This is to certify that the

thesis entitled

Assessment of Mothers' Nutrition Knowledge and Practices Related to the Supplemental Feeding of Infants

presented by

Amy Lynn Riley

has been accepted towards fulfillment
of the requirements for

Master of Science degree in Human Nutrition

Jenny Taylor Bond
Major professor

Date July 29, 1991

ASSESSMENT OF MOTHERS' NUTRITION KNOWLEDGE AND PRACTICES RELATED TO THE SUPPLEMENTAL FEEDING OF INFANTS

By

Amy Lynn Riley

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

Department of Food Science and Human Nutrition

1991

ABSTRACT

ASSESSMENT OF MOTHERS' NUTRITION KNOWLEDGE AND PRACTICES RELATED TO THE SUPPLEMENTAL FEEDING OF INFANTS

By

Amy Lynn Riley

Little is known about mothers' infant supplemental feeding knowledge or behaviors. The objectives of this research were to develop a valid, reliable instrument to measure mothers' knowledge and behaviors of supplemental feeding; determine mothers' main sources of infant feeding information; determine the effect of socioeconomic factors on supplemental feeding knowledge. Validity and reliability of the knowledge test was established through expert review, pilot testing and reaction group response, and statistical tests. The 503, nationally representative mothers knew the recommended: age to begin supplemental foods, first food to feed, method to feed, number of ingredients in first foods, and number of new foods an infant should have. Most mothers introduced foods before the recommended age; rice/infant cereal was the first food fed. The doctor was the most reported source of infant feeding information. Mothers' age, education, income, marital status, part-time employment, and breast-feeding status were related to knowledge scores.

ACKNOWLEDGEMENTS

This thesis would not have been possible without the assistance of many people. First and foremost I must acknowledge my advisor, Dr. Jenny Bond, for her uncanny ability to make me maximize my potential; for her unfailing confidence in my abilities; for her never-failing guidance and support; and most importantly, for her constant concern for me as a person.

To the members of my committee, Dr. Judy Anderson, Dr. Sandra Andrews, Dr. Anne Murphy, and Dr. Steven Yelon, for all their time, support, expertise, and assistance.

To Gerber Products Company, for providing the names of the mothers and an excellent incentive idea.

To the mothers who participated in this study; without their cooperation, enthusiasm, and concern this research would not have been possible.

To the Department of Food Science and Human Nutrition, the Cooperative Extension Service, and State 4-H Youth Programs, for their support through graduate assistantships.

To my parents, for the many opportunities and privileges they have made possible, and for their support and encouragement.

To Susan Miller, the most competent, organized, and efficient research assistant anyone could hope to have.

To all the "John Bond Jovies" (Marci Askegard, Karen Duve, Donna McLean, and of course, John Bond) who provided fun, friendship, fellowship, and family. A special recognition to Marci Askegard, who endured Biochem, Stats, hours of mind-boggling computer time, and the entire Master's program start to finish with me.

To Sheila Urban Smith, who was a listening ear, an eagle eye, and a soothing voice when I needed it most.

And finally to Dave, for his patience, insight, enthusiasm, and love in helping me fulfill my goals.

TABLE OF CONTENTS

CHAPTER

LIST OF TABLES.....ix

I INTRODUCTION.....1

II REVIEW OF THE LITERATURE.....8

Demographic Factors Affecting Supplemental Feeding....8

Ethnicity and Supplemental Feeding.....8

Formal Education and Supplemental Feeding.....12

Socioeconomic Status and Supplemental Feeding...14

Maternal Age and Supplemental Feeding.....19

Marital Status/Household Composition and Supplemental Feeding.....19

Breast-feeding, Formula-feeding, and Introduction of Supplemental Foods.....20

Summary of Demographic Factors and Supplemental Feeding.....22

Pre/Postnatal Education Classes and Sources of Infant Feeding Information.....23

Nutrition Knowledge and Infant-feeding Behavior.....26

PROBLEM STATEMENT.....31

RESEARCH OBJECTIVES.....32

III MATERIALS AND METHODS.....34

Human Use Approval of the Study.....34

Development of the Instrument.....34

Material, Methods, and Analysis of the Pilot Study and Reaction Group.....37

Pilot Study and Reaction Group Subjects.....37

Reaction Group Response to the Instrument.....38

Validity and Reliability of the Supplemental Feeding Knowledge Survey.....39

Results of the Pilot Test - Demographic Data.....43

Results of the Pilot Test - Supplemental Feeding Knowledge Test.....44

Results of the Pilot Study - Supplemental Feeding Behavior.....48

Summary of Pilot Study and Reaction Group.....52

Materials and Methods of the Research Study.....53

Preparation and Mailing of the Instrument.....53

Subjects and Population for the Research Study..54

Data Analysis.....56

IV RESULTS.....59

Response Rate.....59

Validity and Reliability of the Final Survey.....61

Characteristics of the Mothers Responding to the Survey.....61

Feeding Characteristics of the Infants in the Survey.....69

Infant Feeding Behaviors and Mothers' Rationale for Feeding Infants Supplemental Foods.....75

Reasons Mothers Had Not Introduced Supplemental Foods and Their Plans for Future Feeding.....85

Frequency of Use of Various Liquids.....91

Sources of Mothers' Infant Feeding Information.....95

Infant Supplemental Feeding Knowledge:
Test Scores and Relationship to the Mothers'
Demographic Characteristics.....100

V DISCUSSION.....111

Introduction.....111

Development and Use of the Instrument.....111

Discussion of the Pilot Study and
Reaction Group Findings.....118

Response Rate.....118

Discussion of the Mothers and Their Infants.....120

Discussion of Mothers' Infant Feeding Behaviors
Supplemental Feeding Knowledge.....124

Discussion of Mothers' Sources and Frequency of
Use of Infant Feeding Information.....132

Medical Sources.....132

Family Sources.....134

Publication/Media Sources.....135

Discussion of Mothers' Infant Supplemental
Feeding Knowledge Scores.....136

Discussion of Relationship between Demographic
Variables and Total Infant Supplemental Feeding
Knowledge Scores.....136

VI LIMITATIONS, STRENGTHS, CONCLUSIONS, AND
RECOMMENDATIONS.....139

Limitations of this Study.....139

Strengths of this Study.....140

Summary and Conclusions.....142

Recommendations for Future Research.....145

APPENDICES

A Michigan State University Committee on Research Involving Human Subjects Approval Letter.....147

B Gerber Products Company's Dietary Guidelines for Infants (1989).....148

C Supplemental Feeding Knowledge Survey Used in Pilot Study and Reaction Groups.....149

D Final Supplemental Feeding Knowledge Survey Used in Research Study.....163

E Survey Cover Letter.....177

Bibliography.....178

LIST OF TABLES

Table		Page
3.1	Mothers frequency of use of various sources of infant feeding information	51
4.1	Geographic distribution of returned surveys (n=499)	60
4.2	Reasons completed, returned surveys were not used for analysis (n=24)	60
4.3	Age, education, ethnicity, and income status of mothers responding to the study	63
4.4	Employment, marital, and medical insurance status of mothers responding to the survey	65
4.5	Sources of assistance for study participants (n=397)	66
4.6	Parity and household characteristics relative to children of mothers participating in survey (n=503)	66
4.7	Mean age and birthweight of infants in the survey	67
4.8	Prevalence and incidence of serious infant medical problems and food allergies reported by mothers in the survey	68
4.9	Prevalence and length of time breast-feeding for mothers in this survey (n=503)	69
4.10	Methods of infant feeding during the first few days of life (n=503)	70

4.11	Milk feeding information for the infants in this study (n ranged from 488-490)	71
4.12	Number of time/day infants were fed breast-milk, regular infant formula, and soy infant formula	71
4.13	Juice feeding information (m=500)	72
4.14	Other people who fed the infants in this study more than twice a week (n=463)	73
4.15	Supplemental feeding information	74
4.16	Reasons mothers gave for starting their babies on supplemental foods (n=325)	76
4.17	First food regularly given to the infants (n=328)	77
4.18	Reasons mothers chose the first food fed to their infants (n=324)	78
4.19	How mothers fed the first supplemental food to their infants (n=328)	79
4.20	How mothers decided their infants were ready for supplemental foods (n=321)	81
4.21	The length of time mothers waited between the feeding of the first and second new foods (n=323)	82
4.22	Second food regularly given to the infants (n=216)	83
4.23	Reasons mothers chose the second food fed to their infants (n=220)	84
4.24	Reasons mothers had not introduced supplemental foods to their infants (n=171)	86
4.25	First food mothers planned to give their infants (n=171)	87
4.26	Reasons mothers chose the first food they planned to feed their infants (n=159)	89

4.27	How mothers planned to feed the first supplemental food to their infants (n=172)	90
4.28	Length of time mothers planned to wait between the feeding of the first and second new supplemental foods (n=170)	91
4.29	Second food mothers planned to feed their infants (n=244)	92
4.30	Reasons mothers chose the second food they planned to feed their infants (n=195)	93
4.31	Number of times per week various liquids fed to infants in the study	94
4.32	Self-reported people/places from whom mothers obtained most of their infant feeding information (n=500)	97
4.33	Mothers' frequency of use of various sources of infant feeding information	98
4.34	Infant supplemental feeding knowledge test scores (n=500)	100
4.35	Frequencies and percentages of mothers' responses to supplemental feeding knowledge questions	104
4.36	Frequencies and percentages of mothers' responses to baby food company infant feeding guidelines	107
4.37	Chi-square analysis of demographic characteristics and Score III	110

CHAPTER I

INTRODUCTION

Infant nutrition and feeding are areas of considerable interest to health professionals, anthropologists, sociologists, and of course, parents. The process of infant feeding carries with it a number of cultural, sociodemographic, ethnic, and bio-medical stigmas and values. The method by which an infant is fed from birth through the early months of life has received much attention in the literature. This attention is due largely to both nation-wide and world-wide attempts to increase the incidence and duration of breast-feeding, because of the recognized sanitary, economic, and health benefits breast-feeding offers to both mother and infant. Breast-feeding is also a discrete act, making it relatively easy to identify. However, it is well-recognized that most infants in this country will grow and thrive on an early diet of either breast-milk or infant formula (appropriately given).

In contrast to the many studies of breast-feeding, the topic of weaning and the feeding of supplemental foods is an area of infant nutrition that has remained largely unexplored in the United States. The terms "weaning" and "supplemental feeding" are often used interchangeably when, in fact, they mean very different things. Weaning is often

used loosely in the literature, without a clear understanding of what is meant, and when it "has happened." Millard and Graham (1985a) defined weaning "...as a process that involves both introducing non-breast-milk foods and diminishing lactation." Lebenthal (1985) uses a more functional definition of weaning and describes it as the process where the infant's diet is changed from a mostly milk or formula diet to a predominantly solid diet.

In contrast, supplemental feeding refers to the feeding of any beikost. Beikost is defined by Fomon (1987) as "...foods other than milk or formula fed to infants". Supplemental feeding differs slightly from the term weaning, in that weaning refers to the process of actually changing the infant's diet, and supplemental feeding refers only to the feeding of the beikost. Because of the measurement problems associated with the process of gradually changing an infant's diet from predominantly liquid to predominantly solid food, only supplemental feeding will be examined in this research study.

Supplemental feeding practices appropriate to the individual infant are essential for that infant's continued physical and developmental growth. However, the proper timing, selection, and introduction of supplemental foods into the infant diet is an area of considerable controversy and debate (Parraga et al., 1988), fueled by the fact that most infants can thrive under many feeding circumstances and schedules.

The Committee on Nutrition of the American Academy of Pediatrics (CON/AAP) recommends that supplemental foods be introduced between four and six months of age, as this is thought to be the age at which breast milk may become limiting in some nutrients, and also the age at which an infant has reached appropriate physical development to successfully spoon-feed (AAP/CON, 1980; AAP/CON Handbook, 1985). However, studies of infant feeding indicate that beikost is often introduced before the recommended four to six months of age, especially among minorities and in low socioeconomic populations (Brodwick, 1989; Doucet, 1988; Parraga, 1988; Quandt, 1984; Sarett, 1983;).

In addition to general recommendations for beginning supplemental foods, the AAP also has guidelines for how to appropriately introduce supplemental foods. Because of the easy digestibility, and high and appropriate nutrient content, health professionals usually recommend iron-fortified, single-grain infant cereal as the first supplemental food in the infant diet. After the introduction of infant cereal, health professionals usually recommend that single ingredient vegetables, fruits, and meats be introduced one at a time, at weekly intervals (AAP/CON Handbook, 1985). After the infant is receiving a variety of single-ingredient foods, mixed ingredient foods may be introduced in the same manner as single-ingredient foods.

The American Academy of Pediatrics recommends spoon-feeding as the preferred method of feeding beikost. However, some parents mix the solid foods with milk and feed them from a bottle with a large hole in the nipple, or use devices called "infant feeders" which actually force food into the infant's mouth with a plunger and large cross-cut nipple. Spoon-feeding helps infants develop neuromuscular control and coordination, helps them appreciate the tastes and textures of solid foods, and allows them to communicate hunger and satiety (AAP/CON, 1980; Satter, 1986). Infants that cannot take food from a spoon and swallow it are probably neither developmentally nor physiologically ready for supplemental foods.

Inappropriate feeding of supplemental foods has been associated with a variety of disturbances in infant health, growth, and development. Nursing-bottle caries result when infants are given bottles of juice, sweetened beverage, or milk as pacifiers, or for extended periods of time. The sweetened liquid pools around the teeth, causing mild to severe damage to the baby teeth. The teeth most often affected are the upper incisors (CON/AAP Pediatric Nutrition Handbook, 1985).

A second consequence of inappropriate feeding of supplemental foods may be failure to thrive. Failure to thrive has occurred in previously normal weight-for-height infants and young toddlers when switched to low-fat, high carbohydrate diets. The "prudent" diets were given by

well-meaning parents in attempts to ward off later obesity and heart disease. However, both the linear growth and weight gain of these infants deteriorated. Fortunately the children regained normal growth patterns once an appropriate diet was given (Pugliese et al., 1987).

Early introduction of supplemental foods (and formula feeding) may be a factor contributing to excessive weight gain in infancy and infant obesity (Taitz, 1971). The data are conflicting regarding the persistence of infant obesity into childhood; however, the persistence of childhood obesity into adulthood has been well-established (Tsang and Nichols, 1988). Kramer (1985a) found that the main determinants of weight at 12 months were birth weight, sex, duration of breast-feeding, and age of introduction of solids. At 24 months of age, birth weight, duration of breast-feeding, sex, and maternal relative weight seemed to be significant determinants of weight and adiposity (Kramer, 1985b). However, most of the variation in weight and adiposity remained unexplained, and further research in this area must be done before "causation" may be implied.

A fourth possible consequence of inappropriate feeding of supplemental foods is increased risk of food and skin allergies, childhood eczema in particular, especially in families with a histories of either food or skin allergies. During early infancy, the infant's gastrointestinal tract has not yet developed defense mechanisms to foreign proteins, and is permeable to macromolecules. The young

infant is best able to digest the protein, fat, and carbohydrate found in breast milk. In addition, IgA antibody, responsible for decreasing the amount of antigenic material that passes through the mucosa, does not reach appreciable levels in the infant until approximately 7 months of age (CON/AAP, 1985).

Fergusson et al. (1990) reported on the relationship found in a 10-year longitudinal study between early solid feeding (before four months of age) and recurrent childhood eczema. These researchers found statistically significant relationships between the diversity of the early food diet and risks of eczema. Children exposed to four or more types of solid foods before four months of age had risks of chronic or recurrent eczema that were 2.9 times those of children who were not exposed to early solid feeding. This New Zealand study involved 1210 children at its onset in 1977, and 1067 at its conclusion in 1987. Childhood eczema information was collected from 1) mothers' diaries of their child's medical attendances; 2) maternal recall; 3) child's family doctor. Feeding information was obtained from the child's record of attendance with the community nurse, maternal report, and maternity records.

The age of introduction of beikost into the diet of a breast-fed infant may influence the role the beikost takes in that infant's diet, and possibly the growth of the infant. Quandt (1984) found that the introduction of beikost before four months of age was accompanied by a

reduction in the number of breast-feeds per day, suggesting that beikost was acting as a replacement for breast-milk. Infants receiving beikost after 4 months of age showed either stable or increased nursing frequency, suggesting that beikost was acting as a supplement. In addition, the infants for whom beikost acted as a replacement had significantly lower weights for length and age at 2 months than did the infants for whom beikost acted as a supplement, although the "replacement" and "supplement" groups were similar at birth and one month.

For nutrition educators to successfully educate parents on appropriate supplemental feeding practices, it is critical that they know what factors/determinants typically influence a mother's infant feeding behavior. If nutrition educators recognize factors potentially influencing a mother's infant feeding decisions, they can support positive choices and work to change potentially harmful practices. Because little research has been done to identify factors/determinants associated with the introduction of beikost, and the research that has been done has usually been a minor part of a breast-feeding study, factors and determinants of both supplemental feeding and breast-feeding will be reviewed under the assumption that factors influencing breast-feeding may be similar to factors influencing supplemental feeding. However, while the factors may be similar, the weight and importance of the influencing factors may be very different.

CHAPTER II

REVIEW OF THE LITERATURE

Demographic Factors Affecting Supplemental Feeding

Ethnicity and Supplemental Feeding

While several researchers have found relationships between ethnicity and breast-feeding (Rassin et al. 1984; Gabriel et al., 1986; Weller and Dungy, 1986; Doucet and Berry, 1988; Parraga al., 1988; Wright et al., 1988; and Brodwick et al, 1989) the relationship between ethnicity and supplemental feeding appears to be less defined. Rassin et al. (1984) found a decreased incidence and duration of breast-feeding in Black women from lower socioeconomic groups who gave birth at the University of Texas Medical Branch (UTMB) obstetrical service in July, 1981. Of the 358 subjects in this study, about equal percentages of mothers were Anglo-Americans and Black Americans; a lower percentage of women were Mexican-Americans. A questionnaire given to the mothers in the hospital within 48 hours of delivery showed that 44% of the Anglo-American mothers said they intended to breast-feed, compared to 9.2% of the Black American mothers and 23% of the Mexican-American mothers. Maternal ethnicity was greater than the effect of marital status, head of household, maternal and paternal education, income, and number of pregnancies.

Interestingly, Brodwick et al. (1989), found that neither ethnicity nor any other sociodemographic variable was significantly related to the early introduction of beikost. Subjects for this study were 254 Anglo, Black, and Mexican-American families living in a small, southwestern United States city. In this study, only 15% of the mothers met the minimal recommendation for breast-feeding four or more months and starting solids at four months or later. Over one-third (39%) of the infants received infant cereal before four months of age, with 15% of the infants receiving cereal before one month of age. Most of the mothers in this study, however, did report introducing beikost at four months of age or later, and cereal was the food most often introduced first.

Wright et al. (1988) did a large, prospective study on 1,112 healthy infants using a Health Maintenance Organization (HMO) in Tucson, Arizona. As most households using this HMO had at least one parent employed, the term "middle class" was used to describe the socioeconomic status of the majority of subjects. Infant feeding data were collected by the pediatrician on a standard form at approximately the two, four, six, nine, and twelve-month well-child visits.

Unfortunately the Wright et al. (1988) study had some serious design drawbacks. First, Anglo-women made up 80% of the study population, and the authors generalized results to both Anglo and Hispanic populations. Second, the authors

did not ask the study participants if or when infant cereal, juice, or fruit was introduced to their infants. Many of the infants in this study were probably fed infant cereal, fruit, or juice before vegetables or meats, as health professionals usually recommend infant cereal as the first supplemental food given to infants, and juice or fruit are often fed before vegetables. Therefore, other than for descriptive information, the significance of the results of this study are questionable.

In contrast to the results of Brodwick et al. (1989), Wright et al. (1988) found that Mexican-American women were more likely to introduce vegetables early than were Anglo-American women. Twenty-seven percent of Hispanic infants were eating vegetables by four months of age.

Parraga et al. (1988) found that most infants received some beikost by two months of age, earlier than most health professionals recommend. This study examined the feeding patterns of 116 Black infants born between June 1982 and October 1983 at a metropolitan teaching hospital. The women were part of a larger infant growth study associated with University Hospitals of Cleveland. Twenty percent of the mothers in this study fed some type of baby food (either commercially prepared baby food, infant cereal, or home-prepared baby food) by 3 weeks of age; by 2 months of age 48% of the infants were eating baby foods; at the 4 month visit 72% of the mothers reported feeding baby foods. By 6 months of age almost all (98%) of the infants were

receiving a wide variety of beikost. Parraga et al. (1988) used two trained, mature black women to collect their data, and the authors felt that especially candid, unbiased data were obtained. Similar to the findings of Brodwick et al. (1989), Parraga (1988) found that infant cereal was most commonly the first supplemental food offered.

A concern brought out by Parraga et al's. (1988) study was the number of infants receiving sugar water. Sugar water was defined as corn syrup and water fed from a bottle. At 3 weeks of age, 16% of the formula fed infants received sugar water; 33% of the formula fed infants received sugar water by 6 months of age. Formula fed infants were much more likely than breast-fed infants to be given both water and sugar water.

Similar to Brodwick et al. (1989) and Parraga et al. (1988), Doucet and Berry (1988) found that the low income, mostly black infants in their study had received cereal by one month of age, and over half the infants had cereal before three months. Cereal was also the first supplemental food given to most infants. Subjects of this investigation were 409 adults accompanying infants from birth through one year of age at six Child Health Centers in New Orleans. Three trained students read a standardized questionnaire to the individual adults in the clinic waiting rooms. Similar to Parraga et al. (1988) findings of sugar water use, over one-third of the infants in Doucet and Berry's (1988) study were given cola or "Kool Aid" drinks by three months of age.

Formal Education and Supplemental Feeding

As with ethnicity, numerous authors have found significant associations between mother's formal education level (i.e. years of formal education) and breast-feeding (Switzky et al., 1979; Leeper, 1983; Brogan and Fox, 1984; Baranowski et al., 1984; Rassin et al. 1984; Gabriel et al., 1986; Weller and Dungy, 1986; Brodwick et al., 1988; Parraga et al., 1988; Wright et al. 1988).

Brogan and Fox (1984) found mothers' education was correlated to supplemental feeding as well as to breast-feeding. This study compared the feeding practices of 202, 3 to 18 month old infants from low- and middle-income families in Lincoln, Nebraska. Parents filled out a questionnaire while waiting in either the WIC (low-income) or pediatrician's (middle-income) office. In their sample, more middle- than low-income mothers attended college (44 versus 29) and more middle-income mothers graduated from college (16 versus 10). College-educated mothers were more likely to breast-feed and to bottle-wean late than mothers who did not attend college.

Brogan and Fox (1984) found that the mothers' education was significantly correlated with the age of introduction of all solids (cereal, fruit juice, fruit, vegetable, and meat) except eggs. College-educated women were more likely to introduce solids at later ages than less-educated women. However, the possibility that income is confounding the effects of education was somewhat acknowledged, but not

discussed or considered in statistical analyses by these investigators.

Quandt (1984) did a longitudinal study to determine the effect of beikost on the diets of forty-five breast-fed infants. Mothers completed 24-hour diet diaries at eight-day intervals for their infants from two weeks to six months of age. In this population, the average age of first introduction of beikost was 120.8 days; the most common time of beikost introduction was the fifth month of life when over 40% of the infants received their first beikost. All of the women in Quandt's study were high school graduates, but those with more years of education tended to introduce beikost later than women with fewer years of education.

Wright et al. (1988) also found significant relationships between education and the age when vegetables and meats were introduced. Women with a better education tended to delay the introduction of vegetables until almost seven months of age, compared to about six months of age for less educated women. Similarly, better educated women introduced meats at about eight and one-half months of age, compared to seven and three-fourths months of age in less educated women. However, while these differences in the age of introduction of vegetables and meats were statistically significant, they probably are not physiologically significant.

Socioeconomic Status (family income and employment) and Supplemental Feeding

While Brogan and Fox (1984) found no differences in breast-feeding incidence between low- and middle-income mothers, there were differences reported between the income groups and the introduction of beikost, with low-income mothers generally introducing beikost earlier than middle-income mothers. By three months of age cereal was introduced to 59% of the middle- and 76% of the low-income infants. Fifty-six percent of the middle- and 77% of the low-income infants had been introduced to juice by four months. Fruit was introduced to 49% of the middle- and 73% of the low-income infants by four months. Vegetables were introduced to 51% of the middle- and 76% of the low-income infants by five months. Meat was introduced to 69% of the middle- and 80% of the low-income infants by six months. Finally, 57% of the middle and 70% of the low-income infants had been introduced to eggs by seven months of age.

Brogan and Fox (1988) also found significant correlations between annual income and time of introduction of all types of beikost studied. While the data statistically suggest that mothers with higher incomes introduce solids later, the low correlations also suggest that other factors contribute to the time solids are introduced by this population of mothers. A supplemental food became a "regular" part of the diet about one month after the first introduction of the particular food

(the term "regular" was undefined). These researchers found that low-income women tended to feed their infants beikost on a regular basis earlier than middle-income women, but again the term "regular" was undefined. There were significant, but low, correlations between annual income and the regular feeding of fruit juice, fruits, vegetables, and meats.

Brodwick et al. (1989) found no significant relationships between any sociodemographic variables and the early introduction of solids. They considered maternal and paternal ethnicity, education, employment status, income, socioeconomic status, age, religion, and household structure.

Ferris et al. (1978) investigated the use and cost of beikost (defined in this research as semi-solid foods) in 268 Black, White, and Spanish-surnamed infants under six months of age in three income levels in western Massachusetts. A nutritionist conducted a single interview with each mother in her home. Information collected included demographic data; prenatal, neonatal, and health and development data on the infant; and a nutritional history and 24-hour recall of the infant's food intake. The nutritionist also obtained anthropometric measurements of the infants in their homes.

Results of the Ferris et al. investigation showed that the early introduction of solid foods was observed in all ethnic and income groups. By four weeks of age, 57% of the

infants were regularly given cereal, 32% were given fruit, 4% were given vegetables and soups, and 7% were given juice; none of the infants were given meats. By eight weeks of age, 87% of the infants were given cereal, 81% were given fruit, 31% were fed vegetables, 13% were fed soups, 14% were receiving juice, and 3% were eating meat. Interestingly, at three months of age the percentage of infants receiving cereal remained at 87%, and the percentage of infants receiving fruit was also virtually unchanged at 80%.

Rice cereal was the first beikost usually fed to this population of babies (Ferris et al., 1978). Once the first beikost was introduced, usually cereal, a variety of baby foods were quickly added to the infant's diet. Seventeen percent of these infants received "sweetened" foods or liquids; sugar or corn syrup was added daily to cereal, formula, and/or water. Differences in the pattern of introduction of beikost was related more to income in this study than to type of milk fed (breast or formula). Summaries of usage by ethnic group and income level for each type of infant food follow.

Spanish-surnamed infants had the lowest total usage of cereal (70% of infants received cereal). The iron intake of Spanish-surnamed infants may have been inadequate as these infants also had the lowest use of iron-fortified infant formula (Ferris, A.G., unpublished master's thesis, 1975). Cereal usage of low-income black infants less than three months of age was about equal to cereal usage of

Spanish-surnamed infants. After three months of age, cereal usage of low-income black infants was close to that of other income and ethnic groups -- 82 to 100% of these infants received cereal.

Ferris et al. (1978) included commercially prepared pureed fruits and desserts in the same category as they felt the formulations were often very close, and that parents used pureed fruits and desserts interchangeably. Low-income Black infants under three months of age received less fruit than the other income and ethnic groups. After three months of age, use of fruits by low-income Black infants was nearly the same as White infants -- between 82 and 90% of these infants received fruits. In addition to low use of cereal, the Spanish-surnamed infants also had the lowest use of fruit, with 60% of infants receiving fruit. In addition to income differences, cultural patterns seemed to be related to differences in fruit usage.

Low-income, White infants from birth to three months of age had the greatest percentage use of vegetables in this study; low-income Black and Spanish-surnamed infants had the lowest percentage use of vegetables in this age group. After three months of age, White infants in the high income group were fed the most vegetables, followed by White infants in the middle and low-income groups. Vegetable usage after three months of age continued to be low in the Spanish-surnamed and Black infants.

More than 40% of the infants in this study had juice by three months of age. Spanish-surnamed and Black infants were given juice more frequently than White infants at all income levels. For infants less than three months of age, vegetable-meat mixtures were fed most frequently to the Spanish-surnamed infants. Between three and six months of age, 61% to 71% of the Black, Spanish-surnamed, and low-income White infants received vegetable-meat mixtures regularly. Middle- and upper-income White infants received vegetable-meat mixtures less frequently.

By three months of age, 22% of infants had been given meat; most of these infants were high-income White infants. After three months of age, 46% of high income White infants received meat daily. After meat had been introduced, upper-income parents were more likely to include pureed meats regularly in the infants' diets. In this same age group, only 13 to 26% of the other income and ethnic group infants received pureed meats regularly, perhaps because meats are more expensive.

Wright et al. (1988) found that maternal employment outside the home accounted for a significant amount of variability in the age that vegetables were started in the Hispanic population. In the Anglo women, the addition of maternal employment to the predictor education significantly increased the amount of variability accounted for in age at which vegetables were started.

Maternal Age and Supplemental Feeding

Both Brodwick et al. (1989) and Quandt (1984) found that maternal age was not correlated with the age of introduction of beikost. Mothers in Quandt's study were older (mean age = 26.8 years) and all had at least completed high school. The mothers in Brodwick et al.'s study were classified only as either over 25 or under 25 years of age at the birth of this child.

Marital Status/Household Composition and Supplemental Feeding

The introduction of supplemental foods has been found by some researchers to be related to marital status and/or household composition. Wright et al. (1988) found that married women, and women who were the sole woman in the household were more likely to delay the introduction of vegetables until almost seven months of age, nearly one month later than either single women or women who were not the only woman in the household. In this study, marital status was not significantly associated with the introduction of meat, but women who were the sole women in the household tended to delay the introduction of meat.

As stated earlier, Brodwick et al. (1989) found no associations between any sociodemographic characteristics, including marital status or household composition, and introduction of supplemental foods.

Breast-feeding, Formula-feeding, and Introduction of Supplemental Foods

The method by which an infant is fed in the early months of life has been shown by numerous authors to affect the age at which supplemental foods are introduced. Parraga et al. (1988), Brodwick et al. (1989), and Brogan and Fox (1984) found that breast-fed infants received solid foods later than formula-fed infants. However, Parraga et al. (1988) found that there were no differences in the age of introduction of supplemental foods between mothers who exclusively breast-fed and mothers who partially breast-fed. In contrast, Brogan and Fox (1984) found that exclusively breast-fed infants were introduced to solids later than both exclusively formula-fed infants and infants receiving a combination of breast-milk and formula. A related, but slightly different finding, was reported by Brodwick et al. (1989) who found that the use of non-breast milk had more influence than the introduction of solids on the duration of breast-feeding. Conversely, Ferris et al. (1978) found that the patterns of introducing (and feeding) beikost were similar in mothers of both breast- and formula-fed infants, and that differences were more related to income than breast- or formula-feeding.

Sarret et al. (1983) conducted three surveys to determine breast- and formula-feeding decisions and trends in infant-feeding practices between 1976 and 1980. The three nationwide surveys were done by an independent

marketing research firm. The nationwide sample was obtained from a randomly selected subset of expectant mothers from American Baby magazine. The subset was drawn to reflect age and parity of mothers in the current U.S. census data. Lower and upper socioeconomic groups were under-represented. Results of this investigation showed an increase in the incidence and duration of breast-feeding, decrease in newborn infants receiving formula, increase in use of infant formula (versus cow milk) at six months of age (when breast-feeding is discontinued early), and later introduction of supplementary foods for both breast- and bottle-fed infants. Nearly two-thirds of infants received cereal during the first month in 1976, compared to only 37% of infants in 1980. There was also a greater use of cereal at six months of age in 1980 compared to 1976.

This study also showed changes in young infants usage of jarred baby foods from 1976 to 1980. In 1976, over one-third of infants received jarred foods during the first month of life, compared to 1980 when only 20% received jarred foods in the first month. Overall, between 1976 and 1980 there was a shift of one to one and one-half months in use of baby foods. There was also a change from age of maximum usage of baby foods at five months of age in 1976 to a continuing increase at six months of age in 1980, indicating that baby foods were probably being introduced later and/or more slowly, and consequently, table foods were also being introduced later and/or more slowly.

Analysis of these data for breast- and formula-fed infants showed that supplementary foods were introduced later to breast-fed infants, but both breast- and formula-fed infants were being introduced to beikost later in 1980 than they were in 1976.

Summary of Demographic Factors and Supplemental Feeding

Demographic factors associated with supplemental feeding have been examined by some researchers, with conflicting results. While a clear relationship has been established between ethnicity and breast-feeding, the relationship between ethnicity and supplemental feeding is not well defined. Some researchers have found relationships between ethnicity and supplemental feeding, while other investigators have found that ethnicity is not related to supplemental feeding.

Formal education appears to be correlated with supplemental feeding; the few studies that have been done have found that mothers with more years of formal education introduce supplemental foods later than women with fewer years of formal education.

The relationship between socioeconomic status (family income and employment) and supplemental feeding is yet not defined. Some investigators have found a relationship between family income and supplemental feeding, while other researchers have found similar feeding patterns across all income levels. Likewise, the relationship between marital

status/household composition and supplemental feeding has not been consistently established.

Unlike the conflicting trends found in the literature between demographic factors and supplemental feeding, the relationship between breast-feeding, formula-feeding, and introduction of supplemental foods has been relatively consistent. Most researchers have found that breast-fed infants receive supplemental foods later than formula-fed infants.

Pre/Postnatal Education Classes and Sources of Infant Feeding Information

While health professionals would like to assume that parents who attend pre/postnatal education classes, and who receive their infant feeding information and advice from health professionals, follow the advice given, this is often not the case. Brogan and Fox (1984) reported that more middle-income mothers who attended prenatal classes breast-fed their infants than low-income mothers who attended prenatal classes. Low-income mothers who had attended prenatal classes weaned their infants later than low-income mothers who had not attended prenatal classes. Low-income mothers who had prenatal education also introduced solids later, but the correlation was low. Middle-class mothers who had attended prenatal classes introduced fruit later than middle-class mothers who had not attended prenatal classes, but fruit was the only solid food

that showed a significant difference in time of introduction.

Shoham-Yakubovich et al. (1990) found results similar to Brogan and Fox (1984) when they assessed the impact of a health education course on infant feeding practices in the West Bank territories (Israel), a population of low socioeconomic status. These researchers compared 235 mothers from 92 villages whose youngest child was one year or less. Of the 235 subjects, 102 mothers attended the course and 133 mothers did not. Data were collected by female field workers. Results showed that after adjusting for the child's age, maternal age and education, parity, and birth site, mothers who had participated in the course were more likely than non-participants to breast-feed and to start supplemental foods at the recommended time.

Brogan and Fox (1984) also found that when both the middle- and low-income parents ranked a list of individuals and media according to the level of influence they had on their current feeding practices, 63% of the low-income and 79% of the middle-income group indicated that the physician had the greatest influence on their infant feeding practices.

The majority of subjects in Doucet and Berry's (1988) study said they had received information on infant feeding from a physician or a nurse. However, when the sources of infant feeding information were examined, 60% of the participants said a nurse had provided information on breast

and/or bottle feeding, and only 26% and 24% said that a physician had provided information on breast or bottle feeding, respectively. Regarding sources of information on supplemental foods, 16% said a physician and 37% said a nurse had provided information. Most alarming was the fact that 35% of the subjects said that no one had provided them with information on the introduction of foods other than milk. Equally alarming is the fact that 19% said they had received no information on breast-feeding, and 21% said they had received no information on bottle-feeding. Other sources of information were friends, relatives and "other."

An exploratory study done by Bryant (1982) focused on the impact of social networks on infant feeding practices. Subjects for this study were Puerto Rican, Cuban and Anglo families enrolled in the Dade County (Florida) Maternal and Infant Child Care program during the summer of 1976. Kin, friend, and neighbor networks were examined, and their influence on infant feeding practices was determined. Most of the Cuban and Puerto Rican subjects, and one-third of the Anglo subjects interviewed had a more significant reliance on network members than on health care professionals for infant care and feeding information. When the actual feeding practices of the subjects were examined, the mothers' feeding behaviors supported the reports that they relied more on network members than health care professionals. The majority of women in each of the ethnic groups followed the advice given by friends, relatives, and

neighbors more consistently than the information given by health care professionals.

The impact of the health care professionals depended on the location of influential network members in all three ethnic groups. Subjects that lived close to influential friends, relatives, or neighbors did not rely heavily on physicians or nutritionists for information on infant care and feeding. Conversely, women who did not live close to influential friends, relatives, or neighbors were most influenced by health professionals' advice. Also, there were ethnic differences in the importance given to network members and health care professionals. Most of the Puerto Rican and Cuban women considered the baby's maternal grandmother as the most important source of information on infant feeding. Anglo women usually relied most on the advice of friends and health professionals. The husband had little impact on infant feeding decisions in Cuban and Puerto Rican families, but in Anglo families the husband was involved in infant feeding decisions.

Nutrition Knowledge and Infant-feeding Behavior

Nutrition educators have, in the past, focused their efforts on increasing their audiences nutrition knowledge, assuming that those who learn/know the basic concepts and principles of nutrition will use and apply nutrition knowledge to their food choices (Schwartz, 1975; Sims, 1976). However, nutrition knowledge is not always a

determinant of "nutrition action," or nutrient intake, nor is it the only factor involved in people's food choices (Eppright, 1970; Sims, 1976; Sims, 1978; Schaefer, 1978; Grotkowski, 1978; Guiry, 1986).

For example, in a study to determine caffeine knowledge, attitudes, and practices of young women, Guiry and Bisogni (1986) found that knowledge about caffeine was not correlated with caffeine consumption. Another study done to determine the effect of nutrition education in high school found that nutrition knowledge did not affect the food choices of young women (Schwartz, 1975).

Knowledge of the benefits of breast-feeding was an influencing factor for mothers in deciding whether to breast-feed or formula-feed (Sarett et al., 1983). Mothers who chose to breast-feed in this study most frequently stated that they thought breast-feeding was healthier or better (than formula-feeding), or that they had read a book or literature showing advantages of breast-feeding. In contrast, the main reasons for giving formula were that it was more convenient, and the women wanted to return to work or school. A study done by Leeper et al., (1983), similarly found that limited knowledge about the benefits of breast-feeding seemed to influence the low incidence of breast-feeding in a group of low-income mothers from Alabama.

Rassin (1984) also found a relatively low level of

knowledge of the benefits of breast-feeding in his study. In response to knowledge of early infant feeding recommendations, less than two-thirds of the subjects in Rassin's study knew that the AAP recommends breast-feeding as the preferred method of feeding, and only about one-third believed that breast-feeding was the best method of feeding.

In a study done by Gabriel et al. (1986), cultural factors associated with breast-feeding were higher among women who said it was best for the baby; among these women, those who also said that breast-feeding was best for the mother had an 85% incidence of breast-feeding compared to only a 25% incidence of breast-feeding among women who thought that bottle feeding was best for the mother. Of the women who reported that breast-feeding was best for both mother and baby, nearly all of the women indicated biomedical and/or psychological reasons why breast-feeding is good for the baby, but many of these women did not know why breast-feeding was good for the mother.

Women who responded that bottle-feeding is better for mother and baby were also examined to determine reasons for their responses. When asked why bottle feeding was better for the baby, most women responded in terms of their own health habits, especially "bad" habits such as smoking and poor diets. When asked why bottle-feeding is better for the mother, the response given most frequently was that others could feed the baby. Many women also gave reasons as to why

they could not breast-feed. The women did not say that they bottle fed because formula was more beneficial.

A study done by Kaplowitz and Olson (1983) focused on the effects of a breast-feeding education program on the incidence and duration of breast-feeding in 44 upstate New York WIC programs. Criteria for inclusion in the study were: at least 18 years old, in the fourth to sixth month of pregnancy, and a primigravida or a woman who had either bottle-fed previous children or had an unsuccessful breast-feeding experience (unpleasant or terminated before the mother wanted to stop nursing). Women who were randomly assigned to the control group received a series of pamphlets on infant feeding; women in the control group did not receive the infant feeding pamphlets.

Results of this investigation showed that the program did increase the women's knowledge about breast-feeding, but it did not cause the women to have a more positive attitude about breast-feeding. More importantly, the education program did not increase the incidence or duration of breast-feeding in these women.

However, as discussed earlier in this report, other investigators have found that women with more education, who believe that breast-feeding is better for the baby, and who want more information about breast-feeding or supplemental feeding are more likely to feed their infants according to health professionals' recommendations. It could be

hypothesized that although knowledge of nutrition may not affect one's own food choices and eating behaviors, it may affect the choices and behaviors women make for their infants.

Bowering et al (1978) found that Expanded Food and Nutrition Education Program (EFNEP) aides had some influence in delaying the introduction of whole cow milk to Puerto Rican and Black infants. While none of the differences between study and control groups was statistically significant, the trend toward formula use (versus whole cow milk) in groups visited by the EFNEP aides was consistently seen in both ethnic groups. In this same study, EFNEP aides had a statistically significant affect on the food variety scores of the study infants in three age periods. In addition, regardless of whether they had an EFNEP aide or not, most of the infants were receiving solid foods well before the recommended times. Often, the solid foods were fed mixed with milk in the bottle in both study and control groups. The authors of this investigation felt that the EFNEP aides may have transferred their own beliefs toward the early introduction of solids to the mothers, as the two to four month old study infants consumed more cereal, fruit, and combination dinners than did the control infants.

PROBLEM STATEMENT

While knowledge of breast-feeding has been shown by previous researchers to at least partially affect the breast-feeding decision, little research has been done to determine how knowledge of supplemental feeding affects mothers' supplemental feeding decisions. Based on descriptive data in the literature, there is often a discrepancy between infant feeding recommendations made by health professionals and the infant feeding practices of mothers, especially mothers with low education levels and socioeconomic status. While factors related to breast-feeding have received considerable attention, factors other than demographic data related to the feeding of supplemental foods have remained largely unexplored. If infant supplemental feeding practices are to be improved, it is imperative that factors and determinants influencing and affecting mothers' infant feeding decisions and practices be identified.

One seemingly important predecessor to appropriate supplemental feeding is the possession of the knowledge of the recommended time and method to introduce and feed supplemental foods to an infant. If a mother does not know current infant feeding recommendations, or has incorrect information, one can not expect her to feed her infant according to health professionals' recommendations.

In addition, nutrition educators often focus their attempts at improving nutrition behavior on the acquisition

of nutrition knowledge. Previous research has shown that nutrition knowledge does not necessarily translate into recommended behavior. It is imperative that nutrition educators know if knowledge is indeed an important factor influencing how mothers feed their infants, so more appropriate nutrition education techniques can be employed.

For the above reasons, it is important to determine and evaluate the influence of mothers' infant supplemental feeding knowledge on infant feeding decisions and practices. Before the influence of knowledge can be evaluated, a valid and reliable tool must exist for measuring mothers' knowledge of infant supplemental feeding.

RESEARCH OBJECTIVES

This research study is designed to develop a valid and reliable questionnaire to determine a mother's infant supplemental feeding knowledge. While various nutrition knowledge instruments exist, (i.e. instruments that measure knowledge of caffeine, knowledge of general nutrition, mothers' and elderly individuals' general knowledge of nutrition) many of these instruments have not been shown to be reliable or valid. In addition, no valid and reliable instrument designed to measure a mother's knowledge of supplemental feeding is available. The development of such an instrument will be useful to nutrition educators and health professionals in assessing clients' knowledge, and evaluating the effectiveness of education programs.

The objectives of this research are to:

1) **Develop a valid, reliable instrument to measure mothers' knowledge of supplemental feeding.**
2) **Determine the knowledge level of a group of mothers related to infant supplemental feeding using the newly developed knowledge instrument.**
3) **Determine the supplemental feeding practices of the mothers completing the supplemental feeding knowledge instrument.**
4) **Determine mothers' main sources of infant feeding and supplemental feeding information.**
5) **Determine the relationship between demographic factors and mothers' knowledge of supplemental feeding recommendations.**

CHAPTER III

MATERIALS AND METHODS

This mail survey was conducted to determine a group of new mothers' infant supplemental feeding knowledge and behaviors. Basic research methods employed in this research study included: development and revision of the survey instrument; pilot and reaction group testing of the instrument; finalization of the instrument; subject selection; survey mailing; and survey tabulation and statistical analysis. The following chapter explains in detail each of the above steps in the research process.

Human Use Approval of the Study

This study was approved by the Michigan State University Committee on Research Involving Human Subjects (Appendix A). The subjects' completed, returned survey was their signed consent to participate in this study.

Development of the Instrument

While surveys designed to measure mothers' knowledge of breast-feeding exist, the author found no evidence in the literature of a survey to measure knowledge of supplemental feeding that had been determined to be valid and reliable. In this research, knowledge of supplemental feeding was defined as the ability to communicate, comprehend, and apply

(Bloom, 1956) the American Academy of Pediatrics recommendations on supplemental feeding. Thus, a valid and reliable self-administered survey had to be developed.

The developed survey consisted of three parts: infant feeding behavior, supplemental feeding knowledge, and demographic data. The survey will collectively be referred to as "The Infant Feeding Survey". The first part of the survey collected data on the mother's self-reported infant feeding practices. Information obtained included:

- number of other children the mother had
- infant's medical or food allergies
- how the infant was fed during early infancy
- age of introduction of 100% fruit juice
- sources and types of milk fed
- who else fed the infant more than twice a week
- age of introduction of first supplemental foods
- method of introducing new supplemental foods
- method of feeding supplemental foods
- use of sugar-sweetened drinks
- sources of infant-feeding information.

Part two of the questionnaire contained knowledge test items related to supplemental feeding. Test question content was derived from the American Academy of Pediatrics recommendations and guidelines for introducing and feeding supplemental foods. A series of correct/incorrect questions was also derived based on current popular topics surrounding infant feeding.

Knowledge test questions were written to represent key concepts and principles in the subject matter material. The measurement construct was "knowledge of supplemental feeding recommendations." The subconcepts include:

- knowledge of recommended age/time to begin supplemental foods
- knowledge of recommended first supplemental food
- knowledge of recommended method of feeding supplemental foods
- knowledge of recommended method of introducing new supplemental foods
- knowledge of recommended sequence of introducing supplemental foods
- reasons for introducing supplemental foods
- knowledge of the differences between the adult dietary guidelines and infant dietary guidelines.

Test items were generated to measure the subjects' knowledge, comprehension, and application of the above principles and concepts (Bloom, 1956). Knowledge is defined by Bloom as "...the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting." Comprehension is defined by Bloom as "...the type of understanding or apprehension such that the individual knows what is being communicated and can make use of the material or idea being communicated without necessarily relating it to other material or seeing its fullest implications." Bloom defines application as "The use of abstractions in particular and concrete situations."

Constructed test items were independent of each other, contained only plausible and attractive distractors, were free of irrelevant information, contained no verbal clues to the correct response, and were stated in a positive form when possible (Henerson et al., 1987).

In a separate section of the supplemental feeding knowledge survey, the mothers responded "Correct,"

"Incorrect," or "Don't Know" to a variety of infant dietary guideline statements. Most of the statements used in this part of the pilot study and reaction groups were taken verbatim from the Infant Dietary Guidelines published by a U.S. baby food company in 1989 (Appendix B).

The third part of the survey focused on demographic data from the mothers. Demographic data included the following: mother's age, ethnicity, level of formal education, employment status, household income, marital status, and participation in pre/postnatal education classes.

After development of the Infant Feeding Survey an expert review committee reviewed and evaluated all parts for content validity. The review committee consisted of five experts in the fields of infant nutrition and feeding, community nutrition, and survey design. The review process included several meetings. Consequently, the survey was revised at least six times based on recommendations and suggestions from the expert review committee.

Materials, Methods, and Analysis of the Pilot Study and Reaction Group

Pilot Study and Reaction Group Subjects

To ensure construct validity and reliability of the instrument, the questionnaire was pilot-tested and reaction group-tested after expert review and subsequent instrument revision (Appendix C). Subjects for the pilot test were 16

mothers with infants 10 to 56 weeks of age. Subjects for the reaction group were a total of 12 mothers who participated in the pilot test of the instrument. All the mothers were volunteers responding to an ad in the Michigan State University (MSU) daily newspaper, The State News. Mothers were mailed the Infant Feeding Survey one week before the reaction group session, so they could complete it ahead of time, as instructed. To encourage participation, the mothers were called by the researcher; the survey, campus maps, and other instructions were mailed immediately; the mothers could bring other children to the session. The day before the reaction group session, the mothers were called by the researcher again, to remind them of the session, and double-check if they would be attending.

Reaction Group Response to the Instrument

To ensure the usability and appropriateness of the instrument, reaction groups of mothers met to discuss and evaluate the three different parts of the survey. Reaction group members consisted of 12 of the pilot study volunteers. There were a total of three reaction group sessions. Each reaction group met for fifty minutes, and was led by an experienced leader; each question on each section of the three surveys was evaluated. The behavior and knowledge sections of the survey were evaluated by 12 mothers in two sessions; 6 of these mothers were able to return the next week to evaluate the demographic section of the survey. As

an incentive, mothers were given lunch at the session and coupons for free ice cream at the Dairy Store on the MSU campus.

Completed Infant Feeding Surveys were collected from the mothers before the reaction group started. The mothers were given a clean copy of the survey for review during the reaction group session. Mothers were asked if 1) they understood each question; 2) if there were any words/phrases in each question that were confusing or unclear; 3) if the answers were clear; 4) if the answer they thought was right appeared as a possible response; 5) if they had any comments about the question, or suggestions for making the question clearer; 6) if it was clear how answers should be selected. The interactions with the reaction groups were audiotaped, to ensure that all comments were considered when revising the surveys.

Validity and Reliability of the Supplemental Feeding Knowledge Survey

Based on the mothers' responses to the pilot test, the supplemental feeding knowledge questions underwent item analysis to evaluate the effectiveness of the questions. Because the number of subjects participating in the pilot study was small, the index of discrimination was used to determine the validity of the knowledge questions (Ebel, 1979). The index of discrimination is the difference between the percentage of the high scoring group marking the

right answer and the percentage of the low scoring group marking the right answer. Items with an index of discrimination greater than .33 were considered valid. Items with an index of discrimination less than .33 were carefully examined, as a low index of discrimination indicates that the item does not differentiate between mothers with high and low infant supplemental feeding knowledge scores; i.e. mothers with high scores got the item wrong and/or mothers with low scores got the item right.

Item difficulty was also considered when examining the index of discrimination. The index of difficulty was the percentage of the total group answering that item correctly. Items with an item difficulty less than 20 percent and greater than 80 percent were either omitted or revised, as questions that are too hard or too easy will not discriminate between mothers who are knowledgable about supplemental feeding and mothers who are not. The item difficulty and index of discrimination were calculated at the Michigan State University Computer Center.

Reliability was determined using the Kuder-Richardson 20 (K-R 20) coefficient of reliability. The instrument was considered reliable if the K-R 20 coefficient was greater than or equal to .70 (Henerson et al., 1987). This survey was found to be reliable with a K-R 20 value of .70.

Eleven of the questions on the knowledge survey had an index of discrimination greater than .33; twenty-seven of the questions had an index of discrimination less than .33.

Eighteen of the questions had a difficulty index between 20 and 80; twenty items had a difficulty index either less than 20 or greater than 80.

Many of the items were not considered valid because of confusing or unclear wording; these items were changed based on recommendations from the reaction group. Other items were not numerically valid because either all subjects (or almost all subjects) got that question correct or incorrect; in this situation it was impossible to "discriminate" between mothers who were knowledgeable about supplemental feeding and mothers who were not knowledgeable about supplemental feeding (Ebel, 1979). Because it is important to know what most mothers already know about supplemental feeding, and what most mothers do NOT know, some of these items were left in the knowledge survey. Concepts that less than 20% of the mothers answered correctly that were left on the supplemental feeding knowledge test (with some wording changes based on suggestions from the reaction groups) included:

- several signs of infant readiness for supplemental foods
- some consequences of waiting to start supplemental foods past the recommended age.

Concepts that more than 80% of the pilot mothers answered correctly that were left on the knowledge test (with some wording changes based on suggestions from the reaction groups) included:

- a sign of infant readiness for supplemental foods
- the food usually recommended as an infant's first supplemental food
- the recommended method of feeding the first food
- the concept of single versus multiple ingredient foods (the format of this question was entirely changed, however, based on reaction group recommendations)
- the number of new foods an infant should be fed at one time
- the recommended length of time between the feeding of two new foods
- the effect of cereal feeding on an infant's sleeping habits
- the recommend method of feeding cereal
- several infant feeding guidelines (many of these also had extensive wording changes based on reaction group suggestions).

As noted above, the purpose of the reaction groups was to determine the clarity and conciseness of the questions on the survey, and to determine if the questions on the knowledge survey addressed the desired infant supplemental feeding concepts. The reaction groups provided invaluable recommendations and suggestions for improving the clarity, readability, and appropriatiness of many questions. Some examples of how some instructions/questions were changed based on recommendations/suggestions from the reaction groups follow:

- Mothers were instructed to report their infants' ages to the nearest week on the pilot study. They reported that this often involved going back to calendars and counting weeks. On the final survey, mothers were instructed to report infant ages to the nearest months, using fractions if appropriate (i.e. 2 1/2 or 3 1/4 months).
- Supplemental foods were defined on the pilot test as "ANY food or liquid besides breast-milk, infant formula, or water." This caused much confusion, as the mothers did not know whether to consider juice a solid or liquid. Therefore, supplemental foods were defined on the final survey as "any food or liquid

besides breast-milk, infant formula, 100% fruit juice, or water."
- Question #3 was changed from "Feeding solid foods to a baby too early may:" to "Feeding foods other than breast-milk, infant formula, 100% fruit juice, or water to a baby that is too young may:." The reaction group mothers thought that too early could mean too early in the day or morning, when the concept being measured was really age.
- Question #7 was worded "What fruit would be best for the baby just starting fruits?" followed by answer fruits containing varying numbers of ingredients as answer choices. This question was changed to "What food would be best for a baby just starting foods other than breast-milk, infant formula, 100% fruit juice, or water?" followed by answer choices that specified the number of ingredients in a food, NOT particular foods.
- Question #13 was changed from "You should listen to your baby's appetite to avoid over-feeding or under-feeding" to "You should pay attention to your baby's appetite to avoid over-feeding or under-feeding.
- Question #16 (pilot study) was changed from "Don't over-do high-fiber foods in your baby's diet" to "Babies don't need special high-fiber foods in their diets (#15 on final survey).

Results of the Pilot Test - Demographic Data

A total of sixteen mothers responded to the advertisement in the State News and completed the Infant Feeding Survey; twelve of these mothers participated in the reaction groups. Fifteen of the pilot study participants were Caucasian and one was Hispanic. Eleven of the mothers were first-time mothers; the remaining five mothers had two children.

Twelve of the women were between 25 and 34 years of age; two women were between 20 and 24 years of age, and two women were between 35 and 39 years of age. All sixteen women were high school graduates; six women had completed

some college; eight mothers had graduated from college; one mother had done some post-graduate work.

Twelve mothers were employed full time and two mothers were employed part-time; one subject was on leave, and one subject was a part-time student. Interestingly, only four women indicated that they were also "homemakers." Nine of the women had household incomes greater than $40,000 per year; three had household incomes between $30,000 and $40,000 per year; three had household incomes between $20,000 and $30,000 per year; and one had a household income between $10,000 and $20,000 per year.

The mean birth weight of these mothers' infants was 3324 grams (7 lbs. 6.4 oz.), ± 356.2 grams; birthweights ranged from 2716 grams to 3948 grams (6 lbs. 1 oz. to 8 lbs. 13 oz.). The mean age of the infants at the time of the reaction session was 27.7 weeks ± 14.9 weeks; infants ranged in age from 10 to 56 weeks.

Results of the Pilot Test - Supplemental Feeding Knowledge Test

The mean score on the knowledge survey was 23.4 (38 possible), with a standard deviation of 4.3; the scores ranged from a low of 14 to a high of 32. Only one mother correctly identified all five common signs that show a baby's readiness for supplemental foods; however, fifteen of the mothers knew that drinking more than 32 ounces of formula or breast-feeding more than 8 to 10 times in a

24-hour period was a sign that might indicate a baby's readiness for supplemental foods. Ten of the 16 mothers identified the age when supplemental foods are usually recommended; four of the mothers answered an earlier age, and two mothers answered a later age.

Thirteen of the 16 mothers identified infant cereal as the first supplemental food usually recommended. Four women thought juice and one women thought fruit were the first supplemental foods usually recommended.

Most women (eleven) knew that supplemental foods should be fed from a spoon. Three women answered that supplemental foods should be fed from a bottle, but two of these women thought that juice was the first supplemental food recommended. One mother thought the baby should feed him/herself.

All sixteen mothers knew that only one new food should be fed at a time. Half the mothers (eight) thought that new foods should be given at intervals of three to four days; seven mothers thought the interval should be five to seven days; one mother thought the interval should be one to two days.

Thirteen of the mothers knew that feeding solids to a baby too early may cause food allergies, and seven of the mothers knew it may lead to obesity. One mother thought feeding solids to a baby too early may stunt the baby's growth, and one mother responded "I don't know."

Nine of the mothers knew that feeding solid foods to a baby too late may result in too little of some nutrients in the baby's diet, and five knew that it may make it hard to introduce solid foods. However, few of the mothers recognized that feeding solid foods to a baby too late may stunt the baby's growth (2), or delay the baby's eating and speech development (1). Three mothers responded "none of the above" to this question, and two mothers responded "I don't know.

Interestingly, many of the statements based on the baby food company infant dietary guideline statements were not well understood by the mothers; mothers in the reaction group reported that many of the words used were vague, and that the meaning of the statements was not clear. Based on the reaction groups' recommendations, many of the original statements were revised on the final survey.

For example, the mothers did not know what "wide variety of foods" meant; they did not like the word "listen" in the statement "You should listen to your baby's appetite to avoid over-feeding or under-feeding." They did not understand the terms "too much" and "over-do." In the statements "In an infant's diet, sugar is okay but in moderation," and "In an infant's diet sodium (salt) is okay but in moderation" they wondered if the statement meant sugar/sodium already in foods or added to foods; the meaning of the word "moderation" was also a source of confusion in these statements. Finally, the statement "Babies need more

iron, pound for pound, than adults do." was confusing; the mothers did not know what the iron requirement for adults was, and wondered what it had to do with their babies' iron requirement.

Overall, the pilot study mothers correctly answered the "Correct/Incorrect" baby food company infant dietary guideline statements. However, since the mothers often did not know exactly what the statement meant, they indicated that they did not know how to use the statements in everyday feeding situations with their babies. Sixty-three percent or more of the pilot group mothers answered the following infant dietary guideline statements appropriately, either correct or incorrect depending on the statement (the actual percentage of mothers responding correctly follows each statement):

- A baby's diet should be gradually built to include a wide variety of foods by the end of the first year (True). (88%)
- Babies' less than six months of age need a wide variety of foods to meet their nutritional needs (False). (94%)
- You should listen to your baby's appetite to avoid over-feeding or under-feeding (True). (94%)
- All babies that are the same age need the same amount of food for growth and good health (False). (100%)
- You should not restrict fat and cholesterol too much in your baby's diet (True). (63%)
- In an infant's diet, sugar is okay, but in moderation (True). (88%)

- Sugar substitutes (saccharin and "Nutra-Sweet") should be used in place of sugar in the infant's diet (False). (94%)

- In an infant's diet, sodium, (salt) is okay, but in moderation (True). (63%)

- Babies need more iron, pound for pound, than adults do (True). (63%)

Less than 50% of the pilot group mothers answered the following statements appropriately, i.e. 50% or more of the mothers answered the statement "correct" when it was incorrect and vice versa (the actual percentage of mothers responding correctly follows each statement):

- Don't overdo high-fiber foods in your baby's diet (True). (38%)

- High-fiber foods will help babies get all the nutrients they need (False). (50%)

- Infants usually get more salt from commercially prepared baby food than from home prepared baby food or table food (False). (38%)

- The most common nutritional problem of infants in the United States is lack of iron in the diet (True). (50%)

Results of the Pilot Study - Supplemental Feeding Behavior

Fourteen of the infants in the pilot study had been fed some beikost at the time their mothers participated in the reaction group. The mean age of introduction of beikost was 15.2 $\pm$ 5.4 weeks; the age of introduction of supplemental foods ranged from 6 to 24 weeks.

One major point of confusion in the survey raised by the reaction group was that juice was referred to as a solid food. Many of the mothers did not know how to answer

the question asking if their babies had had solid food including juice, as their doctors were not treating juice as a solid food, but as a liquid. Based on the recommendation of the reaction group, 100% fruit juice was not included as a solid food in the final form of the survey.

Eleven of the mothers gave infant cereal (rice) as the first supplemental food; one gave apple juice; one gave applesauce; and one gave fruits and vegetables. Twelve of the mothers fed the first supplemental food from a spoon, and two fed it from a bottle. However, one of the bottle-feeders fed juice as the first food.

Three of the infants in the pilot study had only received one food at the time of the study. For those who had fed their baby more than one food, one mother waited one to two days before feeding the second new food; two mothers waited three to four days; one mother each waited four to five days, five to seven days, and eight to ten days. Five mothers waited longer than ten days; these mothers waited from 17 days to 2 months between the feeding of the first and second new foods.

The major source of infant feeding information for these mothers were doctors/pediatricians (nine subjects) and books (seven subjects). Other sources of infant feeding information listed by these mothers included reading, child development class, LaLeche League, doctor's office, other mothers, Gerber, experience, and niece.

When asked how often they used the infant feeding information from a variety of sources, the mothers responded as shown in Table 3.1 (n = 15 as one mother did not complete this part of the survey):

Table 3.1 Mothers' frequency of use of various sources of infant feeding information (n=15)

NR=Mother did not receive information from this source.
NU=Mother did not use information from this source.
SU=Mother sometimes used information from this source.
OU=Mother often used information from this source.

Source	NR	NU	SU	OU
Doctor	1	0	3	11
Nurse at Dr's Office	8	1	1	5
Health Dept. Nurse	15	0	0	0
Dietitian/ Nutritionist	13	1	0	1
Midwife	14	1	0	0
Mother	2	5	5	3
Mother-in-law	5	7	3	0
Other relative	6	3	3	2
Friends	3	5	6	1
Neighbors	10	5	0	0
Books	0	0	4	11
Newspaper/ Magazines	3	2	6	4
Publications from formula or baby food companies	1	3	6	5
Television	9	6	0	0
Radio	10	5	0	0
Hospital take-home kit	0	2	10	1
Le Leche League	8	3	2	2
Classes at Health Dept.	13	2	0	0
WIC	12	2	0	0
County Extension Office	13	2	0	0

Summary of Pilot Study and Reaction Group

Overall, these mothers knew the recommended age to introduce supplemental foods, what food to introduce first, the method for feeding, and how to space the introduction of two new foods. These mothers were less knowledgeable about the signs of readiness for supplemental foods. Mothers main sources of infant feeding information were doctors and books.

The mothers' behaviors indicated that they often introduced beikost before recommended. They did follow the recommendations on what food to introduce first, and how to feed and introduce beikost.

The Infant Feeding Survey was revised before the final mailing based on the results and recommendations from the pilot study and reaction group. The audiotapes and notes from the reaction group sessions were reviewed. Infant Feeding Survey questions were re-worded based on the reaction groups' recommendations and suggestions to make them clearer and more concise. Based on the index of difficulty and index of discrimination, some questions were omitted or revised. The final survey included both forced-choice and open-ended questions.

Materials and Methods of the Research Study

Preparation and Mailing of the Instrument

Following the pilot study and reaction groups, the final Infant Feeding Survey and other materials needed for the mailing were prepared. To make the survey more attractive to new mothers, a yellow cover was made with "clip-art" baby illustrations, and 1000-plus copies were made (Appendix D). Self-addressed, pre-paid, business-reply envelopes and postcards were prepared using Michigan State University's printing department. A cover letter was written which explained the study and informed potential participants that their responses would be confidential (Appendix E).

Subjects for this study were obtained from Gerber Products Company's computerized mailing lists of new mothers. Mothers with infants between the ages of zero to six months were requested.

When asked what was an effective incentive in their new-mother mailings, Gerber reported that good response rates resulted using fifty-cent pieces minted with the year of the baby's birth. Since a fifty-cent piece is a relatively inexpensive, non-promotional, novelty item, the researcher decided to use them as the incentive for this study.

The biggest unforeseen challenge in preparing the mailing was obtaining the 1000, 1990 fifty cent pieces needed as an incentive. Lansing area banks reported that

they could not control the dates of the fifty-cent pieces they received; they merely had to take what was sent to them. The Old State Bank of Fremont, (the researchers home-town) was contacted, and they happened to have 1000, 1990 fifty cent pieces in a teller's drawer.

Subjects and Population for the Research Study

Subjects for this study were 1000 new mothers nationwide, with infants less than approximately six months of age. The subjects names and addresses were obtained from Gerber Products Company's (GPC) mailing list of new mothers. GPC supplied ten randomly selected names per each of the fifty states from each of the following infant age groups: zero to one month old, one to two months old, two to three months old, three to four months old, and four to five months.

Twenty surveys were mailed to each state; the twenty surveys per state were comprised of five randomly selected names from each of the following infant age groups: one to two months old, two to three months old, three to four months old, and four to five months old. The survey was not sent to infants in the youngest age group, so subjects within the desired age range (0 to 6 months) would still be available in case a poor response initiated a second mailing of the survey.

Each subject received the following information in a first-class mailing: the self-administered Infant Feeding

Survey (Appendix D); an individually signed letter explaining the study (Appendix E); a 1990 fifty-cent piece (glued to the letter); a self-addressed, pre-paid, business-reply return envelope; and a self-addressed, pre-paid, business-reply postcard where subjects could record their name, address, and whether they had returned their survey or not. The postcard was included so that the investigators could track who had returned surveys; in case of a low-response rate, a reminder letter could be sent to mothers who had not returned surveys. To track the origin of each returned survey, the state to which it was being sent was hand-written on the back of the survey prior to mailing.

The cover letter requested that the surveys be returned approximately two weeks after they were mailed. The majority of surveys were returned within this two-week time frame. As the surveys were returned, they were initially sorted by parity into two groups: first-time mothers and mothers with more than one child. However, since the distribution was almost equal between first-time mothers and mothers with more than one child, the surveys were combined for data analysis. Surveys were also eliminated if the infant weighed less than 2500 grams, if the mother had more than one baby with this pregnancy, and if the infant was older than 8 months of age.

Data Analysis

The survey data were entered into SPSS using the Data Entry portion of the program (SPSS/DE). The researcher entered results from all of the surveys into the program. To determine the accuracy of the entry process, 10% of the surveys were double-checked by a research assistant. Fourteen errors were found in the 50 surveys checked; based on the 16,250 items these 50 surveys represented, this represented an acceptable error of .09%.

Validity and reliability of the final survey was determined. Reliability was determined using the alpha coefficient. Validity was determined using the index of discrimination.

Much of the behavior data on this survey were collected from open-ended questions. To make this open-ended data usable, the decision was made to quantitate the mothers responses and establish the most popular "answers" to the open-ended questions. The researcher and a research assistant reviewed 20 surveys from mothers who had fed their infants beikost at the time of the study, and 20 surveys from mothers who had not. Each mother's responses to the open-ended questions were recorded; responses that appeared on the 40 reviewed surveys and additional responses that the researcher thought would be representative of all of the mothers in the survey were then entered into SPSS/DE as variables. Mothers were then scored on the open-ended questions as to whether they had answered any of the

choices; if not, "other" was indicated. As the researcher scored surveys, other responses were added to the open-ended questions. The original 40 surveys reviewed, however, provided an accurate picture of what the mothers as a whole would answer.

The infant supplemental feeding knowledge section of the survey was divided into 2 scores. Score I was the score from the section based on questions from the AAP infant feeding recommendations. Score II was the score from the section based on the baby food company infant feeding guidelines. Score I and Score II were added together to create Score III, a comprehensive infant supplemental feeding knowledge score.

To meet the defined research objectives, descriptive data (means, standard deviations, and ranges), frequency data and chi-square were the statistical methods appropriate for use in these analyses. Mothers ages and incomes were converted to the categorical range means, and score III was converted to quartiles for chi-square analysis.

Frequencies and percentages were calculated for all questions on the survey, except on those items where descriptive data were appropriate. Descriptive data were calculated for mothers' parity, infants' ages and birthweight, breast-feeding duration, frequency of breast-milk and infant formula feedings, age juice was introduced/planned to be introduced, age supplemental foods

were introduced, and total infant supplemental feeding knowledge score.

Crosstabs and chi-square analysis were done on Score III and each of following variables: mothers' age, mothers' income, mothers' education, mothers' employment (full-time and part-time), marital status, mothers' ethnicity, mothers' parity (first baby), and if the mother ever breast-fed.

To eliminate cells for each individual score, Score III data were grouped into quartiles for chi-square analysis. Because there were expected cell values less than five in the initial chi-square analysis, categories of responses in the education, ethnicity, and marital status variables were combined to make fewer cells of larger size (Alreck and Settle, 1985). This eliminated expected cell values of less than five in the education and Score III crosstabs; it reduced the number of expected cell values of less than five in the race and Score III crosstabs from 17 out of 24 to 1 out of 12. It reduced the number of expected cell values of less than five in the marital status and Score III crosstabs from 12 out of 20 to 4 out of 12.

CHAPTER IV

RESULTS

This chapter presents the data and results from the mothers' completed Infant Feeding Surveys. Included in the results are the response rate of the survey; characteristics of the mothers (and their infants) responding to the survey; feeding characteristics of the infants in the survey; infant feeding behaviors and mothers' rationale for feeding infants supplemental foods; reasons mothers had not introduced supplemental foods and their plans for future infant feeding; frequency of use of various liquids; sources and frequency of use of infant feeding information; and infant supplemental feeding knowledge and its relationship to mothers' demographic characteristics.

Response Rate

One thousand surveys were mailed in the initial mailing; 20 surveys to each of the 50 states as described in the previous chapter. Mothers were asked to respond within approximately two weeks of the survey mailing; the majority of surveys were returned within this time frame. Forty-four surveys were returned due to incorrect or insufficient addresses. Forty-four surveys were re-mailed to different addresses from the same state from which they were returned. Only four surveys were returned from this second mailing due

to incorrect or insufficient addresses. Thus, a net total of 996 surveys was mailed.

A total of 527 completed surveys was returned resulting in a response rate of 52.9%. Response rate by geographic regions is reported in Table 4.1 (U.S. Department of Health and Human Services, 1984).

Table 4.1 Geographic distribution of returned surveys (n=499)

Geographic Region	n of returned surveys (%)
Northeast	99 (19.8)
North Central	129 (25.8)
South	147 (29.5)
West	124 (24.8)

Table 4.2 Reasons completed, returned surveys were not used for analysis (n=24)

Reason not used	n
Mother had twins	9
Infant weighed <2500 grams	13
Infant > 8 months old	1
Survey returned too late	1

Of the 527 returned surveys, 503 were used for analysis (Table 4.2). Nine surveys were not used as the mother had twins; thirteen were not used because the infants weighed less than 2,500 grams; one was not used because the infant was too old (fourteen months); and one was not used because the mother returned it too late. Seven non-completed surveys were also returned for various reasons: the infant was too old, the infant had not been born yet, there was no infant in the household, and the infant had died. Because of the good response rate (52.8%), no follow-up mailings were used (Alreck and Settle, 1985).

Validity and Reliability of the Final Survey

The alpha coefficient of reliability for the final survey was .59. There were 41 items on the knowledge test. The index of discrimination for each item ranged from -.08 to .57. Thirteen items had an index of discrimination greater than or equal to .33; 28 items had an index of discrimination less than .30. The index of difficulty ranged from 9 to 99. Twenty-three items had an index of difficulty between 20 and 80.

Characteristics of Mothers Responding to the Survey

Approximately 88% of the mothers completing the survey were Caucasian and 83% were between 20 and 34 years of age (Table 4.3). The number of subjects (n) varies for each demographic variable, as it does for most of the variables

in this study, because some mothers did not answer all of the questions. In all cases, the n reported for each variable indicates the number of mothers answering that particular question. Education and income were more evenly dispersed than ethnicity and age. The majority of women participating in this study were high school graduates. The single education category with the most respondants was high school graduate (23%); however women in most of the other categories would also have been high school graduates.

Table 4.3 Age, education, ethnicity, and income status of mothers responding to the study

Demographic Variable	n (%)
AGE IN YEARS (n=500)[a]	
<20	34 (6.8)
20-24	119 (23.8)
25-29	169 (33.8)
30-34	127 (25.4)
35-39	36 (7.2)
40-44	15 (3.0)
>45	0
HIGHEST LEVEL OF EDUCATION COMPLETED (n=498)	
High school graduate	112 (22.5)
Bachelors degree	96 (19.3)
Some college	94 (18.9)
Associates degree	53 (10.6)
Some high school	44 (8.8)
Advanced degree	27 (5.4)
Vocational training	20 (4.0)
Some post-graduate work	19 (3.8)
GED	17 (3.4)
Technical training	12 (2.4)
8th grade or less	4 (0.8)
ETHNICITY (n=489)	
Caucasian	429 (87.7)
African American	24 (4.9)
Hispanic	14 (2.9)
Asian	8 (1.6)
American Indian	5 (1.0)
Other	9 (1.8)
ANNUAL INCOME ($ -U.S.) (n=495)	
<10,000	55 (11.1)
10,001-15,000	38 (7.7)
15,001-20,000	36 (7.3)
20,001-25,000	41 (8.3)
25,001-30,000	53 (10.7)
30,001-35,000	41 (8.3)
35,001-40,000	48 (9.7)
>40,000	165 (33.3)
Did not wish to answer this question	18 (3.6)

[a]n varies with the number of responses to each question.

One-third of the mothers lived in households with incomes greater than $40,000. The majority of women (88%) had medical insurance, and 87% were married. Almost half of the mothers described themselves as homemakers (46%); 28% were currently employed full-time and 16% were employed part-time (Table 4.4).

While low-income women were not targeted for this study, results show that 32% of the women (responding to the question) had been enrolled in the Women, Infants, and Children Program (WIC) for assistance (Table 4.5). Other programs mothers commonly had participated in included prenatal classes (57%) postnatal classes (14%) Food Stamps (9%), La Leche League classes (9%), and Aid to Families with Dependent Children (AFDC) (5%). Places less than 5% of the mothers went for assistance included Health Department classes, day care, commodity food programs, and the Expanded Food and Nutrition Education Program (EFNEP) (Table 4.5).

Forty-seven percent of the subjects in this study were first-time mothers (Table 4.6). For mothers who had had more than one baby, the mean number of other children was 1.5.

Table 4.4 Employment, marital, and medical insurance status of mothers responding to the survey

	n (%)
EMPLOYMENT STATUS[a] (n=499)	
Homemaker	232 (46.5)
Employed fulltime	137 (27.5)
Employed parttime	79 (15.8)
Student	46 (9.2)
Unemployed	45 (9.0)
Employed in own home	23 (4.6)
Unemployed, looking for work	22 (4.4)
Employed fulltime, on leave	20 (4.0)
Employed parttime, on leave	12 (2.4)
Disabled	3 (0.6)
MARITAL STATUS (n=500)	
Married	437 (87.4)
Single	45 (9.0)
Divorced	9 (1.8)
Separated	8 (1.6)
Widowed	1 (0.2)
MEDICAL INSURANCE STATUS (n=499)	
Had medical insurance	437 (87.6)

[a]n > 499 as mothers could check more than 1 response.

The mean age of the infants in this study was 4.01 months, and mean birth weight was 3444.7 grams (Table 4.7). Very few of the infants had serious medical problems or food allergies (2% and 5% respectively) (Table 4.8); None of the infants with medical problems or food allergies were excluded from the study, as their surveys indicated that the problems were not affecting feeding.

Table 4.5 Sources of assistance for study participants (n = 397)

Source	number participating[a]
Prenatal classes	226 (56.9)
WIC classes	127 (32.0)
Postnatal classes	56 (14.1)
Food stamps	35 (8.8)
La Leche League classes	34 (8.6)
AFDC	21 (5.3)
Health department classes	16 (4.0)
Day care	14 (2.8)
Commodity food programs	2 (3.5)
EFNEP program	1 (0.3)
Other	110 (21.9)

[a]n>397 as mothers could check more than one response.

Table 4.6 Parity and household characteristics relative to children of mothers participating in survey (n=503)

Mother's first baby	236 (46.9%)
Mean number of other children Range of children = 1-7	1.5 $\pm$ .77
Mother's whose other children live with her	255 (95.5%)

Table 4.7 Mean age and birthweight of infants in the survey

Characteristic	Mean ± SD	Range
Age, months (n=501)	4.01 ± 1.22	(.50-7.50)
Birth Weight, gms (n=502)	3444.7 ± 459.6	(2500-4872)

Table 4.8 Prevalence and incidence of serious infant medical problems and food allergies reported by mothers in the survey

	n (%)
SERIOUS MEDICAL PROBLEMS	
Prevalence of infants with serious medical problems (n=503)	9 (1.8)
Incidence of Serious Medical Problems[a]	
Apnea	1 (11.1)
Asthma	1 (11.1)
Brain cyst	1 (11.1)
Cleft lip	1 (11.1)
Crib death syndrome	1 (11.1)
Reflux	1 (11.1)
Heart murmur	1 (11.1)
Hypoglycemia	1 (11.1)
Not reported	1 (11.1)
FOOD ALLERGIES	
Prevalence of foods allergies (n=502)	23 (4.6)
Incidence of Food Allergies[a]	
Cow milk/formula/lactose	20 (87.0)
Fruit	2 (8.7)
Protein allergic colitis	1 (4.3)

[a]Percentages are the number of infants with either the medical problem or the food allergy.

Feeding Characteristics of the Infants in the Survey

Two-thirds of the mothers indicated that they had ever breast-fed their infants (Table 4.9). Almost half of the mothers (49%) were still breast-feeding at the time of the survey. The mean length of time mothers breast-fed was 11.9 weeks; however, this mean includes women who were still nursing.

Table 4.9 Prevalence and length of time breast-feeding for mothers in this survey (n = 503)

Number of infants ever breast-fed	331 (65.8%)
Mean length of time breast-fed (in weeks) (includes infants still being breast-fed)	11.9 ± 7.5 Range = 0-33
Number of mothers still breast-feeding	161 (48.6%)

Consistent with the mothers' reports that 66% had breast-fed their infants, 52% indicated that their infant was breast-fed during the first few days of life, and 12% indicated that their infant was combination breast-fed and formula fed the first few days of life (Table 4.10). The remaining infants (34%) were formula fed the first few days of life.

Table 4.10 Methods of infant feeding during the first few days of life (n=503)

Method of Feeding	n(%)
Breast-fed	260 (51.7)
Any Infant formula	173 (34.4)
Combination of breast-fed and infant formula	62 (12.3)
Other (either IV, water, or glucose water)	8 (1.6)

Very few of the infants in this study received milks other then breast-milk or infant formula, either cow-milk based or soy-based (Table 4.11). One percent or less of the infants had received the following milks at the time of the survey: whole cow milk, 2% cow milk, skim milk, evaporated milk, sweetened-condensed milk, or goat milk (Table 4.11).

Infants were fed formula fewer times per day than breast-milk (Table 4.12). Infants received on the average breast-milk 5.90 times per day, regular formula 4.91 times per day, and soy formula 4.95 times per day.

Table 4.11 Milk feeding information for the infants in this study (n ranged from 488-490)[a]

Sources of milk	n (%)
Whole cow milk	1 (0.2)
2% cow milk	5 (1.0)
Skim milk	1 (0.2)
Evaporated milk	1 (0.2)
Regular infant formula	300 (61.3)
Soy milk	7 (1.4)
Breast milk	147 (30.1)
Soy infant formula	81 (16.6)
Sweetened condensed milk	0
Goat's milk	0
Other	12 (2.5)
Nutramigen	6
Alimentum	3
Acidopholis milk	1

[a]n ranged from 488-490 as some mothers skipped some milks.

Table 4.12 Number of times/day infants were fed breast-milk, regular infant formula, and soy infant formula

Milk	n[a]	Mean ± SD	Range
Regular infant formula	300	4.91 ± 1.90	1.00-12.00
Breast-milk	147	5.90 ± 2.02	1.00-10.00
Soy formula	81	4.95 ± 1.55	1.00- 8.00

[a]n>503 as mothers could check more than one response.

Over one-third of the infants had been fed 100% fruit juice at the time of this study. Mothers introduced juice at a mean age of 3.3 months (Table 4.13). Mothers who had not introduced juice reported that they planned to introduce it at a mean age of 5.69 months.

Table 4.13 Juice feeding information (n=500)

Number of infants fed 100% fruit juice at the time of this study	179 (35.8%)
Mean age, in months, when juice was introduced Range: .50-7.00	3.31 ± 1.24
Mean age, in months, when mothers planned to introduce juice Range: 2.50-24.00	5.69 ± 2.05

Mothers reported that the majority of fathers fed their infants more than twice a week (78%) (Table 4.14). Many infants were also fed more than twice a week by their day-care providers and the mother's mother (30% and 22% respectively).

Table 4.14 Other people who fed the infants in this study more than twice a week (n=463)[a]

Person	n of infants fed >2 times/week by this person (%)
Baby's father	363 (78.4)
Baby sitter/ Day care provider	140 (30.2)
Mother's mother	104 (22.5)
Mother's mother-in-law	43 (9.3)
Other relative	43 (9.3)
Older sibling	29 (6.3)

[a]n>463 as mothers could check more than one response.

Most of the infants (66%) in this study had been fed supplemental foods at the time of this study (Table 4.15). The mean age when the first supplemental food was given was 2.82 months ± 1.35, with a range of .10 to 10.00 months.

Table 4.15 Supplemental feeding information

Number of infants given supplemental foods (n=503)	330 (65.6)
Mean age, in months, when first supplemental food was given (n=327) Range: 0.10-5.50	2.82 ± 1.35

Infant Feeding Behaviors and Mothers' Rationale for Feeding Infants Supplemental Foods

Mothers who had already started their infants on supplemental foods gave numerous reasons for doing so (Table 4.16). The five most frequently reported responses were: baby was hungry/not satisfied (48%), baby's doctor/pediatrician recommended (25%), baby was drinking too much formula/feeding too often (25%), baby was not sleeping through the night (14%), and baby was the right age/weight (12%).

The first food the majority of mothers introduced was rice cereal (61%) (Table 4.17). Other foods mothers introduced first included: cereal plus another food (10%), cereal (9%), baby cereal (7%), and applesauce (3%). Because the question was open-ended, only answers that specified "rice cereal" were counted as rice cereal. Therefore, some mothers who answered cereal may actually have used rice cereal.

Based on their responses, 50% of the mothers chose the first food they fed because their doctor/pediatrician recommended it (Table 4.18). Other reasons mothers chose the first food they fed were: the food is easy/easiest to digest/well-tolerated (16%), this food is the recommended food to start with/normally the first food given (14%), experience (9%), book/magazine recommended (6%), and food will fill-up/satisfy baby (6%).

Table 4.16 Reasons mothers gave for starting their babies on supplemental foods (n=325)

Reason[a]	n (%)[b]
Baby hungry/not satisfied	157 (48.3)
Doctor/pediatrician recommended	82 (25.2)
Baby drinking too much formula/feeding too often	81 (24.9)
Baby not sleeping through the night	47 (14.5)
Baby is the right age/weight	38 (11.7)
Mother didn't think baby was getting enough breast-milk or formula/baby needs more food	27 (8.3)
To reduce vomiting/spitting-up	13 (4.0)
Baby interested	11 (3.4)
Baby needs something more substantial	8 (2.5)
Big baby	7 (2.2)
Let baby get used to food before needs it	7 (2.2)
Book/magazine recommended	6 (1.8)
Baby ready	6 (1.8)
Friend/relative recommended	3 (0.9)
Nutrient needs/reasons	3 (0.9)
Recommended time/age to start	3 (0.9)
Nurse recommended	1 (0.3)
Dietitian recommended	0
Other reasons	31 (9.5)
Constipation problems	2
Baby too heavy	2

[a]Reasons are reported in mothers' words whenever possible.

[b]n > 325 as question was open-ended, and mothers responses often included several reasons.

Table 4.17 First food regularly[a] given to the infants (n=328)

Food	n (%)
Rice cereal	199 (60.7)
Any cereal plus other food	34 (10.4)
Cereal	31 (9.5)
Any baby cereal	24 (7.3)
Applesauce	9 (2.7)
Oatmeal cereal	7 (2.1)
Baby food	5 (1.5)
Fruit	5 (1.5)
Vegetable	4 (1.2)
Bananas	3 (0.9)
Other foods	7 (2.1)
mashed potatoes and gravy	3
gravy	1
brown rice cereal	1
grits	1
rice	1

[a]Foods given regularly versus a food given in an isolated incidence.

Table 4.18 Reasons mothers chose the first food fed to their infants (n=324)

Reason[a]	n (%)[b]
Doctor/pediatrician recommended	163 (50.3)
Food easy/easiest to digest/well-tolerated	52 (16.0)
Recommended food to start with/ normally the first food given	45 (13.9)
Mothers' experience	30 (9.3)
Book/magazine recommended	21 (6.5)
Food will fill-up/satisfy baby	21 (6.5)
Food does not promote/cause allergies	19 (5.9)
Friend/relative recommended	13 (4.0)
Food is the right texture/can mix to the right consistency	8 (2.5)
Meets baby's nutritional needs/ nutritional reasons	7 (2.1)
Food is bland/mild	6 (1.9)
Food can be made with formula/breast-milk	6 (1.9)
Nurse recommended	2 (0.6)
Dietitian recommended	0
Other	67 (20.7)

[a]Reasons are reported in mothers' words whenever possible.

[b]n>324 as question was open-ended and mothers responses often included several reasons.

Most mothers (65%) reported feeding the first supplemental food to their babies from a spoon (Table 4.19). However, over one third of the mothers fed the first supplemental food to their babies from either a bottle (24%) or an infant feeder (11%).

Table 4.19 How mothers fed the first supplemental food to their infants (n=328)

Methods of feeding	n (%)
From a spoon	213 (64.5)
From a bottle	78 (23.6)
From an infant feeder	35 (10.6)
Baby fed self with hands	2 (0.6)
From a cup	0

Mothers gave many reasons for how they decided their babies were ready for supplemental foods (Table 4.20). For the most part, the mothers did not differentiate between the reasons they started supplemental foods, and how they decided their babies were ready for supplemental foods. The five most reported responses were: baby was still hungry/not satisfied (46%), baby drinking too much formula/too many bottles/feeding too often (33%), doctor/pediatrician recommended (26%), baby is the right age/weight (9.0),and baby stopped/not sleeping through the night.

Mothers waited various lengths of time between the feeding of the first and second new supplemental foods (Table 4.21). Most mothers waited one to two days (11%),

three to four days (11%), five to seven days (13%), or eight to ten days (8%). Surprisingly, 20% of the mothers indicated the "other" response to this question. The "other" lengths of time they reported varied from 2 weeks to 4 months. Thirty percent of the infants had been fed only one supplemental food at the time of this research was done.

Table 4.20 How mothers decided their infants were ready for supplemental foods (n=321)

Reason[a]	n (%)[b]
Baby still hungry/not satisfied	149 (46.4)
Baby drinking too much formula/ many bottles/feeding too often	106 (33.0)
Baby stopped/not sleeping through the night	28 (8.7)
Doctor/pediatrician recommended	84 (26.2)
Nurse said/recommended	3 (0.9)
Dietitian said/recommended	0
Friend/relative recommended	15 (4.7)
Book/magazine recommended	7 (2.2)
Baby is the right age/weight	29 (9.0)
Baby interested in food/eating solids	21 (6.5)
Baby doesn't spit food out	5 (1.6)
Other	57 (17.8)
Mothers experience	9
Spitting up alot	4
Sitting up/holds head up	4
Big baby	4

[a]Reasons are reported in mothers' words whenever possible.

[b]n > 321 as question was open-ended and mothers often indicated several reasons.

Table 4.21 The length of time mothers waited between the feeding of the first and second new foods (n=323)

Length of time	n (%)
Baby had been fed only 1 food	97 (30.0)
Second new food given at the same meal as the first food	10 (3.1)
A few hours	3 (0.9)
Less than 1 day	5 (1.5)
1 to 2 days	34 (10.5)
3 to 4 days	36 (11.1)
5 to 7 days	41 (12.7)
8 to 10 days	27 (8.4)
Could not remember	5 (1.5)
Mother was not there to feed the second new food	1 (0.3)
Other[a]	64 (19.8)

[a] Values ranged from 2 weeks to 4 months.

The food most commonly cited as the second supplemental food regularly given to the infants in this study was fruit(s) (26%) (Table 4.22). Applesauce was specified as the second food by 20% of the mothers. Other common second foods mother named included: baby cereal (12%), vegetable(s) (10%), and both fruit(s) and vegetable(s) (10%).

Mothers reported choosing the second supplemental foods for reasons somewhat different than they chose the first supplemental foods. Over one-fourth (27%) of the mothers chose the second supplemental food because their doctor/pediatrician recommended it. Other reasons for choosing the second supplemental food included the

following: babies usually like/a pleasant taste for babies/babies accept well (14%), food well-tolerated/easily digested (12%), this food recommended next/right food to feed next (10%), and to give a new/different taste (8%) (4.23).

Table 4.22 Second food regularly given to the infants (n=216)

Food	n (%)
Fruit(s)	56 (25.9)
Applesauce	44 (20.4)
Baby cereal (any variety)	27 (12.5)
Vegetable(s)	22 (10.2)
Bananas	21 (9.7)
Fruit(s) and vegetable(s)	9 (4.2)
Baby cereal plus other food(s)	8 (3.7)
Carrots	7 (3.2)
Yellow vegetable(s)	6 (2.8)
Baby food(s)	4 (1.9)
Peaches	3 (1.4)
Other	9 (4.2)
Gravy	2
Mashed potatoes	2
Broccoli and cheese	1
Egg	1
Fruit dessert	1
Table food	1
Yogurt juice	1

Table 4.23 Reasons mothers choose the second food fed to their infants (n=220)

Reason[a]	n (%)[b]
Doctor/pediatrician recommended	59 (26.8)
Babies usually like/a pleasant taste for baby/babies accept well	30 (13.6)
Food well-tolerated/easily digested	26 (11.8)
This food recommended next/ right food to feed next	22 (10.0)
Give baby a new/different taste	18 (8.2)
No reason/had on hand	16 (7.3)
Constipation/bowels	12 (5.5)
Right texture/smooth consistency	10 (4.5)
Mixes with cereal	9 (4.1)
Mothers' experience	8 (3.6)
Friend/relative recommended	8 (3.6)
Ready for it/needs more food	8 (3.6)
Book/magazines recommended	7 (3.2)
Baby didn't like first food/ see if baby liked	6 (2.7)
If gave fruit first, baby might not eat vegetables	6 (2.7)
Nutritional needs/reasons	5 (2.3)
Give baby a balanced meal/diet	5 (2.3)
Single-ingredient/simple food	5 (2.3)
Nurse recommended	1 (0.5)
Pure ingredients; no salt, sugar, preservatives, etc.	1 (0.5)
Part of commercial baby food company's feeding program/plan	1 (0.5)
Dietitian recommended	0
Other	26 (11.8)

[a]Reasons are reported in mothers' words whenever possible.

[b]n>220 as question was open-ended and mothers answers often included more than one response.

Reasons Mothers Had Not Introduced Supplemental Foods and Their Plans for Future Feeding

Mothers cited a number of reasons for why they had not given their infants supplemental foods at the time of this study (Table 4.24). The most frequently reported reason was that their baby was too young/not the right age yet/not the right weight (57%). Other reasons mothers most often stated were: doctor/pediatrician recommended (39%), other foods not medically/nutritionally needed yet (25%), baby satisfied with breast-milk/formula alone (19%), digestive system not mature yet (6%), and dietitian had not recommended (3%). This is the first time any of the mothers mentioned a dietitian relative to any of their infant feeding decisions.

Table 4.24 Reasons mothers had not introduced supplemental foods to their infants (n=171)

Reason[a]	n (%)[b]
Baby too young/not right age yet/ not right weight	97 (56.7)
Doctor/pediatrician has not recommended yet	67 (39.2)
Other foods not medically/ nutritionally needed yet	42 (24.6)
Baby satisfied with formula/ breast-milk alone	32 (18.5)
Baby has good weight gain/growth with just breast-milk/formula	17 (9.8)
Digestive system not mature yet	10 (5.8)
Baby sleeps all night	7 (4.1)
Avoid allergies	5 (2.9)
Baby too little/not big enough yet	3 (1.8)
Books/magazines do not/ have not recommended yet	3 (1.8)
Dietitian has not recommended yet	3 (1.8)
Friends/relatives do not/ have not recommended yet	2 (1.2)
Avoid stomach/digestive problems	2 (1.2)
Nurse has not recommended yet	0
Other	21 (12.3)

[a]Reasons are reported in mothers' words whenever possible.

[b]n>171 as question was open-ended and mothers answers often included several reasons.

As with mothers who had already introduced supplemental foods to their infants, the food most named by mothers as the first food they planned to feed their infants was rice cereal (51%) (Table 4.25). Cereal (15%) and baby cereal (12%) were also frequently reported. Interestingly, 6% of the mothers indicated that they did not know what food they were planning to feed their infants first.

Table 4.25 First food mothers planned to give their infants (n=171)

Food	n (%)
Rice cereal	88 (51.5)
Cereal	26 (15.2)
Baby cereal (any variety)	21 (12.3)
I don't know	11 (6.4)
Any cereal plus other food	9 (5.3)
Fruit(s)	3 (1.8)
Oatmeal cereal	2 (1.2)
Baby food(s)	2 (1.2)
Bananas	2 (1.2)
Fruit(s) and vegetable(s)	2 (1.2)
Other	5 (2.9)
Mashed potatoes/potatoes	3
Egg and potatoes	1
Vegetables and meat	1

Reasons mothers planned to feed their infants the particular first supplemental food cited were nearly the same as those reported by mothers who had already fed their infants the first supplemental food (Table 4.18). The reason reported most often was doctor/pediatrician recommended (42%) (Table 4.26). Other frequently reported reasons were: food easy/easiest to digest (24%), experience (18%), recommended food to start with/normally the first food given (18%), food does not cause/promote food allergies (11%), and food meets baby's nutritional needs/nutritional reasons (7%).

Over three-fourths of the mothers planned to feed the first supplemental food to their infants from a spoon (77%) (Table 4.27). Fewer mothers planned to feed their infants the first supplemental food from a bottle (9%) or infant feeder (7%) (Table 4.27) than mothers who had already fed supplemental foods to their infants (Table 4.19).

Table 4.26 Reasons mothers chose the first food they planned to feed their infants (n=159)

Reason[a]	n (%)[b]
Doctor/pediatrician recommended	67 (42.1)
Food easy/easiest to digest	38 (23.9)
Mother's experience	28 (17.6)
Recommended food to start with/ normally the first food given	28 (17.6)
Food does not cause/promote food allergies	17 (10.7)
Meets baby's nutritional needs/ nutritional reasons	11 (6.9)
Food is the right texture/can mix food to the right consistency	9 (5.7)
Friend/relative recommended	8 (5.0)
Book/magazine recommended	8 (5.0)
Food can be made with formula/breast-milk	7 (4.4)
Food is bland/mild	6 (3.8)
Food will fill-up/satisfy baby	4 (2.5)
Nurse recommended	1 (0.6)
Dietitian/nutritionist recommended	1 (0.6)
Other	25 (15.7)

[a]Reasons are reported in mothers' words whenever possible.

[b]n>159 as question was open-ended and mothers answers often included more than one response.

Table 4.27 How mothers planned to feed the first supplemental food to their infants (n=172)

Method of feeding	n (%)
From a spoon	133 (77.3))
From a bottle	16 (9.3)
From an infant feeder	12 (7.0)
I don't know	8 (4.7)
Baby will feed self	3 (1.7)
From a cup	0

Most mothers (29%) indicated that they planned to wait 5 to 7 days between the feeding of the first and second new supplemental foods (Table 4.28). However, almost as many women (23%) reported that they did not know how long they would wait between the feeding of the first and second food. Fifteen percent of the women said they planned to wait 3 to 4 days, and 11% said they would wait 8 to 10 days between the feeding of the first and second supplemental foods.

Fruit(s) was the food most frequently reported as the second supplemental food mothers planned to feed their infants (25%) (Table 4.29). Many women (18%) indicated that they did not know what food they would feed as the second food. Other foods mothers listed as the second food they planned to feed were baby cereal (11%), vegetable (10%), applesauce (9%), and both fruit(s) and vegetable(s) (8%) (Table 4.29).

Table 4.28 Length of time mothers planned to wait between the feeding of the first and second new supplemental foods (n=170)

Length of time	n (%)
5 to 7 days	50 (29.4)
I don't know	39 (22.9)
3 to 4 days	25 (14.7)
8 to 10 days	19 (11.2)
1 to 2 days	11 (6.5)
The second new food wil be fed at same meal as the first food	3 (1.8)
A few hours	0
Less than 1 day	1 (0.6)
Other	22 (12.9)

Over one-third of the mothers (36%) chose the second supplemental food because their doctor/pediatrician recommended it (Table 4.30). Seventeen percent chose the second food because this food was recommended next/right food to feed next; 15% choose it based on past experience; 14% because the food was well-tolerated/easily digested; 13% for nutritional needs/reasons; and 11% because babies like/a pleasant taste for babies/babies accept well.

Frequency of Use of Various Liquids

Surprisingly, 34% of the mothers reported that their infants were never fed water (Table 4.31). Seventeen percent of the infants received water daily, and 15% received juice daily. While most infants were not fed sugar water, 11% were fed sugar water more than once a week.

Another 9% received sugar water, but less than once a week. Very few of the infants in this study were fed Hi-C, soda/pop, diet drinks, Kool-aid, tea, or coffee, according to their mothers' reports (Table 4.31).

Table 4.29 Second food mothers planned to feed their infants (n=244)

Food	n (%)
Fruit(s)	60 (24.6)
I don't know	45 (18.4)
Baby cereal(s) (any variety)	26 (10.7)
Vegetable(s)	25 (10.2)
Applesauce	21 (8.6)
Fruit(s) and vegetable(s)	19 (7.8)
Bananas	17 (7.0)
Yellow vegetable(s)	10 (4.1)
Baby food(s)	5 (2.0)
Carrots	4 (1.6)
Peaches	3 (1.2)
Meat(s)	1 (0.4)
Baby cereal plus other food	1 (0.4)
Other	7 (2.9)
Mashed potatoes	3
Juice	1
Liver	1
Rice	1
Sweet potatoes	1

Table 4.30 Reasons mothers chose the second food they planned to feed their infants (n=195)

Reason[a]	n (%)[b]
Doctor/pediatrician recommended	71 (36.4)
This food recommended next/right food to feed next	34 (17.4)
Past experience	29 (14.9)
Food well-tolerated/easily digested	28 (14.4)
Nutritional needs/reasons	25 (12.8)
Babies like/a pleasant taste for babies/ babies accept well	22 (11.3)
Book/magazine recommended	10 (5.1)
If gave fruit first, baby might not eat vegetables	9 (4.6)
Friend/relative recommended	7 (3.6)
Give a new/different taste	6 (3.1)
Right texture/smooth consistency	6 (3.1)
Give a balanced meal/diet	3 (1.5)
Pure ingredients/no sugar, preservatives, salt, etc.	2 (1.0)
Dietitian/nutritionist recommended	0
Nurse recommended	0
Part of commercial baby food company's feeding program/plan	0
Other	40 (20.5)

[a]Reasons are reported in mothers' words whenever possible.

[b]n>195 as question was open-ended and mothers answers often included several reasons.

Table 4.31 Number of times per week various liquids were fed to infants in the study

Liquid	Times Per Week				
	Never[a] (%)	< 1 (%)	1-2 (%)	3-5 (%)	Daily (%)
Sugar Water n=481	382 (79.4)	44 (9.1)	23 (4.8)	13 (2.7)	19 (4.0)
Water n=487	165 (33.9)	114 (23.4)	78 (16.0)	47 (9.7)	83 (17.0)
Hi-C n=455	451 (99.1)	1 (0.2)	3 (0.7)	0	0
100% fruit juice n=476	291 (61.1)	24 (5.0)	45 (9.5)	43 (9.0)	73 (15.3)
Soda/pop n=463	450 (97.2)	9 (1.9)	2 (0.4)	2 (0.4)	0
"Diet" drinks n=463	462 (99.8)	1 (0.2)	0	0	0
Fruit punch n=463	457 (98.7)	4 (0.9)	1 (0.2)	1 (0.2)	0
Kool-aid n=463	453 (97.8)	7 (1.5)	2 (0.4)	1 (0.2)	0
Tea n=464	449 (96.8)	10 (2.2)	4 (0.9)	1 (0.2)	0
Coffee n=462	460 (99.6)	0	2 (0.4)	0	0

[a]Missing responses were NOT counted as "never."

Sources of Mothers' Infant Feeding Information

When asked where or from whom they received most of their infant feeding information, 65% of the women said from their doctor/pediatrician, 26% from books, 21% from their mother, 14% from relatives/family/in-laws, 12% from friends/other mothers, and 12% from magazines. Many mothers also relied on experience (8%), information received at the hospital (7%), and literature from their doctor/pediatrician or their office (5%) (Table 4.32).

A separate question asked mothers how often they used the infant feeding information they received from various sources (Table 4.33). Based on their responses, women most "often used" the information from the following sources: doctor (75%), nurse at doctor's office (35%), mother (33%), books (24%), and hospital take-home kit. Mothers reported that they "sometimes used" the infant feeding information from many different sources. Sources of infant feeding information which were "not used" by the mothers in this study included: television (35%), radio (32%), formula or baby food company publications (25%), mother-in-law (21%), neighbors (19%), hospital take-home kit (18%), and books (17%), to name a few. One hundred thirty mothers reported that they sometimes used (60) or often used (70) WIC for infant feeding information (Table 4.33).

Unfortunately, over 75% of these mothers reported that they did not receive information from a dietitian/nutritionist, and 9% indicated that they did not

use information from a dietitian/nutritionist. Almost 10% said they sometimes used information from a dietitian/nutritionist, and only 6% said they often used information from this source.

Table 4.32 Self-reported people/places from whom mothers obtained most of their infant feeding information (n=500)[a]

Source	n indicating (%)
Doctor/pediatrician	326 (65.2)
Books	130 (26.0)
Mother	104 (20.8)
Friend(s)/other mothers	62 (12.4)
Magazines	61 (12.2)
Experience	39 (7.8)
Relatives	38 (7.6)
Hospital/information or literature received at hospital	37 (7.4)
Family/in-laws	33 (6.6)
Publications/literature/written information from doctor/ pediatrician or their office	24 (4.8)
Mother-in-law	23 (4.6)
WIC	22 (4.4)
Pamphlets/brochures/literature	21 (4.2)
Myself/instinct/own judgement	20 (4.0)
Nurse/Doctor's office staff	15 (3.0)
Sister	15 (3.0)
Baby classes	13 (2.6)
Gerber/baby food company	10 (2.0)
Information/literature or staff from Health Department	10 (2.0)
La Leche League	9 (1.8)
Sister-in-law	5 (1.0)
Dietitian/nutritionist	6 (1.2)
Other	18 (3.6)
School/nursing school	5
Lamaze	3
Husband	2

[a]n>500 as question was open-ended and mothers often reported more than one person/place from whom they received infant feeding information.

Table 4.33 Mothers' frequency of use of various sources of infant feeding information

NR=Mother did not receive information form this source.
NU=Mother did not use information from this source.
SU=Mother sometimes used information from this source.
OU=Mother often used information from this source.

Medical Sources	NR (%)	NU (%)	SU (%)	OU (%)
Doctor (n=496)	19 (3.8)	6 (1.2)	101 (20.3)	370 (74.6)
Nurse at Dr's office (n=490)	156 (31.8)	31 (6.3)	130 (25.5)	173 (35.3)
Health Dept. Nurse (n=480)	338 (70.4)	54 (11.3)	48 (10.0)	40 (8.3)
Dietitian/ Nutritionist (n=482)	364 (75.5)	43 (8.9)	46 (9.5)	29 (6.0)
Midwife (n=478)	416 (87.0)	43 (9.0)	12 (2.5)	7 (1.5)
Family/Friends Sources				
Mother (n=488)	72 (14.8)	41 (8.4)	215 (44.1)	160 (32.8)
Mother-in-law (n=484)	155 (32.0)	103 (21.3)	160 (33.1)	66 (13.6)
Sister (n=479)	265 (55.3)	59 (12.3)	107 (22.3)	48 (10.0)
Sister-in-law (n=478)	268 (56.1)	85 (17.8)	102 (21.3)	23 (4.8)
Other relative (n=404)	265 (65.6)	56 (13.9)	61 (15.1)	22 (5.4)
Friends (n=481)	135 (28.1)	71 (14.8)	241 (50.1)	34 (7.1)
Neighbors (n=477)	309 (64.8)	90 (18.9)	71 (14.9)	7 (1.5)
Babysitter/Daycare provider (n=474)	313 (66.0)	71 (15.0)	70 (14.8)	20 (4.2)

Table 4.33 (cont'd).

PUBLICATION/MEDIA SOURCES	NR (%)	NU (%)	SU (%)	OU (%)
Newspapers/ magazines (n=483)	126 (26.1)	107 (22.2)	199 (41.2)	51 (10.6)
Television (n=474)	217 (45.8)	167 (35.2)	80 (16.9)	10 (2.1)
Radio (n=470)	306 (65.1)	151 (32.1)	12 (2.6)	1 (0.2)
Books (n=483)	107 (22.1)	81 (16.8)	180 (37.3)	115 (23.8)
Formula/baby food company pubs. (n=479)	83 (17.3)	121 (25.3)	221 (46.1)	54 (11.3)
Hospital take-home kit (n=480)	49 (10.2)	86 (17.9)	237 (49.3)	108 (22.5)
ORGANIZATIONS/CLASSES				
La Leche League (n=472)	330 (69.9)	76 (16.1)	42 (8.9)	24 (5.1)
Classes at Health Department (n=472)	372 (78.8)	57 (12.1)	24 (5.1)	19 (4.0)
WIC (n=481)	298 (62.0)	53 (11.0)	60 (12.5)	70 (14.6)
County Extension Office (n=472)	412 (87.3)	54 (11.4)	6 (1.3)	0
Classes (n=425)	300 (70.6)	46 (10.8)	53 (12.5)	26 (6.1)
Other (n=171)	129 (75.4)	22 (12.9)	5 (2.9)	15 (8.8)

Infant Supplemental Feeding Knowledge: Test Scores and Relationship to the Mothers' Demographic Characteristics.

The infant supplemental feeding knowledge test was divided into two sections: a section that tested the mothers knowledge of AAP and health professional infant feeding recommendations (Score I), and a section that tested mothers' knowledge of various infant feeding guidelines and popular infant feeding statements (Score II). A comprehensive infant supplemental feeding knowledge score was calculated by adding the two section scores together (Score III).

Table 4.34 Infant supplemental feeding knowledge test scores (n=500)

Test	Mean ± SD	Range	Total Possible
Score I Infant Supplemental Feeding Knowledge (n=501)	19.7 ± 2.9	11.0-28.0	29.0
Score II Infant Feeding Guidelines (n=502)	8.2 ± 2.0	0.0-12.0	12.0
Score III Total Score (n=500)	27.9 ± 4.1	11.0-40.0	41.0

The mean total score was 27.9 ± 4.1 (68.0%) out of a possible 41 points (Table 4.34). Scores ranged from a low of 11.0 (26.8%) to a high of 40.0 (97.6%).

Frequencies and percentages of mothers' right and wrong answers are presented in Table 4.35. Questions and responses have been shortened in these tables for simpler table presentation. Over two-thirds (67%) of the mothers knew the recommended age to introduce supplemental foods (Table 4.35). Seventy-seven percent of the survey mothers knew that drinking more than 32 ounces of formula or breast-feeding more than 8-10 times a day was a sign of readiness for supplemental foods. However, mothers also thought that a baby's showing interest in food (15%) and the baby not sleeping through the night (78%) were signs of readiness for supplemental foods. Only 16 mothers (3.2%) reported that they did not know how to determine if their baby was ready for supplemental foods (Table 4.35).

Over one-fourth of the mothers thought that feeding a baby supplemental foods at too early an age would lead to obesity. Almost half (49%) knew that feeding supplemental foods too early may cause food allergies; almost 60% knew it may cause stomach problems (Table 4.35).

Most mothers (63%) knew that waiting to start supplemental foods until the baby is too old may result in a deficit of some nutrients in the infant's diet. However, only 36% knew it may make it hard to introduce supplemental

foods, and only 9% knew that it may delay the infant's eating and speech development (Table 4.35).

The majority of mothers (88%) knew that infant cereal is usually the first supplemental food recommended. Only 8% of the mothers reported "fruit" as the first food usually recommended.

Seventy-three percent of the mothers knew that the first supplemental food should be fed from a spoon. However, almost one-fourth of the mothers (24%) thought the first supplemental food should be fed from either a bottle or an infant feeder (Table 4.35).

Almost 90% of the women knew that a single-ingredient food would be best for a baby just starting supplemental foods. Almost 95% knew that only one new food should be introduced at a time. Compared to these two questions which nearly all the mothers answered correctly, the answers were more scattered on the recommended time to wait between the feeding of the first new food and the second new food The amount of time mothers thought you should wait was: 1 to 2 days (12%) (Table 4.35), 3 to 4 days (27%), 5 to 7 days (38%), and 8 to 10 days (12%). Both 3 to 4 days, and 5 to 7 days were counted as correct responses to this question.

Most mothers knew why infant cereal is good for babies, but 27% thought it was good because it could be fed to young babies from a bottle, and 30% thought it would help babies sleep through the night (Table 4.35).

The mothers participating in this study knew that an infant's diet should include a variety of foods by the end of the first year; that babies less than 6 months old did not need a variety of foods to meet their nutritional needs; that they could trust their babies to communicate hunger and satiety; and that iron-fortified foods were important for babies (Table 4.36). However, the mothers were less clear on the remaining statements. Over half the women either did not know or thought that fat and cholesterol should be restricted in an infant's diet; less than half (47%) of the mothers knew that babies did not need special high-fiber foods in their diets (Table 4.36).

Over 25% (27%) either did not know or did not think that sugar already in foods was okay for a baby. More disturbing, 13% either did not know or thought that sugar subsitutes were acceptable in an infant's diet. Worse yet, one-third of the mothers either did not know or thought that honey was better for babies than sugar is. Twenty-six percent either did not know or thought that sodium already in an infants' food was not acceptable.

Only 44% knew that babies usually get more salt from home-prepared versus commercially-prepared infant foods, and only 45% knew that babies need more iron, per weight, than adults (Table 4.36).

Table 4.35 Frequencies and percentages of mothers' responses to supplemental feeding knowledge questions

Question		Response	n	(%)
Recommended age to begin supplemental supplemental foods (n=502)		a) < 1 mos. old	2	(0.4)
		b) 1-2 mos. old	14	(2.8)
		c) 2-4 mos. old	77	(15.3)
	*	d) 4-6 mos. old	337	(67.1)
		e) 6-8 mos. old	57	(11.3)
		f) > 8 mos. old	12	(2.4)
		g) I don't know.	3	(0.6)
Signs that show baby might be ready for supplemental foods (n=501	*	a) Baby doesn't spit-out food	74	(14.8)
		b) Baby shows interest in food	74	(14.8)
	*	c) >32 oz. formula or nursing >8-10 times/day	390	(77.5)
		d) Baby not sleeping through night	191	(38.1)
	*	e) 2x birthweight	97	(19.4)
	*	f) Sit-up without support	73	(14.6)
		g) None of above	13	(2.6)
		h) I don't know	16	(3.2)
Feeding supplemental foods to a baby that is too young may: (n=501)	*	a) cause food allergies	244	(48.6)
	*	b) cause stomach problems	295	(58.8)
		c) make baby sleep too much	3	(0.6)
		d) make baby develop too early	7	(1.4)
		e) lead to obesity	131	(26.1)
		f) stunt growth	6	(1.2)
		g) None of above	44	(8.8)
		h) I don't know	46	(9.2)

Table 3.35 (cont'd)

Question		Response	n	(%)
Waiting to start supplemental foods until baby is too old may: (n=502)	*	a) stunt baby's growth	49	(9.8)
	*	b) cause food allergies	5	(1.0)
	*	c) result in too little of some nutrients in baby's diet	314	(62.5)
	*	d) make it hard to introduce food	182	(36.3)
		e) lead to obesity	7	(1.4)
	*	f) delay baby's eating and speech development	46	(9.2)
		g) None of the above	55	(11.0)
		h) I don't know	60	(12.0)
First supplemental food usually recommended (n=502)		a) Ice-cream	1	(0.2)
		b) Fruit	41	(8.2)
		c) Cow's milk	2	(0.4)
	*	d) Infant cereal	440	(87.6)
		e) Meat	1	(0.2)
		f) Teething biscuits	4	(0.8)
		g) Adult cereal	0	
		h) Vegetable	11	(2.2)
		i) Dry bread	0	
		j) Yogurt	0	
		k) Other	1	(0.2)
		l) I don't know	1	(0.2)
How should the first food be fed (n=501)		a) Infant feeder	60	(12.0)
		b) Bottle	59	(11.8)
		c) Cup	0	
	*	d) Spoon	367	(73.2)
		e) Baby should feed self with hands	3	(0.6)
		f) None of the above	1	(0.2)
		g) I don't know	11	(2.2)
What food would be best for a baby just starting foods? (n=499)		a) Combination food with many ingredients	7	(1.4)
	*	b) Food with only 1 ingredient	445	(89.2)
		c) Number of ingredients doesn't matter	7	(1.4)
		d) None of the above	15	(3.0)
		e) I don't know	25	(5.0)

Table 4.35 (cont'd)

Question		Response	n	(%)
How many new foods should a baby be at one time? (n=502)	*	a) 1	476	(94.8)
		b) 2	9	(1.8)
		c) 3	2	(0.4)
		d) 4	1	(0.2)
		e) It doesn't matter	4	(0.8)
		f) None of the above	1	(0.2)
		g) I don't know	9	(1.8)
After introducing one new food, how long should you wait before feeding the baby another new foods? (n=502)		a) Two new foods may be introduced at the same meal they are nutritious	8	(1.6)
		b) A few hours	5	(1.0)
		c) 1-2 days	58	(11.6)
	*	d) 3-4 days	136	(27.1)
	*	e) 5-7 days	189	(37.6)
		f) 8-10 days	62	(12.4)
		g) It doesn't matter	4	(0.8)
		h) None of the above	13	(2.6)
		i) I don't know	27	(5.4)
Why is infant cereal good for babies? (n=501)	*	a) Good source of extra nutrients babies need	361	(72.1)
		b) Help babies sleep through night	153	(30.5)
	*	c) Can be made thin or thick	166	(33.1)
		d) Can be fed to young babies from bottle	134	(26.7)
	*	e) Less likely to cause allergies than other foods	309	(61.7)
		f) I don't know	15	(3.0)

* Indicates the correct response(s).

Table 4.36 Frequencies and percentages of mothers' responses to baby food company infant feeding guidelines

Statement	n (%) Correct	n (%) Incorrect	n (%) Don't Know
Baby's diet should be built to include a variety of foods by the end of the 1st year. (n=500)	455* (91.0)	21 (4.2)	24 (4.8)
Babies <6 mos. old need a variety of foods to meet their nutritional needs. (n=502)	47 (9.4)	430* (85.7)	25 (5.0)
You should pay attention to baby's appetite to avoid over- or under-feeding. (n=501)	478* (95.4)	17 (3.4)	6 (1.2)
You should not restrict fat and cholesterol in your baby's diet. (n=499)	222* (44.5)	186 (37.3)	91 (18.2)
Babies don't need special high-fiber foods in their diets. (n=501)	233* (46.5)	122 (24.4)	146 (29.1)
In baby's diet, sugar already in foods is OK. (n=502)	365* (72.7)	87 (17.3)	50 (10.0)
Sugar substitutes can be used in place of sugar in a baby's diet. (n=500)	14 (2.8)	434* (86.8)	52 (10.4)
Honey is better for babies than sugar is. (n=500)	66 (13.2)	331* (66.2)	103 (20.6)

Table 4.36 (cont'd).

Statement	n (%) Correct	n (%) Incorrect	n (%) Don't Know
In a baby's diet, sodium already in foods is OK. (n=502)	372* (74.1)	73 (14.5)	57 (11.4)
Babies usually get more salt from store-bought baby food than from home-made baby food. (n=499)	217 (43.5)	138* (27.7)	144 (28.9)
Iron-fortified foods are important for babies. (n=499)	427* (85.6)	31 (6.2)	41 (8.2)
Babies need more iron, pound for pound, than adults do.	225* (44.8)	51 (10.2)	226 (45.0)

*Indicates the correct response.

Chi-square analysis was done to determine if there was a relationship between the mothers' total infant nutrition knowledge scores (Score III) and their age, income, education, employment (either full or parttime), marital status, ethnicity, parity, and breast-feeding (Table 4.37). Chi-square analysis revealed that the relationships between the total infant supplemental feeding knowledge scores and the mothers' age, income, education, and marital status were highly statistically significant ($p \leq .005$). The relationship between mothers' employment-parttime and whether the mother ever breast-fed was also statistically significant ($p \leq .05$). The relationships between Score III and mothers' ethnicity, fulltime employment, and parity, were not statistically significant.

Table 4.37 Chi-Square analysis of demographic characteristics and Score III

Demographic Variable	Chi-Square Value	Significance
Mothers' Age[a]	42.4	.000
Mothers' Income[a]	53.3	.000
Mothers' Education[a]	75.7	.000
Marital Status[a]	20.8	.002
Mother Employed-Parttime[b]	10.0	.019
Baby was Breast-fed[b]	9.1	.027
Mother Employed-Fulltime	.7	.868
Mother-Homemaker	2.3	.515
Mothers' Ethnicity	10.1	.122
Mothers 1st Baby	5.9	.116

[a]Value was highly significant ($p \leq .005$).

[b]Value was significant ($p \leq .05$).

CHAPTER V

DISCUSSION

Introduction

The objectives of this research study were 1) to develop a valid, reliable instrument to measure mothers' knowledge of supplemental feeding; 2) to determine the knowledge level of a group of mothers related to infant supplemental feeding using the knowledge instrument developed; 3) to determine the supplemental feeding practices of the mothers completing the supplemental feeding knowledge instrument; 4) to determine the mothers' main sources of infant feeding information; and 5) to determine the relationship between demographic factors and mothers' knowledge of supplemental feeding recommendations. A discussion of each of these objectives as it relates to the data collected in this study follows.

Development and Use of the Instrument

A self-administered, in-home questionnaire was selected as the most appropriate method of data collection for this study for a number of reasons (Henerson et al., 1987). First and foremost, since we were not aware that a study of this kind had ever been done, the researchers wanted a large enough sample size to start to establish a data base of mothers' infant supplemental feeding knowledge and

behaviors. The researchers also were using a national sample, making the use of other kinds of survey methods financially and administratively unfeasible.

Secondly, interviewer bias may have been difficult to avoid and subject honesty more difficult to obtain if the questionnaire had been administered to the mothers by trained interviewers, for example in pediatricians or health department clinics. Also, many mothers would find it inconvenient, if not impossible, to answer questions or complete a survey while caring for a fussy or sick infant.

The third reason was that an in-home survey should better reflect mothers' "take-home" knowledge from their various sources of infant feeding information (doctor, clinic) and what they are actually feeding their infants in the home.

Unfortunately, disadvantages of an in-home mail survey do exist. Subjects may find it easier to refuse to participate since the "human element" of the survey administer is missing. Another disadvantage is that subjects cannot ask questions about misunderstood or unclear items. Therefore, inaccurate or inappropriate answers may be more likely than if the administrator was present to answer such questions. Third, it is more likely that subjects may not follow the directions necessary to complete the survey correctly. Fourth, this survey would have been difficult for subjects with poor or no English reading

skills to complete. If subjects with low reading skills obtained assistance, the reader's biases may have affected the mother's responses (Henerson et al., 1987).

Questions from part one (Score I) of the supplemental feeding knowledge test were derived from the Committee on Nutrition of the American Academy of Pediatrics (AAP/CON) recommendations and guidelines for introducing and feeding supplemental foods (AAP/CON, 1980; AAP/CON Handbook, 1985). The AAP/CON was selected as the basis for supplemental feeding knowledge test questions as health care professionals depend on this organization for current, scientifically based, infant feeding guidelines. In addition to being the most prestigious and elite pediatric health-care organization in this country, the CON/AAP is also the organization upon which all respected infant feeding guidelines are based.

Questions from the second part of the supplemental feeding knowledge test (Score II) were derived from a U.S. baby food company's infant feeding guidelines (Appendix B). The guidelines were developed by this company because of concerns that parents were inappropriately applying the adult U.S. dietary guidelines to their infants. The infant feeding guidelines differentiate between the nutritional needs of infants versus adults, and explain how the adult dietary guidelines are inappropriate for children less than two years of age. Questions based on these infant dietary guidelines were included on the supplemental feeding

knowledge test because of the important infant feeding concepts they represented. The researchers also felt it was important to determine the degree to which mothers understand the differences between the nutritional needs of adults versus infants.

The reliability, content validity, and construct validity of the instrument were established as follows. In the pilot test, the instrument was determined to be reliable, with a K-R 20 value of .70. Content validity of the instrument was determined by extensive expert review. Experts reviewing the instrument included an infant nutrition and feeding specialist, nutrition educators, and an education specialist. Construct validity of the instrument was determined in the pilot test using the index of discrimination. Items that had an index of discrimination less than .33 and/or an index of difficulty less than 20 or greater than 80 were either omitted or revised on the final survey based on recommendations from the reaction group mothers. Based on the results of these procedures, the final instrument used in this research was assumed to be both reliable and valid.

The reliability and validity of the final instrument were also calculated. While the final instrument appeared to be "less reliable" than the pilot instrument, there are several possible explanations for the variation. First, the test was composed of mostly heterogenous, rather than homogenous items. Tests that are homogenous tend to be more

reliable than more heterogenous tests. Most concepts on this test were measured by a single item (Ebel, 1979).

Secondly, while the test was approximately the same length as the pilot test, it still was rather short (consisting of 22 questions and 41 points as some questions had more than one possible answer). In general, the longer the test the more reliable it is (Ebel, 1979).

Finally and possible most importantly, many of the test items were not discriminating between low and high scorers. Tests that are composed of discriminating items will be more reliable than tests composed of less discriminating items; i.e. the higher the indices of discrimination of test items, the more reliable the test will be (Ebel, 1979).

Closely related to item discrimination is item difficulty. Tests that are composed of items of middle difficulty will be more reliable than tests composed of mainly very easy or very hard items, mainly because questions that almost everyone gets right or wrong cannot discriminate between high and low scorers. About half (23) of the items on this test were of medium difficulty with an index of difficulty between 20 and 80, and about half (18) had an index of difficulty less than 20 (difficult item) or greater than 80 (easy item) (Ebel, 1979).

Thirteen of the items on the final test could be considered valid with indices of discrimination greater than .33 (Ebel, 1979). However, 28 of the test items were poor discriminators in that they did not differentiate between

high and low scorers. Many (18) of the poor index of discrimination values occurred on items that either most of the mothers got right or wrong; as discussed previously, it is impossible to discriminate between high and low scorers if nearly all respondents got that item right of wrong. Many of these items were items that also had low index of discrimination scores on the pilot test because the majority of mothers got the item either right or wrong. Since the number of mothers in the pilot study was small (16), the decision was made to leave some of these items on the final test. The information obtained from these items is still important, however, as it is critical for nutrition educators to assess what supplemental feeding knowledge is known and not known by the majority of a particular group of mothers.

The remaining ten items that had poor index of discrimination values and were not either too easy or too hard (as determined by the index of difficulty) should undergo further revision and analysis. Perhaps these items should be eliminated from future versions of this instrument. Further reaction group testing may reveal why these items did not discriminate between high-scoring and low-scoring mothers.

The importance of the pilot study and reaction group mothers to the success of this research study cannot be over-emphasized! While the survey went through several "expert" reviews and subsequent revisions, it was the "real"

mothers who provided the experience and insight needed to expose and correct clarity and comprehension problems with the survey.

Based on the author's literature review and experience, and the number of mothers studied, the area of juice feeding is a definite "gray zone" for both mothers and infant health professionals. In the pilot study, 100% fruit juice was defined as a supplemental food on the survey, but this caused mass confusion for the mothers completing the surveys. It was consequently removed from the supplemental food questions. The pilot study/reaction group mothers reported that many physicians do not address when or how fruit juice should be introduced, and if it is a food or a liquid. Indeed, even the AAP does not address juice feeding, nor give recommendations for introducing juice to an infant, aside from the fact that it should be fed from a cup (AAP/CON Handbook, 1985).

A second area of confusion surrounding juice is the problem that "juice" means different things to different people. To dietitians and nutritionists, juice is 100% fruit juice. To mothers, however, juice may be everything from Kool-aid to Hi-C to orange drink to 100% fruit juice. To add to the confusion, many mothers feed diluted "juice" to their infants, so when the question was asked if they had fed 100% fruit juice to their baby, many said they had not, because they were giving their babies diluted 100% fruit juice. This confusion did not arise on the pilot study;

however, the author recommends that future versions of this survey address the diluted versus undiluted, 100% fruit juice problem.

More importantly, the area of juice feeding needs to be addressed and clarified by infant health professionals. One cannot expect mothers to follow appropriate infant feeding practices on an issue that is not clear to "experts."

Discussion of the Pilot Study and Reaction Group Findings

The most far-reaching result of the pilot study and reaction group were the mothers' responses to the infant dietary guidelines. Many of the mothers found the infant dietary guideline statements vague and so general that they were meaningless. The terms and/or statements "wide variety of foods," "too much," and "moderation" were not well-understood by these mothers. Unfortunately, these are the very words and phrases health professionals use frequently when giving nutrition (and other health information) to the general public. Nutrition educators must remember that the general public does not understand these unquantifiable, broad terms. For best results, nutrition information should be "pilot tested" with a group of subjects similar to the population that will ultimately use the material.

Response Rate

The response rate (52.9%) obtained in this research is unusual for mail surveys which normally have much lower

subject participation rates. Mail surveys with response rates greater than 30% are rare, and response rates of 5 to 10% are more the norm (Alreck and Settle, 1985). However, other studies involving new mothers have also demonstrated excellent response rates. Sarett et al., 1983, reported response rates from 67% to greater than 80% for the three-part mail survey they sent to mothers to determine when mothers decided how they would feed their infants in the first weeks of life. Joffe and Radius (1987) had less than 1% of the adolescent mothers approached at prenatal clinics decline to participate or fail to complete the questionnaire that supplied information regarding attitudes toward and knowledge about breast-feeding, social support, personal experience, and other variables possibly associated with infant feeding methods.

These data indicate that mothers are eager and willing to participate in research studies; a direct contrast to the difficulties many researchers have in obtaining satisfactory response rates for their studies. In fact, these researchers' experience is that mothers enjoy participating, especially if they feel they may be helping other new mothers. Many mothers wrote positive comments on their surveys, indicating they were pleased to be a participant in this study. Comments included:

-"I enjoyed doing this and found it very interesting..."
-"Thank you for including me in the survey. Also, thank you for the fifty-cent piece! God bless you!"
-"You're very welcome!!" (Below the 'Thank you for your

time!' statement which ended the survey.)
-"Thank you for the 50-cent piece! What a motivator to fill out survey!"
-"Good luck on your research. I'm always looking for new and updated information!"

Discussion of the Mothers and Their Infants

The mothers participating in this study were largely white, high-school or higher educated, employed, married women with relatively good incomes (Tables 4.3 and 4.4).

The low number of non-Caucasian mothers may be a result of either 1) the survey being sent to mostly Caucasian women, or 2) non-Caucasian women not wanting to participate in this study. Future studies should concentrate on determining how to appeal to other ethnic races, and how to increase their participation in infant feeding studies.

Most of the women in this study had a high-school or higher education, implying that they could read and answer the questions on this survey. The low numbers of mothers with less than high-school educations may be a result of the survey, as it required reading and writing to respond.

While low-income women were not specifically targeted for this study and many women in the study had good incomes, many of the women were participating in the WIC program (Table 4.5). The unexpectedly high number of WIC participants responding to this study indicates that this instrument may be especially useful for health professionals working with the WIC program. One of the main objectives and components of the WIC program is nutrition education.

This instrument, with revisions to make it appropriate for the audience to which it is being administered, could be an invaluable tool for assessing mothers' infant supplemental feeding education needs. The instrument could also be used as an evaluation tool, for determining the effectiveness of infant nutrition education programs.

The subjects participating in this study were fairly typical in terms of ethnicity, age and parity to U.S. mothers as a whole. The 1980 United States census data reported that 83.0% of the female population was Caucasian, compared to 87.7% observed in the mothers participating in this study. Black women comprised 12.0% of the national population, compared to 4.9% in this study. Asian women were .6% of the National population, and 1.6% of this research study. American Indian women were also .6% of the National population and 1.0% of this study population. Strangely, Hispanic women were not a part of the summary statistics (U.S. Department of Commerce, Bureau of the Census, 1983).

The fact that the majority of mothers in this study were between 20 and 34 years of age is an appropriate age-representative sample of child-bearing women in this country. In 1987, 6.8% of women giving birth were less than 20 years of age; 28.2% were between 20 and 24 years of age; 31.9% were between 30 and 34 years of age; 6.5% were between 35 and 39 years of age; and .9% were greater than 40 years of age (U.S. Department of Commerce, Bureau of Census,

1990). In this study, 6.8% of the women were less than 20 years of age; 23.8% were between 20 and 24 years of age; 33.8% were between 25 and 29 years of age; 25.4% were between 30 and 34 years of age; 7.2% were between 35 and 39 years of age; and 3% were greater than 40 years of age.

This was approximately half of the subjects' first baby (Table 4.6), with the other half of the mothers having, on average, one or two other children in addition to the new baby. The latest birth-rate data reported that 35.5% of the total births in 1988 were first births (U.S. Department of Commerce, Bureau of the Census, 1990). For the women participating in this study, 46.9% were first-time mothers. It would be interesting to determine if there were more primiparas in this study population, or if this study was simply more appealing to primiparas, as evidenced by their higher participation rates.

The mean age of the infants in this study (4.01 $\pm$ 1.22 months) was ideal, as this is the age when most health professionals recommend that the first supplemental foods be introduced. Mothers, therefore, were completing the survey at approximately the same time they were introducing or planning to introduce the first foods to their infants, eliminating or reducing reporting errors.

It was the intent of this research project to determine the feeding patterns of "typical" infants. Therefore, infants who were low birth weight (less than 2500 grams) at birth were excluded from this study as they may have

different feeding schedules or recommendations than infants of normal weight. Also mothers with twins were excluded because of the feeding difficulties inherent in feeding two infants at one time. Originally, infants with serious medical problems were to be excluded. However, although some mothers reported that their infants had "serious medical problems," (Table 4.8) none of these mothers feeding behavior responses indicated that their infants were being fed any differently than a "normal" infant would be. Therefore, none of the infants with "serious medical problems" were excluded.

While 66% of the infants had been given supplemental foods at the time of this study, only 36% had been fed 100% fruit juice. Also, juice was introduced at a later mean age than were supplemental foods, 3.31 months versus 2.82 months. Mothers in this study apparently fed other solid food first, before giving their infants juice.

Most of the babies' fathers in this survey fed their infants more than twice a week; many infants were also fed by their day-care providers more than twice a week (Table 4.14). With increasing numbers of mothers in the work-force, and so many infants being cared for by people in addition to their mothers, the importance of providing appropriate infant feeding information to these other care-givers becomes apparent.

Discussion of Mothers' Infant Feeding Behaviors and Supplemental Feeding Knowledge

As indicated by the sources of milk for infants in this study (Table 4.11), most mothers were feeding only infant formula (regular or soy) and/or breast-milk to their infants. These mothers were feeding milk appropriately, based on the young age of most infants in this study and the AAP recommendation that whole cow milk should not be introduced before 6 months of age, and then only if the infant is receiving infant formula and approximately one-third of his/her calories from supplemental foods (AAP/CON, 1983). Interestingly, for the few women feeding cow milk to their infants, 2% milk was the most popular (Table 4.11).

Most of the infants were eating supplemental foods at the time of this study (Table 4.15). Interestingly, while most of the mothers knew that the recommended age to begin supplemental foods is 4 to 6 months of age, these mothers introduced supplemental foods to their infants at a mean age of 2.8 $\pm$ 1.35 months. Numerous other authors have reported that mothers introduced supplemental foods to their infants before the recommended age (Brogan and Fox, 1984; Doucet and Berry, 1988; Parraga et al., 1988; Brodwick et al., 1989).

The 500-plus returned surveys were most revealing in terms of why mothers started feeding their infants supplemental foods. The most reported reason mothers gave for introducing supplemental foods (Table 4.16) was that their babies were constantly hungry and not satisfied with

just formula or breast-milk. Many mothers reported that their infants were demanding to be fed every hour, or even minutes after a feeding. Most mothers are not going to wait until 4 months of age to start supplemental foods, if they have a 3-month old infant who is obviously, in their opinion, in need of more food; more importantly than the fact that she will probably not wait, is the issue that it may not be appropriate that she does wait, depending on the individual infant. However mothers also may not be correctly identifying their infants' communication signals; i.e. they may be incorrectly identifying their infants' signals for other needs as signals for hunger. Health professionals should educate mothers on identifying infants cues for hunger versus their cues for other demands (diaper changing, temperature change, etc.).

Because it is nearly universally agreed that infants develop at individual rates, health professionals must consider each individual infant's growth, development, appetite, and history as well as their age when determining when supplemental foods should be introduced (to that infant). Also, health professionals must remember that mothers, as a whole, are going to do what they think is best for their baby, regardless of what guidelines recommend. Interestingly, only five mothers listed a nutritional reason (other than hunger) for starting supplemental foods.

Many mothers still believe that introducing supplemental foods will help their infants sleep through the

night, despite the scientific evidence that it does not. Anecdotal reports that some mothers included with their surveys, however, were interesting. One mother reported that although she knew solid foods were not supposed to help a baby sleep, when she started solid foods, her baby slept better and longer. While there is no "scientific" evidence supporting the question of whether cereal/supplemental foods will help a baby sleep longer/better, perhaps further research needs to be done in this area; it seems unusual that the scientific community says something is not true, while mothers insist that their baby slept all night when cereal was given.

The majority of mothers participating in this study knew that rice cereal is usually the first supplemental food recommended by health professionals (Table 4.35), and most mothers fed or planned to feed rice cereal or a cereal of unspecified variety as the first supplemental food they gave their infants (Tables 4.17 and 4.25). Other researchers have also found high usage of infant cereal as the first supplemental food (Ferris et al., 1978; Doucet and Berry, 1988; Brodwick et al., 1989).

For those mothers who had not yet fed supplemental foods, most stated it was because their baby was too young/not the right weight or the doctor/pediatrician had not recommended yet. However, many mothers also believed that other foods were not medically or nutritionally needed

yet, and that their babies were satisfied with formula or breast-milk alone (Table 4.24).

When asked why they chose or planned the first food fed to their infants, the mothers' most reported response was that their doctor/pediatrician recommended it (Tables 4.18 and 4.26). The "doctor/pediatrician recommended" response was continued throughout the survey, and illustrates the importance of the doctor/pediatrician in the infants' nutritional care and development. This finding emphasizes the importance of both nutrition coursework in medical schools, and of continuing education in current nutrition topics.

Many mothers (16%) were also aware of the digestibility and hypoallergenicity of rice cereal (Table 4.18). However, it would seem that in this population of women, more subjects would have written this response. In open-ended questions, it is sometimes difficult to determine the depth of information a person possesses; in this survey, some mothers wrote only one, short response, while others wrote paragraphs.

Somewhat disturbing was the fact that about one-third of the mothers did not feed the first food from a spoon (Table 4.19), about 16% did not plan to feed the first food from a spoon (Table 4.27), and about one quarter of all the mothers did not know that the first food should be fed from a spoon (Table 4.35). Far too many mothers were still feeding or planning to feed the supplemental food from a

bottle or an infant feeder. Health professionals should emphasize the developmental importance of spoon-feeding supplemental foods, and that infants who are unable to eat from a spoon are probably not ready for supplemental foods.

Mothers did not differentiate between reasons they started supplemental foods and how they decided their infants were ready for supplemental foods (Tables 4.16 and 4.20). This corresponds with the relatively low scores the mothers received on the knowledge question asking that they identify signs that indicate an infant might be ready for supplemental foods (Table 4.35). The only readiness sign recognized by most of the mothers on the knowledge test was drinking more than 32 ounces of formula or breast-feeding more than 8 to 10 times per day. This was also the only sign any quantity of mothers reported as reasons they started their baby on or how they decided their infants were ready for supplemental foods. Clearly, health professionals must educate new mothers on these easily recognized signs that indicate their baby might be ready for supplemental foods. Because most mothers reported the same responses for reasons they started supplemental foods and how they decided their baby was ready for supplemental foods, perhaps future versions of this survey should include only one of these questions.

As indicated by the supplemental feeding knowledge test questions, many of these mothers did not know the consequences of starting their babies on supplemental foods

either too young or too old (Table 4.35). Indeed, 18% indicated either the "none of the above" or the "I don't know" response. Over one-quarter thought that early supplemental feeding may lead to obesity. Nearly 60% did know that early supplemental feeding may cause stomach problems, and 49% knew that early feeding may cause food allergies.

Only 36% of the mothers knew that waiting to start supplemental foods until the baby is too old may make it hard to introduce solid foods, and only 11% knew that waiting may delay baby's eating and speech development. Sixty-two percent knew that waiting to start foods may result in too little of some nutrients in the baby's diet. Nutrition educators should not only tell mothers the appropriate time to begin supplemental foods, but should also inform them of the consequences of feeding supplemental foods either too young or too old.

Most mothers knew that single-ingredient foods are recommended for babies just starting supplemental foods (Table 4.35). This may be a difficult concept for some women, however, as rice cereal is not strictly single-ingredient; the ingredient panel contains many ingredients. This question was revised and reviewed many times prior to the pilot test; ultimately, however, it was the mothers from the pilot test who provided what they felt would be the clearest and most easily understood wording for this rather evasive question. The vast majority of mothers also knew

that babies should only be fed one new food at a time (Table 4.35).

The behavior question which asked mothers how long they waited between the feeding of the first and second new foods provided very insightful data into the supplemental feeding practices of mothers (Table 4.21). About equal numbers of mothers waited 1 to 2 days, 2 to 3 days, 3 to 4 days, 5 to 7 days, and 8 to 10 days. More interesting was the fact that almost 20% of the mothers waited anywhere from 2 weeks to 4 months between the feeding of the first and second new supplemental food. These mothers were apparently feeding the first food, probably rice cereal, to satisfy their hungry infants and then waiting until the infants were older to start other foods.

For mothers who had not yet fed the first supplemental food, almost one-third thought they would wait 5-7 days, and almost 25% did not know how long they would wait between the feeding of the first and second new food (Table 4.28). On the knowledge test, the majority of all mothers knew that the recommended time to wait between the feeding of the first and second new food was 3 to 7 days (Table 4.35).

Most mothers reported feeding or planning to feed a fruit or vegetable as the second supplemental food (Tables 4.22 and 4.29). It is possible that some mothers reported that a fruit or vegetable was the second <u>type</u> of supplemental food given to their infant, not knowing that a second variety of infant cereal was really the second food

given, i.e. to the mothers, infant cereal is all the same. Almost 20% of mothers who had not fed their babies supplemental foods yet did not know what they would feed as the second food.

Mothers picked or planned to pick the second food fed to their babies for a wide variety of reasons (Tables 4.23 and 4.30). While the recommendation of the doctor/pediatrician was still the most reported reason mothers choose the second food, the importance of the baby liking the food also surfaced. Nutritional reasons were rarely mentioned as a reason to choose the second food by mothers who had already started foods, but it was reported by almost 13% of the mothers who had not given their babies supplemental foods.

While other authors have reported high usage of sugar water and sugar-sweetened drinks (Doucet and Berry, 1988; Parraga et al., 1988), the mothers in this survey did not report much use of these liquids . However, the subjects in these earlier studies were very different from the mothers participating in this study; subjects for both these earlier studies were mostly black, low-income mothers. In this research, sugar water was the most frequently reported sweetened drink, with about 12% of the mothers giving their infants sugar water at least once a week (Table 4.31).

While these mothers were not feeding sugar-sweetened drinks, many were also not feeding plain water. One-third reported that they never gave their infants water, while

almost 25% gave it less than once a week. There may have been some confusion on this question as to whether to report water used to mix formula. If the mother reported "in formula only," the "never" category was indicated in data analysis, as the amount of plain water given was the focus of this question.

Discussion of Mothers' Sources and Frequency of Use of Infant Feeding Information

Medical Sources

The data reporting where mothers obtained most of their infant feeding information and how often they used the infant feeding information from various sources can provide much insight to health professionals on what infant feeding information is being used by mothers, and where they get their information (Tables 4.32 and 4.33). The doctor/pediatrician was where the majority of mothers not only obtained most of their infant feeding information, but was also the source of infant feeding information most often used. Other authors have also reported that the doctor/physician is an important source of infant feeding information (Brogan and Fox, 1984; Doucet and Berry, 1987). This indicates how important the doctor-mother relationship is to the nutritional health of the infant. Doctors need to provide mothers with current, usable infant feeding information, and take time to answer any infant feeding questions the mother may have. Physicians should also be

aware that any booklets or publications they provide to mothers or have available in their office may be perceived by the mothers as that physician's recommendations.

The nurse at the doctor's office was not a frequently reported source of infant feeding information; they were a source of infant feeding information often or sometimes used by these mothers. Doucet and Berry (1987) also reported that the nurse was a source of infant feeding information; in fact in their study, more subjects said the nurse, rather than the physician, had provided information on infant feeding (either milk or supplemental). All doctors' office nursing staff should know current infant feeding recommendations, and should be prepared to answer mothers' infant feeding questions.

Unfortunately, the professionals most trained in nutrition were the ones least utilized by these mothers; probably not by choice, but by lack of access to dietitians. Dietitians/nutritionists were a seldom reported or used source of infant feeding information. Indeed, 9% of these mothers indicated that they did not use the infant feeding information given to them by a dietitian/nutritionist; only 15% indicated that they either sometimes or often used the infant feeding information from a dietitian/nutritionist. These data are particularly disheartening in view of the fact that approximately one-third of these mothers participated in the WIC program, and a major portion of the WIC program is nutritional counseling with a nutritionist.

It could be hypothesized from these results that only mothers in the WIC program had contact with a dietitian/nutritionist. It could also be hypothesized that many of the mothers in the WIC program that do see a dietitian/nutritionist either do not remember or do not know who the person is. Dietitians need to be aware of the low visibility they have with a segment of the population that could truly benefit from their expertise.

Family/Friends Sources

Friends, family and relatives, especially the mothers' mothers, were other important sources of infant feeding information for the subjects in this study. Health professionals need to be aware of the credibility other mothers have with new mothers; after all, other mothers have the experience and knowledge of what really works with babies. Health professionals may lack credibility with mothers if they are not parents themselves. Bryant (1982) also reported that a mothers' family and friends may have a greater influence on her infant feeding decisions than her health care professional. Interestingly, mothers reported that they did not use information from babysitters/day-care providers very often.

Many mothers in this study used information they already had, based on their own past experience feeding another child. Health professionals should not assume, however, that the mothers of a second (or more) baby do not

need infant feeding information. The mothers may be using old or incorrect guidelines, or may have forgotten basic principles of infant feeding.

While 53% of these mothers were at least second time mothers, less than 8% reported using their past experience as the source where they obtained most of their infant feeding information. Health professionals and nutrition educators should not assume that second-time (or more) mothers know or are confident with infant feeding guidelines and recommendations.

Publication/Media Sources

Health professionals should also be aware that books and magazines are another frequently utilized source of mothers' infant feeding information (Tables 4.32 and 4.33). They could do mothers a great service by recommending credible, accurate books and magazines, and warning mothers about questionable ones. Also, hospital take-home kits and publications from formula and baby food companies were sources of infant feeding information sometimes or often used by many of the mothers in this study. Health professionals should be familiar with these publications, and should educate new mothers on the appropriate use of formula or baby food that is often in hospital take-home kits.

Discussion of Mothers' Infant Supplemental Feeding Knowledge Scores

The mothers' mean total supplemental feeding knowledge score (Score III) was 27.9 ± 4.1 (Table 4.34). On a percentage basis, the mothers did nearly the same on the two parts of the test. On Score I (infant supplemental feeding recommendations), the mean percentage correct was 67.9%; on Score II (baby food company infant dietary guideline statements) the mean percentage correct was 68.3%. Since the authors are not aware of any previous research measuring mothers' supplemental feeding knowledge, we cannot compare our mothers' results with any other research. For the relatively well-educated mothers participating in this study, the mean supplemental feeding scores seemed rather low.

Discussion of Relationship between Demographic Variables and Total Infant Supplemental Feeding Knowledge Scores

The chi-square analysis showed statistically significant relationships between several of the mothers' demographic variables and their total infant supplemental feeding knowledge score (Score III) (Table 4.37). The mothers' age, income, education, marital status, part-time employment, and whether they ever breast-fed were related to their Score III. While there were low expected values (expected values less than five) in the 42-year old age

group, one would not expect many mothers in this older age group.

Although the chi-square value was statistically significant for marital status and Score III, there were several cells that contained expected values less than five, which may weaken the statistical association (Alreck and Settle, 1985; Fitz-Gibbon and Morris, 1987). However, even after regrouping the categories into three groups (single; married; divorced, separated, and widowed), there were still expected values less than five in the "divorced, separated, widowed" cells.

While chi-square analysis can determine whether two variables are acting dependently versus independently, it cannot determine "causation," or how the variables are related. These analyses show that the mothers' total infant supplemental feeding knowledge score and their age, income, education, marital status, part-time employment, and whether they ever breast-fed are related, but the direction of the relationship is unclear.

It was interesting and unexplainable why mothers' part-time employment was related to their Score III, and full-time employment was not related to Score III. Even after regrouping ethnicity, the chi-square statistic was not significant. The small number of non-Caucasian participants probably affected the outcome of the chi-square statistic.

Interestingly, whether this was the mother's first baby or if she had other children was not statistically

associated with her total infant supplemental feeding knowledge score. Based on the results from this sample of mothers, experience does not necessarily mean a mother knows more about infant feeding.

Other researchers have reported that breast-feeding mothers introduce supplemental foods at a later time (Brogan and Fox, 1984; Parraga et al., 1988; Brodwick et al., 1989). One cannot assume that a breast-feeding mother has more infant supplemental feeding knowledge, however, since the direction of the chi-square relationship is not known.

CHAPTER VI

LIMITATIONS, STRENGTHS, CONCLUSIONS, AND RECOMMENDATIONS

Limitations of this Study

As with any research, this study had several limitations. First, because a computerized mailing list was used to obtain the subjects, it was impossible to determine who the subjects were until after the survey was completed and returned, i.e. it could not be determined if the mailing went to a representative sample of child-bearing women in the United States. Also, there was no way to determine if the mothers who did not return surveys were different than the subjects who did return the surveys.

Second, the use of a self-administered questionnaire may limit the number of subjects who can respond because of their reading ability or inability to understand questions. However, since this research was largely focused on the development of a valid, reliable instrument, the final version can be revised depending on the reading level of the desired audience. Another problem with self-administered questionnaires is that the researcher cannot be sure that questions are being interpreted correctly by the subject, or cannot answer any questions the subject may have. The pilot and reaction group testing conducted as part of the development of the instrument used in this research hopefully reduced the incidence of this problem. Also,

because the survey was sent in the mail, mothers could have either asked other people or "looked-up" the questions on the supplemental feeding knowledge portion of the survey.

Another limitation of this study was also a major strength. The use of open-ended questions allowed subjects to say what they really meant, and did not force them into given choices. However, open-ended questions are difficult to tabulate, and appropriate statistical analyses are limited.

Finally, the supplemental feeding knowledge instrument is specific for the population of mothers to which it was administered in this study. If the instrument is to be used on Hispanic, African American, or Asian women, it should be revised based on pilot and reaction group testing representative of the population who will use it.

Strengths of the Study

The results of any study can only be considered as good as the instrument which was used to measure the desired variables. Therefore, a major objective of this research was the development of a valid and reliable instrument to measure mothers' infant supplemental feeding knowledge. The instrument underwent numerous revisions, pilot and reaction group testing, and validity and reliability assessment prior to the final mailing. The supplemental feeding knowledge instrument developed in this study was

proven to be a valid and reliable one for the population of mothers to which it was administered.

This survey's excellent response rate (52.9%) established a solid data base of U.S. mothers' supplemental feeding knowledge and behaviors. The high response rate also was an indication that the survey was well-organized and easy to take, and that the incentive was effective.

The fact that there was a response bias for white mothers makes this survey especially good for evaluating the supplemental feeding knowledge of this population of mothers. If the population of mothers responding to this survey had been more racially mixed, the instrument's applicability to any one specific group of mothers would have been limited.

Summary and Conclusions

The objectives established for this research study were met. Through extensive expert review, pilot and reaction group testing, validity and reliability assessment, and revisions, a valid, reliable instrument was developed to measure mothers' knowledge of supplemental feeding. Using the newly developed instrument, the supplemental feeding knowledge of a nation-wide sample of mothers was determined. The reliability and validity of the final instrument was also established. The reliability of the final instrument was lower than the pilot instrument; thirteen of the items on the final instrument were valid, eighteen of the items were either too easy or too hard to determine the discrimination. Ten items could not be considered valid because of low index of discrimination values.

Overall, the mothers participating in this study knew the recommended age to begin supplemental foods, the first supplemental food usually recommended, the recommended method to feed the first supplemental foods, the recommended number of ingredients beginning foods should have, how many new foods a baby should be given at one time, and some of the reasons infant cereal is good for babies. The majority of these mothers also understood that a baby's diet should include a variety of foods by the end of the first year; that babies less than 6 months old do not need a variety of foods to meet their nutritional needs; that babies' appetites are a good indicator of how much food they need;

that sugar and sodium already in foods is acceptable; that sugar substitutes and honey are not acceptable for infants; and that iron fortified foods are important for babies.

Overall, many of these mothers did not know many signs that indicate a baby might be ready for supplemental foods; consequences of starting supplemental foods either before or after the recommended age; and the recommended length of time to wait between the feeding of two new foods. Mothers also did not understand the appropriate restriction of fat, cholesterol, and high-fiber foods in the infant's diet; many also did not understand the dangers of using honey in an infant's diet.

The objectives of determining mothers' supplemental feeding behavior and their main sources of supplemental feeding information were also met using the newly developed instrument. For mothers who had already started their infants on supplemental foods, most introduced supplemental foods before the recommended age. However, the majority were using rice or infant cereal as the first supplemental food. There was a large variance in the number of days subjects waited between the feeding of the first and second supplemental foods. The most common second supplemental foods fed were fruits and vegetables.

The mothers most commonly reported source of infant feeding information, and the source they used the most was the doctor/pediatrician. However, other commonly reported and highly used sources of infant feeding information were

books and magazines, and family and friends, especially other mothers.

The relationship between demographic factors and mothers' supplemental feeding knowledge scores was determined based on mothers responses to the supplemental feeding knowledge test. Chi-square analysis revealed that mothers' age, income, education, marital status, part-time employment, and whether she ever breast-fed were significantly related to their total supplemental feeding knowledge score (Score III).

Because the subjects participating in this study were mostly white, high-school educated, married women, the results can only be generalized to populations of similar mothers.

Recommendations for Future Research

Future studies should aim to increase the reliability and validity of the supplemental feeding knowledge test. Further pilot and reaction group testing to improve the discrimination of items with poor discrimination could increase both the reliability and validity of the final test.

Since this was the first study the author is aware of that measured mothers' knowledge of infant supplemental feeding, much research still needs to be done in this area. Future studies should focus on determining the supplemental feeding knowledge of particular demographic populations, particularly those populations where money is being spent on infant feeding education.

Future studies should further investigate the statistical relationship between mothers' infant supplemental feeding knowledge and their infant supplemental feeding behaviors. To facilitate data analysis, the data from these mothers open-ended responses to their infant supplemental feeding behaviors could be used to generate closed-ended infant supplemental feeding behavior questions. However, open-ended questions should not be completely eliminated from the survey, because of the valuable information they generate. Analysis of variance could be done to determine if any of the mothers' demographic factors account for differences in knowledge test scores. Cross-tabs could determine if mothers' supplemental feeding

knowledge is related to their infant supplemental feeding behaviors.

To avoid some of the limitations inherent with self-administered, mail surveys, the instrument developed for this research could be combined with interview(s) or researcher-administered surveys.

Since hunger was the most frequently reported reason these mothers started supplemental foods, future studies may want to identify specific infant behaviors that mothers interpret as "hunger." Health professionals may need to educate mothers on correctly identifying and appropriately responding to their infants' many communication signals.

Another critical area which needs investigation is doctors/pediatricians knowledge of infant supplemental feeding recommendations. If doctors/pediatricians are mothers' main source of infant nutrition information, it is essential for nutrition educators to know what doctors/pediatricians know and what they are telling mothers.

Another area of interest would be to determine what commercial infant feeding information mothers are using.

APPENDICES

APPENDIX A

Michigan State University
Committee on Research Involving Human Subjects
Approval Letter

MICHIGAN STATE UNIVERSITY

OFFICE OF VICE PRESIDENT FOR RESEARCH
AND DEAN OF THE GRADUATE SCHOOL

EAST LANSING • MICHIGAN • 48824-1046

October 26, 1990

Amy Riley, R.D.
Food Science and Human Nutrition
236 Food Science Building

Dear Ms. Riley:

RE: ASSESSMENT OF MOTHERS' NUTRITION KNOWLEDGE AND PRACTICES RELATED TO SUPPLEMENTAL FEEDING OF INFANTS, IRB# 90-438

The above project is exempt from full UCRIHS review. I have reviewed the proposed research protocol and find that the rights and welfare of human subjects appear to be protected. You have approval to conduct the research.

You are reminded that UCRIHS approval is valid for one calendar year. If you plan to continue this project beyond one year, please make provisions for obtaining appropriate UCRIHS approval one month prior to October 26, 1991.

Any changes in procedures involving human subjects must be reviewed by the UCRIHS prior to initiation of the change. UCRIHS must also be notified promptly of any problems (unexpected side effects, complaints, etc.) involving human subjects during the course of the work.

Thank you for bringing this project to our attention. If we can be of any future help, please do not hesitate to let us know.

Sincerely,

David E. Wright, Ph.D.
Chair, UCRIHS

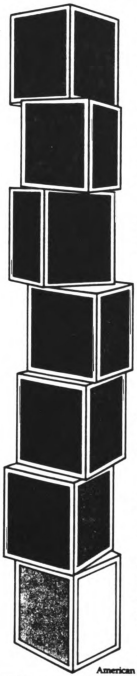
DEW/ deo

cc: Dr. Jenny T. Bond

APPENDIX B

Gerber Products Company's Dietary Guidelines for Infants (1989)

DIETARY GUIDELINES FOR INFANTS



BUILD TO A VARIETY OF FOODS

LISTEN TO YOUR BABY'S APPETITE TO AVOID OVER-FEEDING OR UNDER-FEEDING

DON'T RESTRICT FAT AND CHOLESTEROL TOO MUCH

DON'T OVERDO HIGH-FIBER FOODS

SUGAR IS OKAY, BUT IN MODERATION

SODIUM IS OKAY, BUT IN MODERATION

BABIES NEED MORE IRON, POUND FOR POUND THAN ADULTS

(The Dietary Guidelines for Infants were developed by Gerber Products Company and are consistent with statements published by the American Academy of Pediatrics, Committee on Nutrition.)

APPENDIX C

Supplemental Feeding Knowledge Survey Used in Pilot Study and Reaction Groups

INFANT FEEDING SURVEY - Part I

This section of the survey will ask you questions about how you feed or plan to feed your baby. Please write in or check your answer/answers to each question in the blanks provided. Thank you!!

1a. Is this the first baby you have had?

_____ Yes _____ No

1b. If no, how many other children have you had? _____

1c. Do your other children live with you?
_____ Yes _____ No

2a. Has your doctor told you your baby has any serious medical problems?

_____ Yes _____ No

2b. If yes, what? _____

3a. Did you have more than one baby with this pregnancy?

_____ Yes _____ No

3b. If yes, how many babies did you have? _____

4. How much did your baby weigh when he/she was born? (If you had more than one baby, please write the weight of each baby in the extra space.)

_____ pounds _____ ounces

5a. Was your baby premature, or did he/she come early?

_____ Yes _____ No

5b. If yes, how early was your baby? _____

6. How old is your baby now, to the nearest week?
_____ weeks

7a. During the first few days, how was your baby fed?
_____ breast-fed
_____ infant formula fed
_____ combination of breast-fed and infant formula fed
_____ other_____

7b. Is/was your baby breast-fed? _____ Yes _____ No
If no, please go to question 8.
If yes, how long did you breast-feed?
_____ Days
_____ Weeks
_____ Months

7c. If you are still breast-feeding, how much longer do you plan to breast-feed?
_____ I am no longer breast-feeding.
_____ More days.
_____ More weeks.
_____ More months.
_____ I don't know.

8. What type of milk is your baby currently drinking (check all that apply?
____ Cow's milk (Vitamin D milk, homogenized milk)
____ Evaporated milk (Pet milk)
____ Infant formula (Similac, Enfamil, S.M.A., Gerber infant formula)
____ Soy milk
____ Breast-milk
____ Soy infant formula (ProSobee, Isomil, Nursoy, Soyalac)
____ Sweetened-condensed milk (Eagle brand)
____ Goat's milk
____ Other, please indicate what _____

9a. Who else, besides yourself, regularly feeds your baby?

_____

9b. How are these people (or this person) related to you?

_____

_____

If your baby has had **ANY** food or liquid besides breast-milk, infant formula, or water, please go to page 3.

If your baby has **NOT** had **ANY** food or liquid besides breast-milk, infant formula, or water, please go to page 5.

Please answer the questions on this page only if your baby has had ANY foods besides breast-milk, infant formula, or water. If your baby has not, please go on to page 5.

10. Why did you start feeding your baby solid foods (ANY food or liquid besides breast-milk, infant formula, or water)?

_____
_____
_____

11a. What was the very first solid food of any kind your baby tasted (ANY food or liquid other than breast-milk, infant formula, or water)?

_____

11b. How old, in weeks, was your baby when he/she had the taste of food in 11a? _____ weeks

11c. Why was this food given as baby's first taste of solid food?

_____
_____
_____
_____

12a. What was the first solid food regularly given to your baby as part of his/her diet (this may or may not be the same food as in #11)?

_____

12b. How old, in weeks, was your baby when he/she first had the food in 12a? _____ weeks

12c. Why did you feed this as the first solid food?

_____
_____
_____
_____
_____

13. Please check the method by which you fed the first solid food to your baby.
____ from a bottle
____ with a spoon
____ from an infant feeder
____ baby fed him/herself using hands

14. How did you decide your baby was ready for solid foods?

_____
_____
_____
_____

15. After feeding the first new food to your baby, how long did you wait before feeding him/her the second new food?

_____ My baby has only had 1 solid food so far (If you check this response, please skip the rest of the questions on this page and go on to page 5, question #22.)
_____ the second new food was given at the same meal as the first food
_____ a few hours
_____ less than 1 day
_____ 1 to 2 days
_____ 2 to 3 days
_____ 3 to 4 days
_____ 4 to 5 days
_____ 5 to 7 days
_____ 8 to 10 days

16. What was the second solid food regularly given to your baby?

_____

17. Why did you choose this as the second solid food?

_____
_____
_____
_____
_____

Please go on to page 6.

Answer the questions on this page if your baby has NOT had ANY foods besides breast-milk, infant formula, or water yet. If your baby has had solid foods, answer the questions on pages 2 and 3, and than go to page 6.

18. Why haven't you given your baby any solid foods yet (ANY food or liquid besides breast-milk, infant formula, or water)?

_____

_____

_____

19. What is the first solid food you plan to give to your baby?

___ Meat (pureed, strained, or blended)
___ Juice
___ Vegetable (pureed, strained, or blended)
___ Fruit (pureed, strained, or blended)
___ Infant cereal
___ Table food _____
___ Other _____
___ I don't know.

20. Why do you plan to use the food you answered in #19 as the first solid food?

_____

_____

_____

_____

21. How do you plan to feed the first solid food to your baby?

_____ from a bottle.
_____ from a spoon.
_____ from an infant feeder.
_____ my baby will feed him/herself.
_____ I don't know.

22. What is the second supplemental food you plan to give your baby?

_____

23. Please indicate how long you plan to wait between the feeding of the first solid food and the feeding of the second solid food.

_____ The second new food will be fed at the same meal as the first food.
_____ A few hours.
_____ less than 1 day.
_____ 1 to 2 days.
_____ 3 to 4 days.
_____ 5 to 7 days.
_____ 8 to 10 days.
_____ I don't know.

Please go on to page 6.

Answer the questions on this page whether your baby has had solid foods or not.

24. How often does your baby drink the following liquids?
Sugar water: how often _____
Water: how often _____
Kool-Aid: how often _____
Hi-C: how often _____
100% fruit juice: how often _____
Colas or soft-drinks: how often _____
"Diet" drinks (drinks sweetened with Nutra-Sweet or saccharain"): how often _____
Coffee or tea: how often _____
Fruit punch: how often _____

25. Where or from whom did you get most of your infant feeding information?

---

26. Using the abbreviations below, please make an "X" in the box that best describes how much you used the solid feeding information from the following sources.

NR = Not received; you did not receive any infant solid feeding information from this source.

NU = Not used; you did not use the infant solid feeding information from this source

SU = Sometimes Used; you sometimese used the infant solid feeding inforamtion from this source.

OU = Often Used; you often used the infant solid feeding information from this source.

NR	NU	SU	OU	
				Doctor
				Nurse at doctor's office
				Health Department nurse
				Dietitian/Nutritionist
				Midwife
				Mother
				Mother-in-law
				Other relativ: who?_____
				Friends
				Neighbors
				Books
				Newspapers and/or magaazines
				Publications from infant formula and/or baby food companies

26. (continued)

____ Television
____ Radio
____ Hospital take-home kit
____ La Leche League
____ Classes at Health Department
____ WIC
____ County Extension Office
____ Classes: whate and where _____
_____
____ Other _____

27. Comment, if you wish, about any of the information you were given.

_____
_____
_____
_____

INFANT FEEDING SURVEY - Part II

To answer questions in this section, think about any infant feeding information you have received. Based on this information, circle the best answer(s) to questions 1 through 10. For questions 11 through 24, circle the one response that best answers whether you think each statment is correct or incorrect. **Remember, solid foods are ANY foods or liquids besides breast-milk, infant formula, or water.** Also, remember that infants are children 1 year of age or less. Thank you for helping us help other mothers like yourself!

1. It is usually recommended that babies start solid foods (**ANY** foods or liquids besides breast-milk, infant formula, or water) when they are (please circle the one best answer):

a) less than 1 month old
b) between 1 and 2 months old
c) between 2 and 4 months old
d) between 4 and 6 months old
e) between 6 and 8 months old
f) more than 8 months old
g) I don't know

2. Some signs that show a baby might be ready for solid foods (ANY foods besides breast-milk, infant formula, or water) are (you may circle more than one answer):

a) The baby does not "spit-out" most of the food fed.
b) The baby can sit up without support.
c) The baby has doubled his/her birth weight.
c) The baby weighs at least 13 to 15 pounds.
e) The baby is drinking more than 32 ounces of infant formula or is breast-feeding more than 8 to 10 times in 24-hours.
f) None of the above.
g) I don't know.

3. Feeding solid foods to a baby too <u>early</u> may (you may circle more than one answer):

a) cause food allergies.
b) lead to obesity.
c) make the baby sleep too much.
d) make the baby walk too early.
e) make the baby develop too early.
f) stunt the baby's growth.
g) None of the above.
h) I don't know.

4. Feeding solid foods to a baby too <u>late</u> may (you may circle more than one answer):
a) stunt the baby's growth.
b) delay the baby's eating and speech development.
c) make it hard to introduce solid foods.
d) cause food allergies.
e) lead to obesity.
f) result in too little of some nutrients in the baby's diet.
g) None of the above.
h) I don't know.

5. What food is usually recommended as a baby's first food other than breast-milk or infant formula (please circle the one best answer)?
a) Ice-cream
b) Fruit (pureed, strained, blended, or mashed)
c) Cow's milk
d) Infant cereal
e) Meat (pureed, strained, or blended)
f) Teething biscuits
g) Adult cereal
h) Vegetable (pureed, strained, or blended)
i) Dry bread or toast
j) Juice
k) Other; please indicate _____
l) None of the above
m) I don't know.

6. How should the first solid food be fed (please circle the one best answer)?
a) From an infant feeder
b) From a bottle
c) From a spoon
d) Baby should feed him/herself with his/her hands
e) None of the above.
f) I don't know.

7. What fruit would be best for the baby just starting fruits (please circle the one best answer)?
a) Applesauce-apricot
b) Applesauce
c) Peach Cobbler
d) It doesn't matter.
e) None of the above.
f) I don't know.

8. How many new foods should babies be fed at one time (please circle the one best answer)?
   a) 1
   b) 2
   c) 3
   d) 4
   e) It doesn't matter.
   f) None of the above.
   g) I don't know.

9. After feeding one new food to a baby, how much time should occur before feeding the baby another new food (please circle the one best answer)?

   a) Two foods may be introduced at the same meal if they are nutritious.
   b) A few hours.
   b) 1 to 2 days.
   c) 3 to 4 days.
   d) 5 to 7 days.
   e) 8 to 10 days.
   f) It doesn't matter
   g) None of the above.
   h) I don't know.

10. Infant cereal is good for babies because (you may circle more than one answer):

   a) It is easy for most babies to digest.
   b) It is a good source of the extra nutrients babies need.
   c) It will help babies sleep through the night.
   d) It can be made thin or thick.
   e) It can be fed to young babies from a bottle.
   f) It is bland.
   g) It is less likely to cause allergies than other foods.
   h) I don't know.

For questions 11 through 24, circle the one response that best answers whether you think each statment is correct or incorrect. If you don't know, please circle the "Don't Know" response only.

11. A baby's diet should be gradually built to include a wide variety of foods by the end of the first year.

Correct Incorrect Don't Know

12. Baby's less than six months of age need a wide variety of foods to meet their nutritional needs.

Correct Incorrect Don't Know

13. You should listen to your baby's appetite to avoid over-feeding or underfeeding.

Correct Incorrect Don't Know

14. All babies that are the same age need the same amount of food for growth and good health.

Correct Incorrect Don't Know

15. You should not restrict fat and cholesterol too much in your baby's diet.

Correct Incorrect Don't Know

16. Don't overdo high-fiber foods in your baby's diet.

Correct Incorrect Don't Know

17. High-fiber foods will help babies get all the nutrients they need.

Correct Incorrect Don't Know

18. In an infant's diet, sugar is okay, but in moderation.

Correct Incorrect Don't Know

19. Sugar substitutes (saccharin and "Nutra-Sweet") should be used in place of sugar in the infant's diet.

Correct Incorrect Don't Know

20. In an infant's diet, sodium (salt) is okay, but in moderation.

Correct Incorrect Don't Know

21. Infants usually get more salt from commercially prepared baby food than from home prepared baby food or table food.

Correct Incorrect Don't Know

22. Babies need more iron, pound for pound, than adults do.

Correct Incorrect Don't Know

23. The most common nutritional problem of infants in the United States is lack of iron in the diet.

Correct Incorrect Don't Know

INFANT FEEDING SURVEY - PART III

This last section of the survey will ask you questions about yourself, your baby, and your lifestyle. Information from this section will be used to group participants in this survey into groups that are as much alike as possible. Thank you for your patience and participation!!

1. What is your age? (circle the letter)
   a) Less than 20
   b) 20 - 24
   c) 25 - 29
   d) 30 - 34
   e) 35 - 39
   f) 40 - 44
   g) Over 45

2. What is your birthdate?

3. What is your race?

4. Please check the blank(s) that best describes you now. Check all that apply.
_____ Employed full time outside my home: occupation _____
_____ Employed part time outside my home: occupation _____
_____ Employed outside my home, but currently on leave: occupation _____
_____ Employed in my home: occupation _____
_____ Homemaker
_____ Student
_____ Unemployed
_____ Unemployed, looking for work
_____ Disabled
_____ Other _____

5. Do you have medical insurance? _____ Yes _____ No

6. Who else lives with you (for example: mother, husband, friend, other children)?
Example: mother (do not list her name)_____
_____

7. What is your marital status? Please circle only one letter.
   a) Single
   b) Divorced
   c) Separated
   d) Married
   e) Widowed

8. What is the highest level of education you have completed? Please circle only one letter.

a) 8th grade or less
b) Some high school
c) High school graduate
d) GED
e) Some college
f) College graduate
g) Some post-graduate work
h) An advanced degree (M.S., Ph.D., M.D., etc.)

9. What is your household income level? Please circle only one letter.

a) less than $10,000 per year
b) $10,0000 to $15,000 per year
c) $15,000 to $20,000 per year
d) $20,000 to $30,000 per year
e) $30,000 to $40,000 per year
f) more than $40,000 per year

10. Did you go to or get help from any of the following places? Please check all that apply.

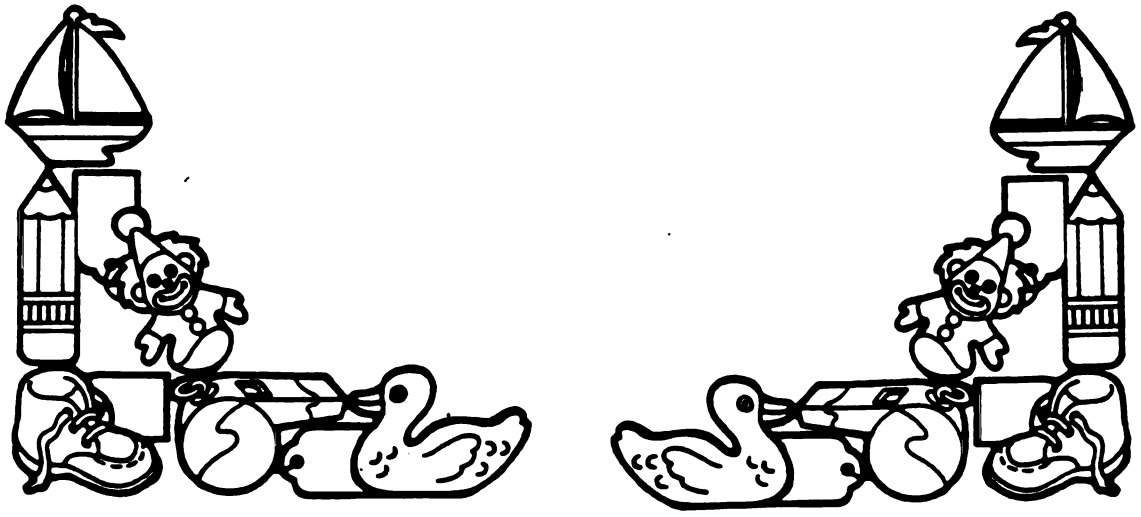
_____ Prenatal classes at the hospital or doctor's office
_____ Postnatal classes at the hospital or doctor's office
_____ WIC (Women, Infants, and Children) classes
_____ EFNEP program (Expanded Food and Nutrition Education Program)
_____ Infant nutrition classes at your health department
_____ La Leche League classes
_____ AFDC (Aid to Families with Dependent Children)
_____ Food Stamps
_____ Commodity Food Programs
_____ Day Care
_____ Other, please indicate _____

11. About how long did it take you to complete the three parts of this survey? _____ minutes

APPENDIX D

Final Supplemental Feeding Knowledge Survey Used in Research Study

BABY FEEDING SURVEY



Michigan State University, 1991

INFANT FEEDING SURVEY - Part I

These forms are for new mothers with babies about 6 weeks to 6 months old. If for some reason your baby does not live with you, please return these blank forms in the enclosed business reply, self-addressed envelope. Otherwise, please go on to the next item.

This section of the survey will ask you questions about how you feed or plan to feed your baby. Please write or check your answer(s) to each question in the blanks provided. **THANK YOU!!!**

1a. Is this the first baby you have had? _____ Yes _____ No
1b. If no, how many other children have you had? _____
1c. Do your other children live with you? _____ Yes _____ No

2a. Does your baby have any serious medical problems? _____ Yes _____ No
2b. If yes, what? _____
2c. Does your baby have any food allergies? _____ Yes _____ No
2d. If yes, what? _____

3a. Did you have more than one baby with this pregnancy? _____ Yes _____ No
3b. If yes, how many babies did you have? _____

4. How much did your baby weigh when he/she was born?
(If you had more than one baby, please write the weight of each baby in the extra space.) _____ pounds _____ ounces _____

5. Was your baby born more than 3 weeks early (3 weeks before the due date)?
_____ Yes _____ No

6. How old is your baby now, to the nearest month? (For example, you may write 3 1/2 months or 2 1/4 months.) _____ months

7a. During the first few days, how was your baby fed?
_____ breast-fed
_____ combination of breast-fed and infant formula fed
_____ infant formula fed
_____ other _____

7b. Is/was your baby ever breast-fed? _____ Yes _____ No
If no, please go on to question 8.
If yes, how long did you breast-feed (how many days, weeks, or months)? _____

7c. Are you still breast-feeding? _____ Yes _____ No

8. How many times a day is your baby fed the following milks?
   _____ Whole cow's milk (Vitamin D or homogenized milk)
   _____ 2% cow's milk
   _____ Skim or 1/2% cow's milk
   _____ Evaporated milk (such as Carnation or Pet milk)
   _____ Infant formula (Similac, Enfamil, S.M.A., Gerber Infant Formula)
   _____ Soy milk
   _____ Breast-milk
   _____ Soy infant formula (Prosobee, Isomil, Nursoy, Soyalac)
   _____ Sweetened-condensed milk (such as Eagle brand)
   _____ Goat's milk
   _____ Other, what:_____

9a. Has your baby been fed 100% fruit juice? _____ Yes _____ No

9b. If yes, how old, in months, was your baby when he/she first had 100% fruit juice? (For example, you may write 4 1/2 months or 6 3/4 months.)
   _____ months

9c. If no, at what age do you plan to give your baby 100% fruit juice? (For example, you may write 2 1/4 months or 3 1/2 months.)
   _____ months

10. Who else, besides yourself, feeds your baby more than twice a week? Please check all that apply.
   _____ Baby's father
   _____ Baby-sitter/Day-care provider
   _____ Older sibling
   _____ My mother
   _____ My mother-in-law
   _____ Other relative
   _____ Other _____

The following section will ask you questions about what your baby is currently eating.

IF YOUR BABY HAS HAD <u>ANY</u> FOOD OR LIQUID BESIDES BREAST-MILK, INFANT FORMULA, 100% FRUIT JUICE, OR WATER, PLEASE GO TO PAGE 3.

IF YOUR BABY HAS <u>NOT</u> HAD <u>ANY</u> FOOD OR LIQUID BESIDES BREAST-MILK, INFANT FORMULA, 100% FRUIT JUICE, OR WATER, PLEASE GO TO PAGE 5.

Please answer the questions on this page only if your baby has had ANY food or liquid besides breast-milk, infant formula, 100% fruit juice or water. If your baby has not, please go on to page 5.

11. Why did you start feeding your baby **ANY** food or liquid besides breast-milk, infant formula, 100% fruit juice, or water?

_____

_____

_____

_____

12a. What was the first food, other than breast-milk, infant formula, 100% fruit juice or water, regularly given to your baby?

_____

12b. How old, in months, was your baby when he/she first had the food in 12a? (For example, you may write 5 1/4 months, 1 1/2 months, etc.)
_____ months

12c. Why did you choose the food in #12a. as the first food?

_____

_____

_____

_____

13. Please check how you fed the first food to your baby.

_____ from a bottle
_____ from a cup
_____ baby fed him/herself using hands
_____ from a spoon
_____ from an infant feeder

14. How did you decide your baby was ready for foods other than breast-milk, infant formula, 100% fruit juice, or water?

_____

_____

_____

_____

15. After feeding the first new food to your baby, how long did you wait before feeding him/her the second new food?

_____ My baby has only had 1 food so far. **(If you check this response, please skip the rest of the questions on this page and continue with question #22 on page 5.)**

_____ The second new food was given at the same meal as the first food.
_____ A few hours
_____ Less than 1 day
_____ 1 to 2 days
_____ 3 to 4 days
_____ 5 to 7 days
_____ 8 to 10 days
_____ Other_____
_____ I was not there to feed my baby the second new food.
_____ I cannot remember.

16. What was the second food regularly given to your baby?

_____

17. Why did you choose this as the second food?

_____

_____

_____

_____

If you checked the first response to #15, skip the rest of the questions on this page and continue with #22 on page 5. Otherwise, please go on to page 7.

Answe
beside
has ha
water.

18.

19.

20.

2

Answer the questions on this page if your baby has NOT had ANY food or liquid besides breast-milk, infant formula, 100% fruit juice, or water yet. If your baby has had food or liquid besides breast-milk, infant formula, 100% fruit juice, or water, answer the questions on pages 3 and 4, and than go to page 7.

18. Why haven't you given your baby any food or liquid besides breast-milk, infant formula, 100% fruit juice, or water?

_____

_____

_____

_____

19. What is the first food other than breast-milk, infant formula, 100% fruit juice, or water you plan to give to your baby? Please name the food.

_____

_____ I don't know.

20. Why do you plan to use the food you answered in #19 as the first food? (If you answered "I don't know" to #19, please skip this question.)

_____

_____

_____

_____

21. How do you plan to feed the first food to your baby?

_____ from a bottle.
_____ from a cup.
_____ my baby will feed him/herself.
_____ from a spoon.
_____ from an infant feeder.
_____ I don't know.

22.

23.

24

22. After feeding the first new food, how long do you plan to wait before feeding your baby the second new food?

_____ The second new food will be fed at the same meal as the first food.
_____ A few hours.
_____ Less than 1 day.
_____ 1 to 2 days.
_____ 3 to 4 days.
_____ 5 to 7 days.
_____ 8 to 10 days.
_____ Other _____
_____ I don't know.

23. What is the second food other than breast-milk, infant formula, 100% fruit juice, or water you plan to feed to your baby? Please name the food.

_____

_____ I don't know.

24. Why do you plan to choose this as the second food?

_____

_____

_____

_____

PLEASE GO ON TO PAGE 7.

ALL MOTHERS SHOULD ANSWER THE QUESTIONS ON THIS PAGE.

24. How often does your baby drink the following liquids? Please make **ONE "X"** in the line for each liquid.

LIQUID	NEVER	LESS THAN ONCE A WEEK	1-2 TIMES A WEEK	3-5 TIMES A WEEK	DAILY
SUGAR WATER					
WATER					
HI-C					
100% FRUIT JUICE					
SODA/POP					
"DIET" DRINKS					
FRUIT PUNCH					
KOOL-AID					
TEA					
COFFEE					

25. Where or from whom did you get most of your baby feeding information?

_____

_____

_____

_____

26. Based on the explanations below, please write down the abbreviation that best describes how much you used the baby feeding information from the following sources.

NR = Not received: you did not receive any baby feeding information from this source.
NU = Not used: you did not use the baby feeding information from this source.
SU = Sometimes used: you sometimes used the baby feeding information from this source.
OU = Often used: you often used the baby feeding information from this source.

_____ Doctor
_____ Nurse at doctor's office
_____ Health Department nurse
_____ Dietitian/Nutritionist
_____ Midwife
_____ Mother
_____ Mother-in-law
_____ Sister
_____ Sister-in-law
_____ Other relative:
who_____
_____ Friends
_____ Neighbors
_____ Baby-sitter or
Day-care provider

_____ Newspapers/magazines
titles:_____
_____ Television
_____ Radio
_____ Books
titles:_____
_____ Publications from infant formula or baby food companies
_____ Hospital take-home kit
_____ La Leche League
_____ Classes at Health Department
_____ WIC (Women, Infants, and Children)
_____ County Extension Office
_____ Classes:
what/where_____
_____ Other:what_____

INFANT FEEDING SURVEY - PART II

To answer the questions in this section, think about any baby feeding information you have received. Based on this information, circle the best answer(s) to questions 1 through 10. Remember that babies are children 1 year of age or less. Thank you for helping us help other mothers like yourself!

1. It is usually recommended that babies start **other** foods or liquids besides breast-milk, infant formula, 100% fruit juice, or water when they are (please circle the one best answer)?
   a) less than 1 month old
   b) between 1 and 2 months old
   c) between 2 and 4 months old
   d) between 4 and 6 months old
   e) between 6 and 8 months old
   f) more than 8 months old
   g) I don't know

2. Some signs that show a baby might be ready for foods other than breast-milk, infant formula, 100% fruit juice, or water are (you may circle more than one answer):
   a) The baby does not "spit out" most of the food fed.
   b) The baby shows interest in food.
   c) The baby is drinking more than 32 ounces of formula, or is breast-feeding more than 8-10 times in 24 hours.
   d) The baby is not sleeping through the night.
   e) The baby has doubled in birthweight.
   f) The baby can sit-up without support.
   g) None of the above.
   h) I don't know.

3. Feeding foods other than breast-milk, infant formula, 100% fruit juice or water to a baby that is too **young** may (you may circle more than one answer):
   a) cause food allergies.
   b) cause the baby to have stomach problems.
   c) make the baby sleep too much.
   d) make the baby develop too early.
   e) lead to obesity.
   f) stunt the baby's growth.
   g) None of the above.
   h) I don't know.

4. Waiting to start foods other than breast-milk, infant formula, 100% fruit juice or water until a baby is too **old** may (you may circle more than one answer):
   a) stunt the baby's growth.
   b) cause food allergies.
   c) result in too little of some nutrients in the baby's diet.
   d) make it hard to introduce solid foods.
   e) lead to obesity.
   f) delay the baby's eating and speech development.
   g) None of the above.
   h) I don't know.

5. What food is usually recommended as a baby's first food other than breast-milk, infant formula, 100% fruit juice or water? Please circle the **ONE** best answer.
   a) Ice-cream
   b) Fruit (pureed, strained, blended, or mashed)
   c) Cow's milk
   d) Infant cereal
   e) Meat (pureed, strained, or blended)
   f) Teething biscuits
   g) Adult cereal
   h) Vegetable (pureed, strained, or blended)
   i) Dry bread or toast
   j) Yogurt
   k) Other, what:_____
   l) I don't know.

6. How should the first food other than breast-milk, infant formula, 100% fruit juice, or water be fed? Please circle the **ONE** best answer.
   a) From an infant feeder
   b) From a bottle
   c) From a cup
   d) From a spoon
   e) Baby should feed him/herself with hands.
   f) None of the above.
   g) I don't know.

7. What food would be best for a baby just starting foods other than breast-milk, infant formula, 100% fruit juice, or water? Please circle the **ONE** best answer.
   a) A combination food with many ingredients.
   b) A food with only one ingredient.
   c) The number of ingredients in a food does not matter.
   d) None of the above.
   e) I don't know.

8. How many **new** foods should a baby be fed at one time? Please circle the **ONE** best answer.
   a) 1
   b) 2
   c) 3
   d) 4
   e) It doesn't matter.
   f) None of the above.
   g) I don't know.

9. After introducing one new food to a baby, how long should you wait before feeding the baby another new food? Please circle the **ONE** best answer.
   a) Two foods may be introduced at the same meal if they are nutritious.
   b) A few hours.
   c) 1 to 2 days.
   d) 3 to 4 days.
   e) 5 to 7 days.
   f) 8 to 10 days.
   g) It doesn't matter.
   h) None of the above.
   i) I don't know.

10. Why is infant cereal good for babies? You may circle more than one answer.
    a) It is a good source of the extra nutrients babies need.
    b) It will help babies sleep through the night.
    c) It can be made thin or thick.
    d) It can be fed to young babies from a bottle.
    e) It is less likely to cause allergies than other foods.
    f) I don't know.

For questions 11 through 24, circle the one response that best answers whether your think each statement is correct or incorrect. If you don't know, please circle the "Don't Know" response only.

11. A baby's diet should be gradually built to include a variety of foods from the basic food groups by the end of the first year.
    Correct Incorrect Don't Know

12. Babies less than six months of age need a variety of foods to meet their nutritional needs.
    Correct Incorrect Don't Know

13. You should pay attention to your baby's appetite to avoid over-feeding or under-feeding.
    Correct Incorrect Don't Know

14. You should not restrict fat and cholesterol in your **BABY'S** diet.
    Correct Incorrect Don't Know

15. **BABIES** don't need special high-fiber foods in their diets.
    Correct Incorrect Don't Know

16. In a **BABY'S** diet, sugar already in foods is okay (for example, sugar in a fresh orange).
    Correct Incorrect Don't Know

17. Sugar substitutes (for example, saccharin and "Nutra-Sweet") can be used in place of sugar in a **BABY'S** diet.
    Correct Incorrect Don't Know

18. Honey is better for babies than sugar is.
    Correct Incorrect Don't Know

19. In a **BABY'S** diet, sodium (salt) already in foods is okay (for example sodium in fresh carrots).
    Correct Incorrect Don't Know

20. Babies usually get more salt from store-bought baby food than from home-made baby food.
    Correct Incorrect Don't Know

21. Iron-fortified foods are important for babies.
    Correct Incorrect Don't Know

22. Babies need more iron, pound for pound, than adults do.
    Correct Incorrect Don't Know

INFANT FEEDING SURVEY - PART III

This last section of the survey will ask you questions about yourself, your baby, and your lifestyle. Information from this section will be used to group participants in this survey into groups that are as much alike as possible. Please remember that your answers to all questions are anonymous. Thank you for your patience and participation!!

1. What is your age? Please circle only **ONE** letter.
   a) Less than 20 years old.
   b) 20 to 24 years old.
   c) 25 to 29 years old.
   d) 30 to 34 years old.
   e) 35 to 39 years old.
   f) 40 to 44 years old.
   g) Over 45 years old.

2. What is your race? _____

3. Please check the blank(s) that best describes you now. Check all that apply.
   ____ Employed full-time outside my home:
   job/occupation_____
   ____ Employed part-time outside my home:
   job/occupation_____
   ____ Employed full-time outside my home, but currently on leave:
   job/occupation_____
   ____ Employed part-time outside my home, but currently on leave:
   job/occupation_____
   ____ Employed in my home: job/occupation_____
   ____ Homemaker
   ____ Student
   ____ Unemployed
   ____ Unemployed, looking for work
   ____ Disabled
   ____ Other_____

4. Do you have medical insurance? ____ Yes ____ No

5. Who else lives with you? For example: mother, husband, friend, other children.
   Please list the relationship only.

   _____

   _____

   _____

6. What is your marital status? Please circle only **ONE** letter.
   a) Single
   b) Divorced
   c) Separate
   d) Married
   e) Widowed

7. What is the highest level of education you have completed? Please circle only **ONE** letter.
   a) 8th grade or less
   b) Some high school
   c) High school graduate
   d) GED
   e) Vocational training
   f) Technical training
   g Associates Degree
   h) Some college
   i) Bachelors Degree
   j) Some post-graduate work
   k) An advanced degree (M.S., Ph. D., M.D., etc.)

8a. What is your household income level? Please circle only **ONE** letter.
   a) less than $10,000 per year.
   b) $10,001 to $15,000 per year.
   c) $15,001 to $20,000 per year.
   d) $20,001 to $25,000 per year.
   e) $25,001 to $30,000 per year.
   f) $30,001 to $35,000 per year.
   g) $35,001 to $40,000 per year.
   h) More than $40,000 per year.
   i) I do not wish to answer this question.

8b. How many people are supported on this income? _____

9. Did you go to or get baby feeding information from any of the following places? Please check all that apply.

   ____ Prenatal classes sponsored by hospital, doctor's office, or community group
   ____ Postnatal classes sponsored by hospital, doctor's office, or community group
   ____ WIC (Women, Infants, and Children) classes
   ____ Infant nutrition classes at your health department
   ____ La Leche League classes
   ____ EFNEP program (Expanded Food and Nutrition Education Program)
   ____ AFDC (Aid to Families with Dependent Children
   ____ Food Stamps
   ____ Commodity Food Programs.
   ____ Day Care
   ____ Other, please indicate _____

10. What date did you complete this survey? _____

THANK YOU FOR YOUR TIME!!

APPENDIX E

Survey Cover Letter

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FOOD SCIENCE AND HUMAN NUTRITION
HUMAN ECOLOGY BUILDING

EAST LANSING • MICHIGAN • 48824-1050

February 13, 1991

Dear New Mother:

This survey is for new mothers with babies less than 1 year old. If for some reason your baby does not live with you, please return the blank survey in the enclosed envelope. No postage is needed. Otherwise, please continue.

Congratulations on the birth of your new baby! As part of my research at Michigan State University, I am doing a study with new mothers about feeding their babies. The results of this study will be used to help other new mothers.

As a new mother, your name has been chosen from a nation-wide list of mothers who gave birth in a hospital during the last year. Please take a few minutes to answer the questions on the enclosed baby feeding survey. The initials of your state have been written on the back of the last page of your survey, so we can group the returned surveys by region. Your answers on this survey will be anonymous; this means that I will not be able to identify your returned survey from any of the other returned surveys.

Your participation in this survey is entirely voluntary. You indicate your voluntary agreement to participate by completing and returning this survey. **Please return your completed survey in the enclosed envelope by March 7, 1991. No postage is needed.**

For participation records, please complete and mail the enclosed postcard separately. No postage is required. We ask for your name and address on the postcard for our participation records only; we will NOT be able to identify your survey from the returned postcards.

If you have any questions about the survey, please call my adviser collect: Dr. Jenny Bond, 517-355-1756.

As a token of appreciation for helping in our research study, we have attached a 1990 fifty-cent piece commemorating the year your baby was born. Thank you for your time!

Sincerely,

Amy L. Riley

Amy L. Riley, R.D.
Graduate Student

ALR/mr

BIBLIOGRAPHY

Bibliography

Alreck, P.L. and R.B. Settle. The Survey Research Handbook. Homewood: Irwin, 1985, pp.303-305, 344-346.

Baranowski, T., D.E. Bee, D.K. Rassin, C.J. Richardson, J.P.Brown, N. Guenther, and P.R. Nader. Social support, social influence, ethnicity and the breastfeeding decision. Social Science Medicine 17:1599-1611, 1983.

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

Bowering, J., R.L. Lowenberg, M.A. Morrison, S.L. Parker, and N. Tirado. Influence of a nutrition education program (EFNEP) on infant nutrition in East Harlem. Journal of the American Dietetic Association 72: 392-397, 1978b.

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

Brogan, B.D., and H.M. Fox. Infant feeding practices of low- and middle-income families in Nebraska. Journal of the American Dietetic Association 84:558-563, 1984.

Bryant, C.A. The impact of kin, friend, and neighbor networks on infant feeding practices. Social Science Medicine 16:1757-1765, 1982.

Committee on Nutrition. On the feeding of supplemental foods to infants. Pediatrics 65:1178-1181, 1980.

Committee on Nutrition, American Academy of Pediatrics. Pediatric Nutrition Handbook. G.B. Forbes, ed. Elk Grove Village: American Academy of Pediatrics, 1985.

Doucet, H.J., and R.A. Berry. Feeding practices of low-income infants: a New Orleans Health Department Study. Journal of the Louisiana State Medical Society 140:16-20, 1988.

Eppright, E.S., H.M. Fox, B.A. Fryer, G.L. Lamkin, and V.M. Vivian. Nutrition knowledge and attitudes of mothers. Journal of Home Economics 62:327-332m 1970.

Fergusson, D.M., L.J. Horwood, and F.T. Shannon. Early solid feeding and recurrent childhood eczema: a 10-year longitudinal study. Pediatrics 86:541-546, 1990.

Ferris, A.G., L. B. Vilhjalmsdottir, V.A. Beal, and P.L. Perrett. I. Energy-yielding nutrients: Diets in the first six months of infants in western Massachusetts. Journal of the American Dietetic Association 72:155-160, 1978a.

Ferris, A.G., L. B. Vilhjalmsdottir, V.A. Beal, and P.L. Perrett. II. Semi-solid foods: Diets in the first six months of infants in western Massachusetts. Journal of the American Dietetic Association 72:160-163, 1978b.

Fitz-Gibbon, C.T. and L.L. Morris. How to Analyze Data. Newbury Park:Sage Publication, 1987, pp.98-104.

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

Gabriel, A., and K.R. Gabriel, and R.A. Lawrence. Cultural values and biomedical knowledge: choices in infant feeding. Social Science Medicine 23:501-509, 1986.

Grotkowski, M.L., and L.S. Sims. Nutritional knowledge, attitudes, and dietary practices of the elderly. Journal of the American Dietetic Associations 72:499-506, 1978.

Guiry, V.C., and C.A. Bisogni. Caffeine knowledge, attitudes, and practices of young women. Journal of Nutrition Education 18:16-22, 1986.

Henerson, M.E., L.L. Morris, and C.T. Fitz-Gibbon. How to Measure Attitudes. Newbury Park: Sage Publications, 1987, pp. 57-92, 132-158.

Joffe, A., and S.M. Radius. Breast versus bottle: correlates of adolescent mothers' infant feeding practices. Pediatrics 79:689- 695, 1987.

Kaplowitz, D.D., and C.M. Olson. The effect of an education program on the decision to breastfeed. Journal of Nutrition Education 15:61-65, 1983.

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

Kramer, M.S., R.G. Barr, D.G. Leduc, C. Boisjoly, and I.B. Pless. Infant determinants of childhood weight and adiposity. The Journal of Pediatrics 107:104-107, 1985b.

Lebenthal, E. Impact of digestion and absorption in the weaning period on infant feeding practices. Pediatrics 75(suppl):207-213, 1985.

Leeper, J.D., T. Milo, and T.R. Collins. Infant feeding and maternal attitudes among mothers of low-income. Psycholigical Reports 53:259-265, 1983.

Parraga, I.M., M.A. Weber, A. Engel, K.G. Reeb, and E. Lerner. Feeding patterns of urban black infants. Journal of the American Dietetic Association 88:796-800, 1988.

Pipes, P.L. Nutrition in Infancy and Childhood. St. Louis: Times Mirror/Mosby College Publishing, 1989.

Pugliese, M.T., M. Weyman-Daum, N. Moses, and F. Lifshitz. Parental health beliefs as a cause of nonorgranic failure to thrive. Pediatrics 80:175-182, 1987.

Quandt, S.A. The effect of beikost on the diet of breast-fed infants. Journal of the American Dietetic Association 84: 47-51, 1984.

Quandt, S.A. The biobehavioral dynamics of the infant feeding process. Unpublished doctoral dissertation, 1981.

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

Sarett, H., K.R. Bain, and J.C. O'Leary. Decisions on breast- feeding or formula feeding and trends in infant-feeding practices. American Journal of the Disabled Child 137:719-725, 1983.

Satter, E. Child of Mine: Feeding with Love and Good Sense. Palo Alto: Bull Publishing Co., 1986.

Shoham-Yakubovich, I., J.S. Pliskin, and D. Carr. Infant feeding practices: an evaluation of the impact of a health education course. Journal of Public Health 80:732-734, 1990.

Schwartz, N.E. Nutritional knowledge, attitudes, and practices of high school graduates. Journal of the American Dietetic Association 66:28-31, 1975.

Sims, L.S. Dietary status of lactating women. Journal of the American Dietetic Association 73:147-154, 1978.

Sims, L.S. Demographic and attitudinal correlates of nutrition knowledge. Journal of Nutrition Education 8:122-125, 1976.

Switzky, L.T., P. Vietze, and H.N. Switzky. Attitudinal and demogrpahic prdictors of breast-feeding and bottle-feeding behavior by mothers of six-week-old infants. Psychological Reports 45:3-14, 1979.

U.S. Department of Commerce, Bureau of the Census. 1980 Census of the Population. Washington: U.S. Government Printing Office, 1983, Vol. 1, p. 1-22.

U.S. Department of Commerce, Bureau of the Census. Statistical Abstract of the United States 1990. Washington: U.S. Governement Printing Office, 1990, pp. 63, 65, 68.

U.S. Department of Health and Human Services, National Center for Health Statistics. Health, United States. Washington: U.S. Government Printing Office, 1984, p. 7.

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

Worthington-Roberts, B. and S.R. Williams. Nutrition in Pregnancy and Lactation. St. Louis: Times Mirror/Mosby College Publishing, 1989.

Wright, A.L., C. Holberg, L.M. Taussig, and the Group Health Medical Associates Pediatricians. Infant-feeding practices among middle-class Anglos and Hispanics. Pediatrics 82:496-503, 1988.