk	3
average/daily amount of fluid provided	9.7 ± 5.5 fluid ounces
Other beverages provided	
Juice	
total number of mothers who provided juice at 12 month interviews	59 (98)
juices provided by	
bottle	25
cup	20
bottle and cup	4

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Juice (continued)	
kind of juices provided	
infant	20
adult	39
infant and adult	2
types of infant juices provided	
apple	29
apple/cherry	12
orange	12
apple/grape	6
pear	4
apple/banana	4
apple/cranberry	4
mixed	6
prune	3
grape	12
others[b]	6
types of adult juices provided	
apple	30
cranberry	4
grape	10
juicy juice	20
average/daily amount of juice provided	
cup	6.2 ± 2.8 fluid ounces
bottle	4.5 ± 1.2 fluid ounces
Koolaide	
total number of mothers who provided Koolaide	18 (30)
provided by	
bottle	0
cup	18
average/daily amount of Koolaide provided	6.7 ± 2.5 fluid ounces

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Carbonated beverages	
total number of mothers who provided carbonated beverages	4 (07)
provided by cup	4
average/daily amount of carbonated beverages provided	3.5 ± 1.7 fluid ounces
Cereal	
total number of mothers who provided cereal	59 (98)
total number of mothers who did not provided cereal	1
kind of cereal provided	
dry infant cereal	2
strained infant cereal	0
regular dry cereal	20
regular cooked cereal	6
combinations of the above	
dry and jar infant cereal	2
regular dry and cooked cereal	17
dry infant and regular dry	12
kind of infant cereal provided	
dry infant cereal	
rice	12
oatmeal	10
mixed	4
barley	4
regular dry cereal	
Cherrios	55
Fruit Loops	8
Rice Krispies	2
Kix	8
Others[d]	8

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Cereal (continued)	
regular cooked cereal	
oatmeal	14
grits	2
cream of rice	2
cream of wheat	2
average/typical serving of	
dry infant cereal	5.5 ± 2.2 Tablespoons
regular dry cereal	0.6 ± 0.2 cups
regular cooked cereal	0.6 ± 0.1 cups
what mothers added to cereal	
sugar	4
fruit	4
formula	12
milk	8
juice	1
Fruit	
total number of mothers who provided fruit	59 (98)
kind of fruit provided	
strained baby food	5
junior baby food	0
raw	4
cooked or canned	2
combinations of the above	
raw and canned	32
strained baby food, raw, and canned	2
strained baby food, and raw	4
junior baby food, and raw	2
junior baby food, raw, and cooked	2
strained and junior baby food, and raw	1
strained baby food, and cooked	2
strained and junior baby food	1
junior baby food and canned	2

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Fruit (continued)	
types of strained/junior fruit provided	
bananas	14
peaches	20
applesauce	16
pears	22
apricots	10
plums	6
mixed	4
apple blueberry	4
others[e]	4
types of raw fruit provided	
bananas	54
apples	12
grapes	2
peaches	5
pears	2
cantaloupe	4
watermelon	10
plums	2
oranges	5
strawberries	2
types of canned fruit provided	
applesauce	30
pineapple	4
peaches	28
pears	22
fruit cocktail	2
average/daily serving	
strained/junior fruit	4.6 ± 1.2 ounces
raw fruit	1 to 1.5 whole
cooked or canned fruit	0.7 ± 0.2 cup
what mothers added to fruit	
infant dry oatmeal	0
vegetables	0
other	0

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Vegetables	
total number of mothers who provided vegetables	60 (100)
kind of vegetables provided	
strained baby food	4
junior baby food	0
raw	0
cooked	39
combinations of the above	
strained baby food and cooked	9
raw and cooked	6
junior baby food and cooked	2
types of vegetables provided	
strained/junior	
green beans	8
carrots	14
green peas	12
sweet potatoes	8
squash	6
garden	6
mixed	2
corn	2
raw/cooked	
potatoes	50
green beans	42
carrots	45
sweet potatoes	2
green peas	55
corn	18
pinto beans	10
broccoli	10
squash	6
others[1]	4
average/typical serving	
strained vegetables	4.4 ± 1.2 ounces
raw and cooked	0.6 ± 0.7 cups
what mothers added to vegetables	
butter	4
gravy	2
salt	3

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Meat	
total number of mothers who provided meat	46 (77)
kinds of meat provided	
strained baby food	2
junior baby food	2
table food	36
combinations of above	
strained baby food and table food	3
junior baby food and table food	2
strained and junior baby food and table food	1
types of meat provided	
strained/junior baby food	
turkey	4
beef	4
ham	2
chicken	5
table food	
chicken	35
hamburger	28
ham	12
meatloaf	6
pork chops	4
fish	20
hot dogs	6
sausage	4
shrimp	2
balogna	3
others[f]	4
average/typical serving	
strained baby food	2.2 ± 0.4 ounces
junior baby food	6.0 ± 0 ounces
table food	2.7 ± 0.9 Tablespoons
what mothers added to meat	
fruit	0
gravy	0
mashed potatoes	0
vegetables	0

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Other foods provided	
custard	6
pudding	24
saltine crackers	58
teething biscuits	6
ice cream	50
candy	6
potato chips	18
french fries	56
other foods[g]	20
Foods provided at fast food restaurants	
mothers who provided food at fast food restaurants	46 (77)
mothers who did not take their babies to these restaurants	14 (23)
types of food provided:	
hamburgers	28
french fries	22
chicken nuggets	2
cheeseburgers	2
pop	6
other foods[h]	2
Foods provided at other restaurants	
mothers who provided food at other restaurants	52 (87)
mothers who did not take their babies to other restaurants	8 (13)

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Foods provided at other restaurants	
types of food provided:	
table food	2
mashed potatoes	24
green beans	12
tacos	5
burritos	4
spaghetti	4
chicken	10
vegetable bar	2
pasta	5
pizza	12
bread	2
macaroni and cheese	3
others[1]	9
bring baby food	10
Modification of table food	
mothers who modified table food	56 (93)
mothers who did not modify table food	4 (07)
method of food modification	
food processor	0
blender	4
food mill	2
knife	38
fork	40
spoon	4

Feeding Practice	Number of Adult Mothers (Percent of n=60 Mothers)
Other feeding practices	
vitamin and mineral supplements	8 (13)
Polyvisol	2
Vidal Mulivitamin	2
Flouride	4
iron supplement	1
who fed the baby?	
mother only	30 (50)
mother and grandmother	11 (18)
mother and day care	8 (13)
mother and babysitter	5 (08)
mother and dad	6 (10)

[a] Adult mothers (ages 22-28 years) recruited from same geographic region and similar socio-economic status as the adolescent mothers.

[b] Other juices mothers reported feeding were apple/pineapple, cranberry, carrot, banana, and yogurt.

[c] Other regular dry cereals mothers reported feeding were grape nuts flakes, corn flakes, raisin bran, and captain krunch.

[d] Other strained fruits mothers reported feeding were peach cobbler, and pear/pineapple.

[e] Other raw/cooked vegetables mothers reported feeding were kidney beans, greens, spinach, french fries, tater tots, cauliflower, asparagus, okra, and cucumbers.

[f] Other regular table food/meats mothers reported feeding were tuna, turkey, spagetti, beef-a-roni, and peanut butter.

[g] Other foods mothers reported feeding were rice, toast, breakfast biscuits, fudge sickles, pasta, watermelon, cheese, white cake, popcorn, peanut butter, yogurt.

[h] Other foods mothers reported feeding in fast food restaurants were chicken nuggets, fish, mini burgers, and cookies.

[i] Other foods mothers reported feeding in other restaurants were roast beef, corn bread, pasta, crackers, biscuits, vegetables, bread, bread dressing, cottage cheese, and peaches.

APPENDIX N

MOTHERS' FEELINGS ABOUT THE WAY INFANTS EAT

1. Adolescent mothers'[a] (n=61) feelings about the way infants eat.

Categories	Number of (n=61) Adolescent Mothers
Positive	He/she is eating fine or good-30 I like it-6 I'm happy about it-1 It's OK-3 It's alright-2
How much infant eats?	He/she eats too much-2 He/she doesn't eat enough-6 He/she wants to eat more-1
Variety of food eaten	He/she eats everything-1 He/she is a picky eater-1
Feeding process	It takes to long to feed him/her-1 My baby wants to eat more-1 She/he is not interested in meals-1
Health	He/she is a healthy eater-1 He/she is getting too fat-1 OK as long as Doctor says OK-1
Needs improvement	It was not good, but is good now-1 It could be better-1

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

APPENDIX N

MOTHERS' FEELINGS ABOUT THE WAY INFANTS EAT

2. Adult Mothers'[a] (n=60) feelings about the way infants eat.

Categories	Number of (n=60) Adult Mothers
Positive	He/she is eating fine/good-21 He/she does well-2 I'm satisfied-2 I'm not worried-1
How much infant eats?	He/she eats too much-4 He/she eats like a horse-1 He/she isnot eating enough-3
Variety of food eaten	He/she eats everything-16 He/she is not picky-4 He/she is a picky eater-5
Health	I'm afraid to give milk-1

[a] Infants of adult mothers (ages 22-28 years) recruited from same geographic region and similar socioeconomic status as the adolescent mothers.

APPENDIX O

MOTHERS' FEELINGS ABOUT INFANTS' HEALTH

1. Adolescent mothers'[a] (n=61) feelings about infants' health.

Categories	Number of (n=61) Adolescent Mothers
Positive	He/she is healthy-7 He/she is fine-6 It is good-22 It is OK-9 I like it-2 I'm satisfied-1 It's alright-1 I'm proud of it-1 He/she is in perfect health-1
Healthy with illness	I can't do much about allergies-1 Healthy except for bronchitis-2 Healthy, but ear infections all the time-2 Healthy other than asthma-1 I'm worried if my baby is OK-1 He/she is OK, but in 4 or 5 years will have spleen removed-1
Infant weight	He/she's weight could be improved-2 He/she is underweight-1
Food	He/she is healthy, not starving-1
Physician visits	He/she is healthy. I like not having to take to the doctor-1

[a] Adolescent mothers who participated in AES-TN860: "Factors Influencing the Nutritional Health of Adolescents During and Post Pregnancy" and completed six and 12 month interviews.

APPENDIX O

MOTHERS' FEELINGS ABOUT INFANTS' HEALTH

2. Adult mothers'[a] (n=60) feelings about infants' health.

Categories	Number of (n=61) Adolescent Mothers
Positive	He/she is healthy-11 He/she is fine-5 It is good-10 It is OK-6 I feel just great-2 He/she is pretty healthy-3 He/she has no problems-3 His health is just great-1 He/she is just great-2
Healthy with illness	His/her asthma is bothersome-1 I would like no milk allergies-2 Healthy, but ear infections all the time-2 Healthy, but concerned about asthma-1 Healthy, but needs to have less colds-1
Infant weight	He/she's losing weight-2 He/she is gaining too much weight-2 He/she is too small-1 I'm worried that he/she will get fat-1
Healthy after illness	I worry sometimes-1 It is good now-1 Hope it continues to be good for now-1 I'm glad that he/she is better-1

[a] Infants of adult mothers (ages 22-28 years) recruited from same geographic region and similar socioeconomic status as the adolescent mothers.

VITA

Wina Lee Nevling attended primary and secondary schools in Aliquippa, Pennsylvania, and graduated from Hopewell High School in 1967. She received a Bachelor of Science degree in dietetics from West Virginia Wesleyan College and a Master of Science degree in Health Related Professions from the University of Pittsburgh. Wina has worked as a clinical dietitian in Pittsburgh, Pennsylvania, and as a assistant professor/clinical coordinator in the Coordinated Undergraduate Program (CUP) at the University of Pittsburgh.

In August 1988, she entered graduate school at The University of Tennessee, Knoxville. While there, she worked as an instructor for the Approved Pre-Professional Program (AP4) and as a graduate research assistant for the Infant Feeding Practices Project in the Department of Nutrition. Requirements for the Doctor of Philosophy degree were completed in May, 1994.

Following graduation, Wina Lee Nevling will pursue a career in pediatric nutrition and higher education.