

FINAL REPORT: WIC INFANT FEEDING PRACTICES STUDY

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TABLE OF CONTENTS

List of Tables x

List of Figures xiii

Executive Summary	1
Chapter I	Introduction	11
I.1	Overview of Infant Feeding and the WIC-IFPS	11
I.2	The WIC Program Relative to Infant Feeding	11
I.3	Reference Guidelines	16
I.4	Objectives of the WIC-IFPS	17
Chapter II	Design of the WIC-IFPS, and the Study Sample	19
II.1	Design of the WIC-IFPS	19
II.2	Data Collection Instruments	23
II.3	Information Collected by WIC-IFPS	24
II.4	Characteristics and Program Participation of the WIC-IFPS Sample	25
Chapter III	Conceptual Model and Approach to the Analysis of the WIC-IFPS	31
III.1	Overview of the Milestones of Infant Nutrition	31
	The Nursing Phase	32
	The Transitional Phase	34
III.2	A General Model of Infant Feeding Practices	38
III.3	An Overview of the Statistical Analysis Methods	41
	Descriptive Analyses	41
	Multivariate Analyses	42
	Comparison of Descriptive and Multivariate Analyses	43

Chapter IV	The Choice Between Breastfeeding and Formula-Feeding in the Nursing Phase	45
IV.1	Overview	45
IV.2	WIC Program Components that Pertain to the Choice Between Breastfeeding and Formula Feeding	45
IV.3	Initiation of Breastfeeding Among WIC Mothers.....	47
	Research Questions	47
	Main Findings	49
	Previous Studies	50
	Statistical Methods.....	53
	Results.....	55
	Conclusions	67
IV.4	Attitudes and Beliefs About Breastfeeding	69
	Research Questions	69
	Main Findings	70
	Previous Studies	70
	Statistical Methods.....	72
	Results.....	74
	Conclusions	80
IV.5	Transition to a Combined Breastmilk and Formula Diet	82
	Research Questions	82
	Main Findings	86
	Previous Studies	86
	Statistical Methods.....	87
	Results.....	91
	Conclusions	102
Chapter V	Hospital Practices and Neonatal Circumstances Experienced by Mothers	105
V.1	Overview	105
V.2	WIC Program Components that Pertain to the Neonatal Period.....	105
V.3	Research Questions	106
V.4	Main Findings	106

V.5	Previous Studies.....	108
V.6	Statistical Methods.....	110
V.7	Results	111
V.8	Conclusions	127
Chapter VI	Breastfeeding and Formula-Feeding Practices in the Nursing Phase	129
VI.1	Overview	129
VI.2	WIC Program Components that Pertain to Breastfeeding and Formula-Feeding Practices	129
VI.3	Breastfeeding Practices.....	130
	Research Questions	130
	Main Findings	131
	Previous Studies.....	132
	Statistical Methods.....	132
	Results.....	133
	Conclusions	141
VI.4	Formula-Feeding Practices.....	142
	Research Questions	142
	Main Findings	143
	Previous Studies.....	143
	Statistical Methods.....	144
	Results.....	145
	Conclusions	149
Chapter VII	Nursing Problems, Continuation and Cessation of Breastfeeding	153
VII.1	Overview	153
VII.2	WIC Program Components that Pertain to Continuation of Breastfeeding, Nursing Problems, and Cessation of Breastfeeding.....	154
VII.3	Nursing Problems	155
	Research Questions	155
	Main Findings	155
	Previous Studies.....	156
	Statistical Methods.....	157
	Results.....	157
	Conclusions	160

VII.4	Analysis of Continuation and Cessation of Breastfeeding	160
	Research Questions	160
	Main Findings	162
	Previous Studies	163
	Statistical Methods	167
	Results	168
	Conclusions	180
Chapter VIII	Initiation of Supplemental Foods: The Transitional Phase of Infant Feeding	183
VIII.1	Overview	183
VIII.2	WIC Program Components that Pertain to Infant Feeding Issues in the Transitional Phase	184
VIII.3	Choice of Supplemental Foods and Timing of Their Introduction	185
	Research Questions	185
	Main Findings	187
	Previous Studies	189
	Statistical Methods	189
	Results	192
	Conclusions	208
VIII.4	Choice of Supplemental Drinks and Timing of Their Introduction	210
	Research Questions	210
	Main Findings	211
	Previous Studies	211
	Statistical Methods	212
	Results	212
	Conclusions	216
Chapter IX	Supplemental Food Feeding Practices	217
IX.1	Overview	217
IX.2	WIC Program Components that Pertain to Supplemental Food Feeding Practices	217
IX.3	Analysis of Supplemental Food Feeding Practices	218
	Research Questions	218
	Main Findings	218
	Previous Studies	219
	Statistical Methods	219
	Results	220
	Conclusions	226

Chapter X	Conclusions	229
X.1	Overview	229
X.2	A Summary of Infant Feeding Practices of WIC Mothers	230
X.3	Breastfeeding Initiation	234
	FCS guideline	234
	Commentary	234
X.4	Breastfeeding Duration	239
	FCS guidelines	239
	Commentary	239
X.5	Formula Feeding	244
	FCS guidelines	244
	Commentary	244
X.6	Introduction of Supplemental Foods	246
	FCS guidelines	246
	Commentary	246
Glossary	251
References	255
Appendix A	Design of the WIC-IFPS: Sampling Design and Methods	
Appendix B	Survey Instruments of the WIC-IFPS	
Appendix C	Description of the WIC-IFPS Sample	
Appendix D	Description of the Study Data Base	
Appendix E	Analysis Weights	
Appendix F	Use of Child Care among WIC mothers	
Appendix G	Multivariate Statistical Methods of Analysis	
Appendix H	A Protocol for Building Multivariate Models of Infant Feeding Practices	
Appendix I	Detailed Tables	
Appendix J	Standard Errors for the Text Tables and Detailed Tables	

LIST OF TABLES

II.1.	Overall study participation counts and rates	21
II.2.	Counts and percent of respondents by sample type and interview month.....	22
II.3.	Percentage distribution of socio-demographic characteristics by maternal race and ethnicity	26
II.4.	Percentage distribution of reported health-related characteristics by race and ethnicity of the mother	27
II.5.	Percentages of mothers reporting the receipt of WIC vouchers for formula and for supplemental foods	28
II.6.	Percentages of mothers reporting receipt of information about various aspects of infant feeding from WIC	29
III.1.	WIC-IFPS data on infant feeding practices in the nursing phase	32
III.2.	WIC-IFPS data on infant feeding practices in the transitional phase	35
IV.1.	Breastfeeding initiation rates by selected socio-demographic and health-related characteristics	56
IV.2.	Estimates of the relative odds estimated by the logistic regression model of breastfeeding initiation (N=874)	61
IV.3.	Items that constitute the perceived benefits of breastfeeding and perceived barriers to breastfeeding scales	75
IV.4.	Percentage of mothers agreeing with the nine statements about perceived benefits of breastfeeding	76
IV.5.	Percentage of mothers agreeing with the 13 statements about perceived barriers to breastfeeding	77
IV.6.	Percentage distribution of the infants by nursing diets at the time of each interview month, by selected socio-demographic characteristics	93
IV.7.	Median age in days of the infant at the time when formula supplementation is initiated, by selected socio-demographic characteristics	97
IV.8.	Estimates of the relative risk estimated by the multivariate models of rates of initiation of formula supplementation (N=477)	99
V.1.	Type of first feeding received by the WIC infants in the hospital	114

V.2.	Percentages of mothers reporting nursing problems while in the hospital	117
V.3.	Percentages of type of feeding at hospital discharge by type of first feeding	120
V.4.	Relative odds of formula feeding at hospital discharge for WIC mothers who breastfeed at the first feeding (N=251).....	122
V.5.	Relative odds of breastfeeding at hospital discharge for WIC mothers who formula feed at the first feeding (N=551).....	125
VI.1.	Breastfeeding schedules of WIC mothers over the first five months of their infants' first year	134
VI.2.	Usual number of daily breastfeeds, by selected maternal socio-demographic characteristics	136
VI.3.	Percentage of WIC mothers who report expressing milk during the past week, by selected maternal socio-demographic characteristics	137
VI.4.	Relative contribution of selected non-program and program factors to the usual daily number of breastfeeds reported at Month 1 interview (N=196)	140
VI.5.	Percentage of WIC mothers who add other foods or liquids into the bottle with the formula by selected socio-demographic characteristics	146
VI.6.	Percentage distribution of formula-feeding WIC mothers by brand name of formula	150
VII.1.	Reported nursing problems by WIC mothers at the time of the Month 1, Month 3, and Month 5 interviews.....	158
VII.2.	Median age of breastfeeding cessation, age when 25% and age when 75% of the infants are weaned from the breast.....	169
VII.3.	Relative risks estimated by the multivariate models of rates of breastfeeding cessation (N=486)	174
VIII.1.	Median age of the infant (in days) when specific supplemental foods are initiated by selected socio-demographic characteristics of the mother	195
VIII.2.	Percentage distribution of the order of initiation of cereals, fruits, vegetables, and meats, by race/ethnicity of the mother	200
VIII.3.	Relative risk of initiation of cereals prior to four months of age (N=745).....	202
VIII.4.	Relative risk of initiation of fruits prior to four months of age (N=803)	205

VIII.5.	Relative risk of initiation of vegetables prior to four months of age (N=835)	207
VIII.6.	Median age of the infant at the time of initiation of fruit juices and sweet drinks, by selected socio-demographic characteristics of the mother	214
IX.1.	WIC-IFPS interview months when questions on the methods of feeding supplemental foods were elicited	220
IX.2.	Methods of feeding supplemental foods at interview months when data were elicited	221
IX.3.	Percentages of WIC mothers who adopt supplemental food feeding practices that are generally not recommended	225
X.1.	Percentages of WIC infants who receive each of the 13 groups of foods at each age	231

LIST OF FIGURES

III.1.	A general model of infant feeding practices and the measures of predictors of infant feeding practices from the WIC-IFPS	39
IV.1.	A model of breastfeeding initiation and the measures of its predictors available from the WIC-IFPS	48
IV.2.	Breastfeeding initiation rates, by race and ethnicity of the mother	57
IV.3.	Relative odds of initiating breastfeeding for WIC mothers who received breastfeeding information and advice from different sources	66
IV.4.	A model of initiation of formula supplementation and the measures of its predictors available from the WIC-IFPS	85
IV.5.	Percentages of only breastfeeding, combined breast- and formula-feeding, and only formula-feeding WIC mothers at each month of interview	91
IV.6.	Percentages of breastfeeding WIC mothers, by type of breastfeeding practice at each month of interview	95
IV.7.	Percentages of breastfeeding WIC mothers who have not yet initiated formula, by the age of the infant	97
V.1.	A model of feeding practices at hospital discharge and the measures of its predictors from the WIC-IFPS	107
V.2.	Number of days of hospital stay for WIC mothers and infants	113
V.3.	Percentage of WIC infants who stayed in the nursery overnight, by race and ethnicity of the mother	113
V.4.	The first feeding of the WIC infants in the hospital, by race and ethnicity of the mother	115
V.5.	Percentage of WIC mothers who did not receive help from the hospital staff among those who had common nursing problems	118
V.6.	Percentage of WIC mothers who reported receiving various items in their gift packages from the hospital	119
VI.1.	A model of daily number of breastfeeds at Month 1 interview and its predictors available from the WIC-IFPS	131

VI.2.	Percentages of WIC mothers who breastfeed on a set schedule, when the infant cries or seems hungry, and on a mixed schedule	135
VI.3.	Percentage of breastfeeding WIC mothers expressing milk using electric breastpumps, using manual breastpumps, and expressing milk by hand.....	138
VI.4.	Percentage of mothers who report adding other foods or liquids in the bottle with the formula at Month 3.....	147
VI.5.	Percentage of mothers who report adding other foods in the bottle with the formula at Month 1 among those who think that the amount of formula given by WIC is more than enough, the right amount, or not enough.....	148
VII.1.	Percentage of breastfeeding WIC mothers who report experiencing nursing problems in Months 1, 3, and 5.....	159
VII.2.	A model of breastfeeding cessation and the measures of its predictors available from the WIC-IFPS	161
VII.3.	Percentage of all WIC mothers breastfeeding, by the age of the infant.....	170
VII.4.	Percentage of WIC mothers still breastfeeding, by the age of the infant and age of the mother	171
VII.5.	Percentage of WIC mothers still breastfeeding, by the age of the infant and whether the mother reports knowing about the special WIC food package for breastfeeding women who do not accept infant formula from WIC.....	172
VII.6.	Percentage of WIC mothers still breastfeeding by the age of the infant and reported receipt of none, one, two, and three WIC program components that support breastfeeding.....	179
VIII.1.	A model of early initiation of supplemental foods and the measures of its predictors from the WIC-IFPS.....	186
VIII.2.	Percentage of WIC mothers who have not yet initiated cereals, fruits, vegetables, and meats, at each age of the infant.....	192
VIII.3.	Percentage of WIC mothers who have not yet initiated dairy foods, high-protein foods other than meats, and sweet/snack foods, at each age of the infant	194
VIII.4.	Percentage of WIC mothers who have not yet initiated cereals at each age of the infant, by maternal immigrant status	196
VIII.5.	Percentages of mothers initiating cereals, fruits, vegetables, and meats as the first, second, third, or fourth type of supplemental food.....	198

VIII.6.	Percentage of WIC mothers who have not yet initiated fruit juices, sweet drinks, and cow's milk or other milk at each age of the infant	213
VIII.7.	Percentage of WIC mothers who have not yet initiated sweet drinks at each age of the infant, by race/ethnicity of the mother	215
IX.1.	Percentage of WIC infants receiving supplemental foods using a spoon at interview months 2, 4, 6, and 9, by race and ethnicity of the mother	222
IX.2.	Percentage of WIC mothers who have used an infant feeder sometime during infancy, by race and ethnicity of the mother	223
IX.3.	Percentages of WIC mothers who feed supplemental foods before Month 4, prior to using a spoon, by race and ethnicity of the mother	226
X.1.	Timeline describing WIC program participation, feeding practices, and hospital practices for WIC mothers from birth through two months of age.....	232
X.2.	Timeline describing WIC program participation and feeding practices for WIC infants from three to twelve months of age	233

EXECUTIVE SUMMARY

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is administered by the Food and Consumer Service (FCS) of the United States Department of Agriculture (USDA). This program provides supplementary foods, nutrition education, and referral to health care for low-income mothers and children who are nutritionally at risk.

Infant nutrition and breastfeeding are areas of maternal and child nutrition that are particularly targeted by the WIC program. During the last few years, Congress has amended the Child Nutrition Act to further promote and support breastfeeding of infant WIC participants. Public Law 101-147, The Child Nutrition and WIC Reauthorization Act of 1989, strengthened the emphasis on infant feeding by focusing more attention on the promotion and support of breastfeeding activities. One of WIC's largest supplemental food packages is targeted at breastfeeding women who elect not to receive infant formula through WIC.

In September of 1993, the FCS contracted with Battelle to conduct the WIC Infant Feeding Practices Study (WIC-IFPS). The study consists of a one-year longitudinal survey of the infant feeding practices of mothers who participated in WIC while pregnant. The mothers were enrolled in the study in the Fall of 1994. The 874 mothers in the study were interviewed up to nine times each, during the first year of the infant's life. The purpose of the WIC-IFPS is twofold:

- (1) to provide a nationally representative description of infant feeding practices among WIC participants, and
- (2) to identify attitudes and practices of WIC participants associated with the initiation and continuation of breastfeeding.

The full report presents the detailed findings from the WIC-IFPS. This executive summary briefly describes the report. It contains four sections, which discuss:

- (1) breastfeeding initiation
- (2) formula feeding
- (3) breastfeeding duration
- (4) introduction of supplemental foods.

Breastfeeding Initiation

- ✓ Slightly over one-half of the WIC mothers initiate breastfeeding.

Although this estimate is higher than the estimates obtained from previous studies, it is substantially below the goal of 75 percent, specified by *Healthy People 2000*.

There are significant differences in breastfeeding initiation rates between subgroups of WIC mothers. Hispanic mothers are the most likely to initiate breastfeeding, and African American mothers are the least likely to do so; the rate for white mothers is intermediate. Being younger (maternal age under 20), never-married, and not living with the infant's father are all factors that are associated with lower rates of breastfeeding. Mothers who were born in the United States are less likely to breastfeed than those who were born in other countries. Long hospital stays are also associated with lower rates of breastfeeding.

A mother's previous breastfeeding experience is strongly predictive of her current choice of a nursing method. Mothers who breastfed before are the most likely to initiate breastfeeding, followed by the first-time mothers. Mothers who have older children but who did not breastfeed these children are the least likely to breastfeed. The strong influence of previous breastfeeding experience underscores the importance of encouraging the first-time mothers to breastfeed, so that their current, as well as their future infants may benefit.

- ✓ Among the mothers who do not receive advice about breastfeeding from a physician, those who report receiving information about breastfeeding from WIC are more likely to breastfeed.

Furthermore, mothers who know about the special WIC food package for breastfeeding mothers who do not accept infant formula from WIC are twice as likely to breastfeed than those who do not know about this package.

Receiving information or advice from professional sources other than WIC is positively associated with breastfeeding initiation.

- ✓ Substantial proportions of WIC mothers experience several hospital practices that are unsupportive of the establishment of breastfeeding immediately after birth.

Less than one-third of WIC infants receive breastmilk at their first feeding. Among the infants who ever breastfeed, only a small minority begin breastfeeding during the first hour after birth, and only one-half breastfeed during the first three hours. During the hospital stay, almost three-quarters of the infants spend at least one night in the nursery, away from their mothers. Almost one-third of the breastfeeding mothers who experience nursing problems in the hospital do not receive any help from the hospital staff. Almost all mothers, including exclusively breastfeeding mothers, receive a hospital gift package that contains a bottle, formula, sugar water, or a pacifier not supportive of breastfeeding. These may be issues that need further collaboration between WIC and local hospitals.

Formula Feeding Practices

- ✓ About one-half of breastfeeding infants are given formula during the first two weeks of life.

Formula supplementation of breastfeeding occurs quite early, with one-half of the mothers initiating formula supplementation by the time their infants are 16 days old. One-quarter of breastfeeding infants receive formula by the age of five days. This practice is likely to result in diminished breastmilk production and is likely to be detrimental to the establishment of breastfeeding during its early stages.

Maternal perception of problems with breastmilk and use of non-maternal child care predict higher likelihood of initiating formula supplementation. Mothers who believe in the benefits of breastfeeding are less likely to supplement breastfeeds with formula.

- ✓ Breastfeeding mothers who know about the special WIC food package for breastfeeding women are less likely to initiate formula supplementation.

This finding supports the hypothesis that the enhanced food package for breastfeeding women may be acting as an incentive not to use formula.

- ✓ Formula-feeding practices of WIC mothers are generally in agreement with the FCS guidelines except that many WIC mothers add cereal to the formula in the bottle.

More than 90 percent of the formula-fed infants receive formula that is fortified with iron, and less than one in ten infants receive formula that is overdiluted to make it last longer. These percentages indicate that most WIC mothers follow the guidelines for appropriate methods of feeding formula. However, one-quarter of the WIC mothers add other foods or liquids to the bottle with the formula during the first three months, a vast majority of these additions being cereal. African American mothers and teenage mothers are significantly more likely to add foods to the formula in the bottle. Receipt of information from WIC about formula feeding is not associated with lower rates of adding other foods to the formula in the bottle.

Breastfeeding Duration, Attitudes, and Practice

- ✓ One-fourth of the WIC mothers who initiate breastfeeding stop by the end of second week and one-half stop by the end of the second month.

Race/ethnicity differences in breastfeeding cessation rates are not significant. Older mothers and highly educated mothers are less likely than younger mothers and less educated mothers to stop breastfeeding early. Mothers who were born in the United States also tend to breastfeed for shorter durations than foreign-born mothers.

- ✓ Mothers who do not believe that they have sufficient milk, or that there is something wrong with their milk, are more likely to stop breastfeeding.

A majority of the breastfeeding WIC mothers experience nursing problems during the first few months. During the first month after birth, only 30 percent of breastfeeding mothers have a problem-free nursing experience. Nevertheless, the proportions of mothers experiencing nursing problems decline during early infancy. Milk insufficiency is one of the most common nursing problems, affecting over one-third of the mothers during the first month after birth.

- ✓ Mothers who believe that breastfeeding is beneficial are less likely to stop breastfeeding early, while those who express concerns about barriers to breastfeeding are more likely to stop breastfeeding.

It is important to understand the attitudes of the WIC mothers towards breastfeeding to better develop programs that address their needs. Statistically, the many attitudes

and beliefs about breastfeeding can be placed in one of two categories: perceived benefits of breastfeeding and perceived barriers to breastfeeding. Both types of attitudes and beliefs are associated with breastfeeding duration.

Hispanic mothers more strongly believe in the benefits of breastfeeding than any other race or ethnic group. African American mothers more strongly believe than any other race or ethnic group that there are barriers to breastfeeding.

- ✓ Supplementing breastfeeding with formula increases the likelihood of breastfeeding cessation by a factor of almost 2½.

The negative consequences of formula supplementation for the continuation of breastfeeding is known by the WIC staff, and they are advised to inform the mothers that formula supplementation may lead to an inability to continue breastfeeding. The strong association between formula supplementation and cessation of breastfeeding does not support the claim that formula supplementation may facilitate the breastfeeding experience of the mothers, thereby allowing them to breastfeed for longer periods of time. There is no comparable association between breastfeeding cessation and supplementing breastfeeding with supplemental foods other than formula.

- ✓ Receipt of advice from a doctor on breastfeeding is associated with increased frequency of breastfeeding.

Mothers who report that they received advice from a physician about breastfeeding, breastfeed, on average, 1.7 additional times a day. Physician's advice, therefore, is associated with initiating breastfeeding, as well as with frequent breastfeeds.

- ✓ Mothers who know about the special WIC food package for breastfeeding women breastfeed for longer durations.

WIC mothers who know about the special WIC food package for breastfeeding mothers who do not accept formula from WIC have lower rates of breastfeeding cessation by one-fourth. Furthermore, WIC program components that support breastfeeding are associated with breastfeeding duration in a cumulative way. Mothers receiving each additional WIC program component in support of breastfeeding are expected to breastfeed for a significantly longer duration. In other words, there appears

to be a dose-response type association between WIC program components that support breastfeeding and duration of breastfeeding among WIC mothers.

- ✓ A majority of WIC mothers do not breastfeed enough times a day to stimulate sufficient milk production, especially in early infancy.

A majority of WIC mothers breastfeed when their infants get hungry as opposed to on a set schedule. FCS advises that generally, infants be breastfed when they seem hungry. However, WIC mothers breastfeed fewer times a day than necessary to establish exclusive or predominant breastfeeding in early infancy. Breastfeeding WIC mothers who also feed formula appear to substitute breastfeeds with formula feeds rather than providing formula to breastfeeding infants as a complementary feed after they breastfeed.

Introduction of Supplemental Foods

- ✓ Other than the issue of breastfeeding, the most prevalent nutritional concern for the WIC infants is the early initiation of supplemental solids.

FCS advises against the initiation of supplemental solids prior to about four to six months of age. This is generally the age when the infant can hold his head up, turn away from food, and eat from a spoon. However, large proportions of WIC infants receive cereals, fruits, and vegetables before this age. Indeed, one-half of WIC infants receive cereals by three-and-a-half months of age, with over one-quarter receiving cereals by two months of age. Over two-fifths of WIC infants receive fruits, and almost one-third receive vegetables prior to four months of age.

- ✓ The order in which supplemental foods are initiated follows the recommended pattern of cereals-fruits-vegetables-meats for a large proportion of WIC infants.

For more than four-fifths of WIC infants, cereal is the first supplemental food. Fruits and vegetables are often introduced within a short time period, often as the second and third types of supplemental foods, although the introduction of vegetables as the second type of supplemental food is not uncommon. Meats are initiated substantially later, often as the last major type of supplemental food, with one-half of the infants receiving meats by six-and-a-half months of age.

- ✓ Formula-feeding infants are more likely to receive cereals, fruits, and vegetables inappropriately early than breastfeeding infants.

Formula feeding is a significant factor that contributes to an inappropriately early initiation of cereals, fruits, and vegetables. Formula feeding more than doubles the likelihood of prematurely initiating cereals, almost triples the likelihood of prematurely initiating fruits, and more than triples the likelihood of prematurely initiating vegetables. The most commonly given reason for feeding cereal early, is "to prevent the infant from consuming *too much* formula."

- ✓ Use of non-maternal child care is associated with an increased likelihood of initiating cereals and fruits inappropriately early.

The likelihood that an infant under four months of age will receive cereals is 70 percent higher if the infant is receiving care from someone other than the mother. The likelihood of receiving fruits too early is also higher for infants who receive care from someone other than the mother.

- ✓ Receipt of information from WIC regarding the initiation of supplemental foods is associated with a significantly lower likelihood of introducing cereals inappropriately early.

Mothers who report receiving information from WIC in early infancy about when to feed supplemental foods are less likely to initiate feeding cereals before their infants reach the age of four months. Although the association is modest (predicting a reduction in rates of early initiation of cereals by a factor of one-fifth), it is significant, and underscores the malleability of inappropriate supplemental feeding practices.

- ✓ Substantial proportions of WIC infants receive supplemental drinks, such as sweet drinks and fruit juices, prior to four months of age.

FCS advises that infants may start receiving fruit juices in moderation as soon as they can drink from a cup, after about four months of age. About two-fifths of the WIC infants receive fruit juices prior to four months of age. Despite the guidelines that infants not be given fruit-flavored drinks, sodas, tea, and coffee (i.e., sweet and caffeinated drinks), one-third of the WIC infants receive sweet drinks prior to four months of age.

Feeding of sweet and caffeinated drinks such as tea is particularly common among the infants of Hispanic mothers. Two-fifths of infants of Hispanic mothers receive sweet drinks by the time they are about six weeks old.

- ✓ Feeding cow's milk to infants is not a nutritional problem affecting a large proportion of WIC infants.

It is currently advised that infants do not receive cow's milk prior to one year of age. A large proportion of WIC mothers appear to be following this guideline, and postponing the introduction of cow's milk. Virtually no infants receive cow's milk prior to nine months of age and a small proportion of WIC infants receive cow's milk between nine and twelve months of age.

- ✓ The examination of the supplemental food feeding practices of the WIC mothers reveals many practices that put the WIC infants at risk of developing dental problems and unsound eating habits.

According to the maternal reports, most WIC infants learn how to use a spoon, learn how to use a cup, and learn how to eat finger foods at about the age when they are expected to reach these milestones. Almost all WIC infants are able to eat from a spoon by the sixth month, more than two-thirds can drink from a cup by the seventh month, and nine out of ten can feed themselves finger foods by the ninth month. However, the feeding of supplemental foods and drinks appears to precede these developmental milestones. A majority of WIC infants receive fruit juices before they ever use a cup, presumably using a bottle instead. This feeding practice is known to be a risk factor for dental disease, and one of *Healthy People 2000* objectives is to reduce this practice. Furthermore, a substantial proportion of WIC infants are given supplemental foods before they learn how to eat from a spoon. Two-fifths of the WIC infants receive supplemental foods from an infant feeder, which pushes food into an infant's mouth. This feeding practice is known to be associated with (inadvertent) forced feeding of the infant and may cause the infant to choke. Use of infant feeders is more common among African American mothers than among Hispanic and white mothers.

CHAPTER I

INTRODUCTION

I.1. Overview of Infant Feeding and the WIC-IFPS

Infant nutrition is an integral part of infant health. Promoting healthy infant feeding practices will influence infant health and development. An infant's nutritional needs change rapidly over the first year of life, requiring a corresponding change from a simple diet of nursing to a varied and complex diet that includes many textured foods. The United States Department of Agriculture (*USDA*) promotes good nutrition for economically disadvantaged and nutritionally at-risk mothers and infants through the Special Supplemental Nutrition Program for Women, Infants, and Children (*WIC*).

In September of 1993, the Food and Consumer Service (*FCS*¹) of the *USDA* contracted with Battelle to conduct the WIC Infant Feeding Practices Study (*WIC-IFPS*). The study consists of a one-year *longitudinal*² survey of the infant feeding practices among WIC participants. A series of eleven interviews was conducted on a group of about 900 mothers and their infants who participated in the WIC Program *prenatally* and over the infants' first year of life. The WIC-IFPS is designed to examine the circumstances and influences that shape mothers' infant feeding decisions and to describe the changes in infant feeding practices over the first year of the infants' life.

I.2. The WIC Program Relative to Infant Feeding

The WIC Program provides supplemental foods, nutrition education, and referral to health care for eligible women, infants, and children. To be eligible for participation in WIC, an individual must be of low income, nutritionally at risk, and be in one of the following categories:

- Pregnant women
- Breastfeeding women, up to one year *postpartum* if breastfeeding

¹ Formerly known as Food and Nutrition Service (FNS).

² Technical terms are italicized the first time that they appear in this document. These terms are defined in the Glossary.

- Postpartum women, up to six months after delivery if not breastfeeding
- Infants up to one year
- Children ages one to five years.

The authorizing legislation, Section 17 of the Child Nutrition Act of 1966 (42 U.S.C. 1786), established the WIC Program as “supplemental” in nature. That is, the WIC food packages are not intended to provide a complete diet, but are designed to provide additional foods needed for a balanced diet. In addition to WIC, the USDA administers a variety of other complementary food assistance programs that can work together to provide a more nutritious diet to needy Americans.

Food package requirements appear in 7 Code of Federal Regulations Section 246.10. There are seven different monthly Food Packages. Food packages I, II, V, and VII are of relevance to infant feeding.

- (I) **Infants 0 through 3 Months:** These infants may receive on a monthly basis up to the following amounts of iron-fortified infant formula: 403 fl. oz. concentrated liquid, 8 lb. powdered, or 806 fl. oz. ready-to-feed (RTF) formula. (An equal quantity of special infant formula or certain medical foods may be substituted for iron-fortified infant formula with a medical prescription for a documented and warranted nutritional need.)
- (II) **Infants 4 through 12 Months:** In addition to the same maximum amount of iron-fortified infant formula (or other authorized formula substitute with a medical prescription) as Food Package I, these infants may receive on a monthly basis up to 24 oz. dry, iron-fortified infant cereal and 63 fl. oz. infant juice rich in vitamin C. (92 fl. oz. single-strength or 96 fl. oz. reconstituted frozen concentrated adult fruit and/or vegetable juice rich in vitamin C may be substituted for 63 fl. oz. infant juice.)
- (III) **Children/Women with Special Dietary Needs:** With a medical prescription, these participants may receive on a monthly basis the same maximum amount of iron-fortified infant formula (or other authorized formula substitute) as Food Package I with the State option to provide, when nutritionally warranted, an additional 52 fl. oz. concentrated liquid, 1 lb. powdered, or 104 fl. oz. RTF formula. In addition, Food Package III includes up to 36 oz. dry, iron-fortified adult or infant cereal and either 138 fl. oz. single-strength or 144 fl. oz. reconstituted frozen concentrated fruit and/or vegetable juice rich in vitamin C.

- (IV) **Children 1 to 5 Years:** Children may receive on a monthly basis up to 24 qt. milk, 2 ½ doz. eggs; 36 oz. dry, iron-fortified adult cereal; 276 fl. oz. single-strength fruit and/or vegetable juice rich in vitamin C; and 1 lb. dry beans/peas. (1 lb. cheese may be substituted for 3 qt. milk up to a maximum of 4 lbs. of cheese, however, additional cheese may be provided if the participant is lactose intolerant; 288 fl. oz. reconstituted frozen concentrated fruit and/or vegetable juice rich in vitamin C may be substituted for 276 fl. oz. single-strength juice; and 18 oz. peanut butter may be substituted for 1 lb. dry beans/peas.)
- (V) **Pregnant and Breastfeeding Women (Basic):** These women may receive on a monthly basis up to 28 qt. milk; 2 ½ doz. eggs; 36 oz. dry, iron-fortified adult cereal; 276 fl. oz. single-strength fruit and/or vegetable juice rich in vitamin C; and 1 lb. dry beans/peas. (The same WIC food substitutions noted above in Food Package IV are allowed in Food Package V.)
- (VI) **Non-Breastfeeding Postpartum Women:** These women may receive on a monthly basis up to 24 qt. milk; 2 ½ dozen eggs; 36 oz. dry, iron-fortified adult cereal; and either 184 fl. oz. single-strength or 192 fl. oz. reconstituted frozen concentrated fruit and/or vegetable juice rich in vitamin C. (The same cheese substitution noted above in Food Package IV is allowed in Food Package VI.)
- (VII) **Breastfeeding Women (Enhanced):** This food package was added in 1992 to promote and support a woman's decision to breastfeed. It provides on a monthly basis the same types and maximum amounts of WIC foods as Food Package V, with the exception that Food Package VII includes augmented amounts of juice (up to an additional 46 fl. oz. single-strength or 48 fl. oz. reconstituted frozen concentrated juice rich in vitamin C), cheese (up to an additional 1 lb.), and dry beans/peas (up to an additional 1 lb.), and the extra WIC foods of carrots (up to 2 lbs.) and canned tuna (up to 26 oz.). (The same WIC food substitutions noted above in Food Package IV are allowed in Food Package VII. In addition, 16-20 oz. canned carrots or 1 lb. frozen carrots may be substituted per 1 lb. fresh carrots.)

Food Package VII is only available to mothers who elect not to receive infant formula through WIC for their infants, and who are, exclusively breastfeeding. Food Package VII was designed to eliminate the economic disadvantage that might be perceived due to not receiving infant formula if a mother chooses to exclusively breastfeed.

Nutrition education is another benefit of the WIC Program to its participants. WIC nutrition education is designed to achieve the following broad goals:

- (1) Stress the relationship between proper nutrition and good health
- (2) Assist the individual who is at nutritional risk in achieving a positive change in food habits, resulting in improved nutritional status and in the prevention of nutrition-related problems, through optimal use of the supplemental foods and other nutritious foods.

WIC participants are encouraged to attend and participate in nutrition education activities. State and local WIC agencies develop the education activities and materials that are appropriate to their populations. Nutrition education is made available to both adult WIC participants, and to parents or caretakers of infant and child WIC participants. Whenever possible, nutrition education is also directly provided to WIC children. All pregnant participants are encouraged to breastfeed unless contraindicated for health reasons. During each six-month period, at least two nutrition education contacts are made available.

During the last few years, Congress has amended the Child Nutrition Act of 1966 three times to further promote and support breastfeeding among WIC participants. Public Law 101-147, The Child Nutrition and WIC Reauthorization Act of 1989, served to strengthen the emphasis on infant feeding in the regulations by focusing more attention on the promotion and support of breastfeeding activities. USDA has always actively endorsed breastfeeding as the optimal method of infant feeding. USDA also has taken non-regulatory actions in this area, including the development of publications to help local agency staff teach participants about breastfeeding; participation in cooperative efforts with other Federal agencies and organizations to promote breastfeeding, such as the USDA Breastfeeding Promotion Consortium; and the award of grants for projects on breastfeeding, such as the funding of a WIC Breastfeeding Promotion Study and Demonstration (USDA, 1990), to identify, evaluate, and demonstrate approaches to promote breastfeeding effectively in WIC. More recently, USDA awarded grants to test the effectiveness of breastfeeding incentives in eight locations. In response to Public Law 101-147, a number of new Federal WIC requirements were added. (Federal Register Vol. 59, No. 48, RIN No. 0584-AB13, March 11, 1994). These include:

- *Definition of breastfeeding.* Breastfeeding was defined to be “the practice of feeding mother’s breastmilk to her infant(s) on the average of at least once per day.”
- *Designation of a breastfeeding coordinator.* Required that each WIC state agency designate an agency staff member to coordinate breastfeeding promotion efforts identified in the state plan.
- *Training for breastfeeding promotion.* Required each WIC state agency to provide training on the promotion and management of breastfeeding to staff members of local agencies who are responsible for counseling WIC participants concerning breastfeeding.
- *Non-English breastfeeding materials.* Required that WIC state agencies develop materials in languages other than English for use in areas where a significant

number or proportion of the WIC population needs the information in a language other than English.

- *Support standards and evaluation.* Required state and local agencies to (1) develop a policy that endorses breastfeeding as the preferred method of infant feeding, (2) designate a staff person to coordinate breastfeeding promotion at each local agency, (3) include breastfeeding promotion in orientation programs for new staff who serve WIC participants, and (4) ensure that all WIC women have access to breastfeeding promotion and support activities during the prenatal and postpartum periods. In addition, WIC state agencies must annually evaluate their breastfeeding promotion and support activities.
- *Breastfeeding aids.* Authorized the purchase of specified breastfeeding aids as an allowable expense under WIC nutrition services and administration.

In 1992, Congress directed the USDA (The Child Nutrition Amendments of 1992, Public Law 102-342) to develop or help others develop appropriate educational materials that promote breastfeeding. In addition, Congress directed USDA to provide assistance in the distribution of breast pumps and similar equipment to breastfeeding women, and to enter into cooperative agreements with other agencies to carry out these actions.

Most recently, the Healthy Meals for Healthy Americans Act of 1994 (Public Law 103-448) increased the amount of WIC nutrition education funds earmarked for breastfeeding and promotion from \$8 million to over \$20 million. It includes a formula that provides \$21 for each pregnant and breastfeeding woman based on average monthly WIC participation. In addition, the Act specifies that the incidence and duration of breastfeeding among WIC participants should be reported by each state agency and included in the biennial report to Congress.

The General Accounting Office (GAO) has examined the breastfeeding promotion efforts of the WIC Program, in response to a request from the United States House of Representatives, and issued a report in December 1993 (GAO, 1993). The GAO report is based on a survey of all state WIC directors, interviews with WIC staff, interviews with program participants at three local sites in each of four states, and analysis of national data on breastfeeding rates.

The GAO report concludes that "State WIC Programs have substantially increased their breastfeeding promotional efforts since the 1989 reauthorization of the WIC Program," often exceeding the mandated levels of expenditure. Many activities have been undertaken at the national, state, and local levels to encourage breastfeeding among WIC participants, according to the report.

I.3. Reference Guidelines

Several documents are used for comparison purposes throughout this report. These include the *Healthy People 2000* goals issued by the U.S. Department of Health and Human Services (*USDHHS*), various guidelines of the WIC Program itself, and statements of other authorities such as the American Academy of Pediatrics and the American Public Health Association.

The *Healthy People 2000* report sets goals for the percentages of infants who are breastfed initially and who are still breastfed at the age of 6 months (USDHHS, 1990). Initiation of breastfeeding is defined in the *Healthy People 2000* report as breastfeeding at hospital discharge, whereas the WIC Program uses the more comprehensive definition of breastfeeding at any point in time. In most of this WIC-IFPS report (notably Chapter IV) the more comprehensive definition is used. However, in order to compare the breastfeeding initiation rate found in this study to the year 2000 goals, the rate is also calculated using the definition of breastfeeding at hospital discharge (see Chapter V)³.

The most comprehensive guidelines issued by the WIC Program on infant feeding are contained in *Infant Nutrition and Feeding—A Reference Handbook for Nutrition and Health Counselors in the WIC and CSF Programs* (FNS, 1993a).

³ The *Healthy People 2000* goals are the only set of numerical figures with which the WIC-IFPS data can be compared. All other guidelines simply indicate the types of feeding practices advised, without specifying target statistics.

Because these represent the most complete infant feeding guidelines, this is the primary document referred to throughout this report as the source of WIC guidelines. It should be noted that this document was not published until November 1994, and was probably not widely disseminated until 1995, and thus was not in circulation in WIC clinics when the WIC-IFPS began in the summer of 1994. Nonetheless, some of the breastfeeding guidelines had been presented in the 1990 National Association of WIC Directors (NAWD) *Guidelines for Breastfeeding Promotion in the WIC Program* (NAWD, 1990), which would have been available in the clinics. NAWD guidelines were much less specific than what appears in FNS, 1993a (e.g., they provided little “how to” information for mothers). This 1990 publication of the NAWD is another source of reference guidelines referred to in the present report, as is the 1994 revision, entitled *Guidelines for Breastfeeding Promotion and Support in the WIC Program* (NAWD, 1994).

The recommendations of the American Academy of Pediatrics, which are presented in the *Pediatric Nutrition Handbook* (American Academy of Pediatrics, 1993), are also referenced throughout this report. Other books that are cited frequently include *Handbook of Pediatric Nutrition* (Queen & Lang, 1993) and *Breastfeeding and Human Lactation* (Riordan & Auerbach, 1993).

I.4. Objectives of the WIC-IFPS

The purpose of the WIC-IFPS is to describe the infant feeding practices of WIC participants and to explore the factors that shape infant feeding decisions. The primary study objectives were (FNS, 1993b):

- (1) to provide a nationally representative description of infant feeding practices among WIC participants
- (2) to identify attitudes and practices of WIC participants associated with the initiation and continuation of breastfeeding.

Infant feeding is a multifaceted issue that has implications not only for an infant’s nutritional and health status, but also for the infant’s psychological development and the development of proper eating habits. Proper eating habits may have far-reaching implications for nutrition and health in childhood. At the same time, infant feeding is rooted in beliefs and attitudes that transcend an individual mother’s decisions and may be closely associated with cultural and social factors (Fomon, 1993: 15-35).

Furthermore, infant feeding practices change very rapidly over the first 12 months of life. Hence, *changes* in infant feeding behaviors over time and the *timing* of such changes are as important as the content of the infant feeding decisions.

Most of the previously available information on infant feeding in the WIC population is based on cross-sectional data, such as the 1988 National Maternal and Infant Health Survey (NMIHS, Schwartz et al., 1992). Many of these studies examined breastfeeding and other feeding practices, although they may be subject to some retrospective recall errors. The WIC-IFPS was designed to collect detailed information on the many aspects of infant feeding throughout the first year of life.

The WIC-IFPS benefited greatly from the work done by the Food and Drug Administration (*FDA*) in developing the FDA Infant Feeding Practices Survey (*FDA-IFPS*). The *FDA-IFPS* was a mail survey, with monthly interviews, that followed a cohort of newly born infants from the United States population for one year. The WIC-IFPS used the *FDA-IFPS* as a resource when developing the WIC-IFPS questionnaire and in the overall structuring of the study design. However, the *FDA-IFPS* data could not be used to study the infant feeding practices of WIC participants. The *FDA* sample contained too few WIC participants to adequately represent WIC mothers. In addition, the *FDA-IFPS* was a mail survey that was above the literacy level of many WIC participants.

CHAPTER II

DESIGN OF THE WIC-IFPS, AND THE STUDY SAMPLE

II.1. Design of the WIC-IFPS

The WIC-IFPS collected longitudinal data regarding feeding practices for about 900 infants. The mothers or caretakers of the infants were interviewed on a monthly basis in the first seven months of these infants' lives, and additional interviews were conducted when the infants were nine and twelve months old. These frequent contacts permitted a detailed description of feeding attitudes/beliefs, practices, and changes in them over the first twelve months of life. The mothers of some infants were also interviewed prenatally but, due to survey implementation difficulties, this group was rather small. The data collection activities were conducted between August 1994 and December 1995.

The WIC-IFPS is based on a sample of 43 WIC clinics nationally representative of the clinics in 48 contiguous United States including the District of Columbia, and the 33 Indian WIC state agencies. This sample excludes WIC clinics and participants in Alaska, Hawaii, Puerto Rico, Guam, American Samoa, and the Virgin Islands. In 1991, Puerto Rico accounted for 2.6 percent of all WIC participants, while Alaska, Hawaii, Guam, and the Virgin Islands accounted for only 0.7 percent. The 43 WIC clinics for this study were drawn in two stages, where the first stage sampled WIC local agencies.

The target population consisted of two groups of mothers and their infants: prenatal WIC participants and postnatal WIC participants. The longitudinal data collection period complicated the definition of WIC participation. Infants could have been associated with the WIC Program through three pathways for this study. First, the infant's mother could have participated in the program while pregnant, resulting in the infant's indirect participation in utero during the prenatal period. Second, the infant may have been enrolled in WIC after birth. Third, the mother may have enrolled herself in the WIC Program during the postnatal period.

Infants who participated in WIC in utero were included by sampling pregnant women in their last trimester of pregnancy from the rolls of WIC participants. Interviews were attempted with these future mothers prior to the birth of their infants, with follow-up

interviews during their infants' first year of life. The infants were followed regardless of their postnatal WIC participation. Thus, the sample of pregnant participants included those infants on WIC whose mothers also participated in the program. The study also attempted to include infants whose mothers did not participate in WIC during pregnancy but who were enrolled after delivery. For this postnatal sample, infants who were less than three months old at the time of the study and whose WIC clinic indicated that their mothers did not participate in WIC while pregnant were initially considered eligible. Unfortunately, WIC clinics could not reliably report the prenatal WIC participation of the mothers of WIC infants. Many of the infants who were originally identified as infants whose mothers were not on WIC prenatally were found, during the interview, to have been on WIC prenatally. Therefore, the analyses reported in this report did not include the infants who participated in WIC *only* postnatally, because very few of these types of WIC participants were interviewed.

The primary mode of data collection for the study was computer-assisted telephone interviewing (*CATI*). Data from 1988 suggest that approximately 27 percent of low-income households do not have telephones. In-person interviews were incorporated into the design to eliminate the bias associated with excluding this large group of people. A computer-assisted personal interview (*CAPI*) used the same data collection program as for *CATI* with a sample of those WIC mothers found to not have a telephone. A detailed description of the study design is presented in Appendix A. A description of the study instruments can be found in Appendix B.

Table II.1 presents a summary of the number of study participants and response rates. A sample of 987 pregnant WIC participants (referred to as the "women" sample) and 246 infant WIC participants (referred to as the "infant" sample), i.e., a total 1,233 WIC participants, was selected. (For a description of sample selection and recruitment procedures, see Appendix C.) A total of 138 of the selected WIC participants were determined to be ineligible for the study after they were selected, leaving a national sample of 1,095 WIC participants. In addition, to be considered a respondent to the WIC-IFPS, a sample member had to (1) complete at least one postnatal interview and (2) report enough information so that breastfeeding status could be determined. (For a description of the process of determining breastfeeding status as well as the complete database, see Appendix D.) A total of 971 sample members met these criteria (773 from

the women sample and 198 from the infant sample). Thus, 79 percent of the selected sample cases participated in the study, while 89 percent of those eligible participated.

Table II.1. Overall study participation counts and rates.¹

	Eligible Sample	At Least One Postnatal Interview and breastfeeding status defined	Main Analysis Sample ²
TOTAL	1,095	971	874
Percent of Eligible Sample		89%	
Women	867	773	773
Percent of Eligible Sample		89%	
Infants	228	198	101
Percent of Eligible Sample		87%	

Notes:

1. A sample of 987 women and 246 infants, for a total of 1,233, was originally selected.
2. Mother was on WIC while pregnant.

The original target population for the WIC-IFPS included two WIC participant groups: (1) women in their last trimester of pregnancy and (2) infants less than three months old whose mothers were not on WIC while pregnant. Approximately 61 percent of the clinics in the study were able to provide information concerning the mother’s prenatal WIC participation status. The remaining clinics did not have this information on record. Thus, the mother’s self-report of prenatal WIC participation was used to determine infants whose mothers were not on WIC while pregnant. However, only 91 mothers of infants in the infant sample were found to not have been on WIC while pregnant. This was deemed to be too small a group for separate analysis, and they were excluded from analysis.⁴ The 101 infant sample cases where the mother reported being on WIC while pregnant were combined with the 773 cases from the women sample for a total of 874 cases in the main analysis sample. Appendix E presents more detail on the main analysis sample. The main analysis sample is a nationally representative sample of WIC infants whose mothers participated in WIC prenatally. The implication of this design is that the results presented in this report can only be generalized to infants whose mothers were on WIC while they were pregnant. Postpartum participants of WIC may differ from prenatal

⁴ An additional 6 cases with unknown prenatal WIC participation were also excluded for a total of 97 cases.

participants in ways that may influence not only their infant feeding practices but the predictors of infant feeding practices as well.

As is the case for any similar study, not all of the selected WIC mothers responded to the WIC-IFPS. Thus, adjusted analysis weights were developed to reflect both the probability sampling methods used to select the study sample and to help correct for any bias due to nonresponse. This process started out by calculating a sampling weight for each of the 1,233 selected sample members as the inverse of the probability that each sample member was included in the study (see Appendix E for the details of this process). The adjusted analysis weights for the responding cases were created by adjusting the sampling weights for cases at each of the 43 sites; they are discussed in detail in Appendix E.

Table II.2 presents the interview rates, by interview month, for the main analysis sample. For Months 4 to 12, extremely high interview rates were obtained—usually over 90 percent. However, only 43 percent and 75 percent of the pregnant women were interviewed prenatally and in Month 1, respectively. A special analysis weight was created for analysis of data items only asked during Month 1. Unfortunately, the interview

Table II.2. Counts and percent of respondents by sample type and interview month.

	Prenatal	M1	M2	M3	M4	M5	M6	M7	M9	M12
TOTAL N=874	335	577	690	756	805	820	814	827	824	824
Percent			79%	87%	92%	94%	93%	95%	94%	94%
Women N=773	335	577	675	707	713	732	723	728	725	725
Percent	43%	75%	87%	91%	92%	95%	94%	94%	94%	94%
Infants N=101	na	na	15	49	92	88	91	99	99	99
Percent			15%	49%	91%	87%	90%	98%	98%	98%

rate for the prenatal interview was too low to support separate analysis of prenatal data items.

II.2. Data Collection Instruments

Based upon the objectives of the WIC-IFPS, the first step in the design of the data collection instruments was to list all the relevant data items sought. The list was then reduced to the most essential data items needed to address the study issues and

maintain an average interview length of 15 minutes. The 15-minute questionnaire design balanced issues of cost, ease of administration by telephone, ability to obtain all required data, and the need to minimize burden on respondents, who, by definition, would be caring for infants.

The list of essential data items became the basis for drafting interview questions. The FDA Infant Feeding Practices Survey served as the basis for developing questions for the WIC-IFPS. The FDA survey collected similar data items, but on a different population than the WIC-IFPS. Whenever possible, question wording was taken from the FDA survey and other existing surveys, including:

- Infant Feeding Practices Survey (Food and Drug Administration)
- WIC Child Impact Pilot Study (Food and Nutrition Service)
- National Maternal and Infant Health Survey (National Center for Health Statistics)
- Gerber Nutrition Surveys (Gerber Products Company)
- Infant Health and Nutrition Study (National Institute of Child Health and Human Development)
- National Health and Nutrition Examination Survey III (National Center for Health Statistics)

Existing questions and newly devised questions were combined into three draft questionnaires suitable for pretesting. The draft questionnaires represented versions of the prenatal interview, the first postnatal interview (Month 1), and the subsequent postnatal interviews (Months 2 through 12). Each of these questionnaires underwent pretesting with six WIC participants at three different WIC clinics.

II.3. Information Collected by WIC-IFPS

WIC-IFPS interviewers conducted up to eleven different interviews with respondents enrolled in the study. The mothers or caretakers of the infants were interviewed on a monthly basis in the first seven months of the infants' lives, and additional interviews were conducted when the focal infants were nine and twelve months old. These frequent contacts permitted development of a detailed description of feeding attitudes/beliefs, feeding practices, and changes in these practices over the first twelve months of life.

The WIC-IFPS collected information regarding the following topics:

- *socio-demographic* characteristics of the mother
- health of the mother
- health of the infant
- maternal employment and use of child care
- use of WIC Program services (vouchers, nutrition education, and nutrition counselling)
- infant feeding in the hospital
- hospital services that pertain to infant feeding
- initiation of breastfeeding
- problems associated with breastfeeding
- breastfeeding of other children
- breastfeeding education from various sources
- initiation of formula feeding, choice of formula, and its preparation
- breastfeeding schedules
- frequency of breast feeding
- attitudes, beliefs, and knowledge about breastfeeding
- breastfeeding cessation
- breastmilk expression and use of breast pumps
- social contacts that may affect feeding decisions
- satisfaction with the WIC formula supplements
- cessation of formula feeding
- initiation of various fluids
- initiation of supplemental foods and drinks
- use of a pacifier, a cup, a spoon, and an *infant feeder*

Though some questions were asked in all interviews, selected questions were asked in specified monthly interviews. For example, questions on breastfeeding attitudes were asked at the prenatal and Month 2 interviews, while questions on the receipt of formula from WIC were asked at every monthly interview. While each interview asked questions on only a selection of these topics, the series of interviews allowed collection of complete data on each respondent.

II.4. Characteristics and Program Participation of the WIC-IFPS Sample

The WIC-IFPS was designed to be nationally representative of all prenatal WIC participants, as described in Section II.1. A total of 874 mother-infant pairs were included in the analyses. These mother-infant pairs include those who met the following criteria: (1) the mother completed at least one postnatal interview, (2) the mother participated in the WIC Program prenatally, and (3) the mother provided enough information so that it could be determined whether she initiated breastfeeding or formula feeding immediately postpartum.

Table II.3 presents descriptive information about the socio-demographic composition of the sample. These estimates are weighted to be representative of all mother-infant pairs meeting the above three criteria for inclusion in the main analysis sample. Table II.3 shows that about half of the WIC-IFPS mothers are non-Hispanic white, with just over 20 percent each being African American and Hispanic. In addition, the infants are equally split by gender, and about two-fifths are firstborn. About one-quarter of the mothers are teenagers at the time of their infant's birth, with African American mothers having the largest percent (one-third) of teenage mothers. Only one-quarter of the Hispanic mothers were born in the United States, while nearly all of the white and African American mothers are United States natives. About one-half of white and Hispanic mothers are married, while only about one in five African American mothers is married. In addition, about two-thirds

Table II.3. Percentage distribution of socio-demographic characteristics by maternal race and ethnicity.

Socio-Demographic Characteristics	Total	Maternal Race/Ethnicity			
		White	African American	Hispanic	Other
Sex ¹					
Male	51	52	49	51	48
Female	49	48	51	49	52
Birth order ²					
First born	40	42	41	40	20
Second born	20	20	20	18	27
Third born or higher	40	38	40	42	54
Age of the mother at time of birth ¹					
14-19 years	24	23	33	21	12
20-25 years	44	47	36	42	46
26 years or older	32	30	31	37	42
Mother born in U.S. ^{2**}	81	98	98	25	74
Maternal marital status ^{1*}					
Married	43	52	19	46	60
Separated	6	5	5	8	5
Divorced	7	10	3	6	5
Widowed	0	1	0	0	0
Never married	43	32	72	40	30
Mother is living with the father of the baby ^{1**}	41	59	19	16	64
Household size ^{1,3*}					
2	5	5	6	4	4
3	26	32	24	18	9
4	27	32	19	25	26
5	18	18	20	14	22
6 or more	24	14	31	38	38
Poverty level ^{1*}					
< 50%	48	42	63	46	53
50 - 100%	38	40	29	41	39
100 to 150%	12	15	7	9	7
150% or more	2	3	1	4	0
Receipt of public assistance ^{1,4**}					
Food Stamps, AFDC, and Medicaid	31	29	49	17	31
AFDC and Medicaid	2	2	2	2	0
AFDC and Food Stamps	2	2	1	2	2
Medicaid and Food Stamps	26	27	26	26	28
AFDC only	0	0	0	0	0
Medicaid only	19	20	11	27	20
Food stamps only	5	6	4	4	5
No other program	14	14	8	21	13
Highest grade completed by the mother ^{1**}					
9 th grade or less	17	10	9	38	32
10 th - 11 th grade	24	23	33	17	23
12 th grade	42	51	37	32	20
More than 12 th grade	17	16	20	13	25
Mother was working while pregnant ⁵	39	41	38	37	27
N	874	449 (51%)	202 (23%)	168 (21%)	55 (5%)

Notes:

1. Measured at the time of birth screener.
 2. Measured at the time of prenatal interview or the first contact with the mother.
 3. Household size includes the focal infant.
 4. These percentages are somewhat different from those reported in the WIC participant characteristics report of 1994 (Abt Associates, 1995). This is probably due to a recent better cross-referral system instituted for the provision of WIC services to Medicaid recipients. This program change resulted in higher proportions of Medicaid- receiving WIC participants in the recent years.
 5. Measured at the time of Month 1 interview or the first postnatal interview.
- * Chi-square statistic testing the association with maternal race/ethnicity is significant at p <.05.
 ** Chi-square statistic testing the association with maternal race/ethnicity is significant at p <.01.

of African American mothers report family incomes less than 50 percent of the poverty level,⁵ while just over 40 percent of white and Hispanic mothers reported such low levels of family income. Finally, about one in ten white and African American mothers have less than a 10th grade education, but over one-third of Hispanic mothers have not completed the 10th grade.

Table II.4 presents some estimates of the WIC mothers' and infants' health-related characteristics. About 80 percent of the mothers sought prenatal care during their first trimesters of pregnancy. Over one-third of the white mothers and lower percentages of the African American and Hispanic mothers smoke. Also, the highest rate of low-

Table II.4. Percentage distribution of reported health-related characteristics by race and ethnicity of the mother.

Health-Related Characteristics	Total	Maternal Race/Ethnicity			
		White	African American	Hispanic	Other
Timing of the first prenatal visit ¹					
0 - 3 months	83	87	79	77	79
4 - 6 months	16	12	20	20	20
7 - 9 months	1	0	1	4	1
Percentage of mothers who smoke ^{1**}	25	40	13	3	11
Health problems during pregnancy ²					
Had diabetes	8	7	9	7	9
Had swelling	46	51	37	41	59
Was hospitalized during pregnancy	14	16	12	9	19
No health problems	46	40	54	51	36
Birthweight ^{3**}					
5 lbs., 8 ozs. or less	7	6	13	1	8
5 lbs., 9 ozs. - 9 lbs., 14 ozs.	90	90	86	96	86
More than 9 lbs., 14 ozs.	3	4	1	3	6
Number of days mother stayed in hospital, postpartum ³					
0 or 1	39	41	34	38	37
2	36	38	34	37	37
3	16	14	20	16	19
4 or more	9	7	12	9	7

Notes:

1. Measured at the time of prenatal interview or the first contact with the mother.
2. Measured at the time of the Month 1 interview or the first postnatal interview.
3. Measured at the time of the birth screener.

** Chi-square statistic testing the association with maternal race/ethnicity is significant at p<.01.

birthweight infants is among African American infants, while there are few low-

⁵ Poverty level is defined as the income of the family relative to the federal poverty level specified for a family of that size.

birthweight Hispanic infants. The remaining aspects of maternal and infant health are comparable for the race/ethnicity groups.

Tables II.5 and II.6 present some aspects of participation in the WIC Program as reported by the mothers. The percentages of mothers reporting receipt of vouchers for formula and supplemental foods for their infants are displayed in Table II.5. During the first year of life, around 80 percent report receiving WIC vouchers. Also, the percent who report receiving WIC vouchers for supplemental foods⁶ for their infants increases rapidly between Month 4 and Month 7. Prior to the fourth month of life, mothers should not be receiving WIC vouchers for supplemental foods for their infants; however, a small percent consistently reported receipt of such vouchers. This is consistent with the percentages reported by the 1988 Study of WIC Participant and Program Characteristics (Research Triangle Institute, 1990).

Table II.6 presents the percentages of mothers reporting the receipt of information on various aspects of infant feeding from the WIC Program. More than four-fifths of the

Table II.5. Percentages of mothers reporting the receipt of WIC vouchers for formula and for supplemental foods.

Interview Month	Reported Receiving WIC Vouchers for Formula		Reported Receiving WIC Vouchers for Supplemental Foods for Their Infants	
	N	Percent	N	Percent
Month 1	576	66	577	4
Month 2	690	80	690	4
Month 3	755	82	755	6
Month 4	805	82	805	17
Month 5	819	82	819	48
Month 6	814	84	814	69
Month 7	827	83	827	83
Month 9	824	82	824	86
Month 12	824	61	823	76

mothers report receiving information prenatally about benefits of breastfeeding. However, percentages reporting receipt of information about how to breastfeed and maternal diet while breastfeeding are lower (68 percent and 59 percent, respectively).

⁶ Supplemental foods (i.e., cereal and juice) do not include iron-fortified formula or other authorized WIC formula substitute.

Table II.6. Percentages of mothers reporting receipt of information about various aspects of infant feeding from WIC.

	N	Percent
RECEIPT OF INFORMATION ABOUT BREASTFEEDING PRENATALLY¹		
Received information on benefits of breastfeeding	541	83
Received information on how to breastfeed	541	68
Received information on maternal diet while breastfeeding	538	58
RECEIPT OF INFORMATION ABOUT BREASTFEEDING POSTNATALLY²		
Received information on benefits of breastfeeding	838	56
Received Information on how to breastfeed	837	50
Received information on maternal diet while breastfeeding	833	48
PERCEPTION ABOUT WIC INFANT FEEDING RECOMMENDATION		
WIC's infant feeding recommendation is thought to be:		
Breastfeeding only	824	38
Bottle feeding only		2
Both are OK		60
RECEIPT OF OTHER INFORMATION/ADVICE		
Received information about the special WIC food package for breastfeeding women who do not accept formula from WIC	831	30
WIC Program staff told mother to breastfeed	837	54
RECEIPT OF INFORMATION ABOUT FORMULA FEEDING		
Received information on how to formula feed	837	58
Received information on how to prepare formula	761	52
RECEIPT OF INFORMATION ABOUT FEEDING OF SUPPLEMENTAL FOODS		
Received information about when to begin giving cereal and other foods	838	60
DISCUSSION OF INFANT FEEDING PRACTICES WITH WIC STAFF		
Reported discussing the methods she is using to feed the infant with WIC staff		
Month 1	542	38
Month 2	663	35
Month 4	794	31
Month 6	802	30
Month 9	812	32
Month 12	805	33

Notes:

1. The question was phrased as, "Before the child was born, did you receive any of the following information or advice from the WIC office? benefits of breastfeeding; how to breastfeed; mother's diet while breastfeeding..."
2. The question was phrased as, "Since the child was born, have you received any of the following information or advice from the WIC office? benefits of breastfeeding; how to breastfeed; mother's diet while breastfeeding..."

The WIC-IFPS included a question in Month 2 eliciting receipt of information about breastfeeding since the birth of the infant. Table II.6 also displays the proportions of mothers reporting receipt of information from WIC after the birth their infants, on benefits of breastfeeding, how to breastfeed, and maternal diet while breastfeeding. These data were elicited at Month 2 interview or at the time of the first postnatal interview, if the mothers were recruited into the study later than Month 2. There are lower percentages receiving breastfeeding education postnatally than prenatally. About one-half of the mothers report receiving information about breastfeeding postnatally (including 51 percent of mothers who never initiated breastfeeding).

Table II.6 shows that one-third of the mothers think that breastfeeding is the infant feeding method recommended by WIC. About three-fifths think that both breastfeeding and formula feeding are acceptable to WIC. Only 30 percent of mothers report receiving information about the special WIC food package for breastfeeding women. The knowledge of the special food package varies significantly by racial/ethnic group (results not shown). The percentage is lowest among African American mothers (17 percent) and highest among white and “other” mothers (37 percent both). Just over one-half of the mothers reported receiving advice from WIC Program staff to breastfeed.

Percentages of mothers reporting receipt of information about formula feeding are also displayed in Table II.6. Slightly more than one-half report receipt of information about how to formula feed and how to prepare formula. White mothers are significantly less likely than the other three groups to report being told how to formula feed (50 percent versus about 66 percent, results not shown). In addition, about three-fifths of the WIC mothers report being told when to begin giving cereal and other foods. The last panel of Table II.6 provides the percentages of mothers who report discussing with WIC staff the methods of infant feeding they use. The percentage who consult with WIC staff is highest in Month 1, when almost two-fifths of the mothers report doing so. The percentages drop slightly to about the 30 percent level by Month 6. This finding suggests that the first postnatal contact with the mothers may be a good opportunity to reach some mothers who do not seek counseling from WIC about infant feeding later.

CHAPTER III

CONCEPTUAL MODEL AND APPROACH TO THE ANALYSIS OF THE WIC-IFPS

III.1. Overview of the Milestones of Infant Nutrition

Infant feeding in the first year of life depends on a complex set of behaviors and decisions by the mothers. Research on infant feeding practices must consider a wide variety of behaviors and characteristics of the mothers, infants, and their social environment. While infant feeding practices throughout infancy are interrelated, three distinct aspects can be distinguished that address the questions of “what?”, “how?”, and “when?”:⁷

- (1) The choice of foods and the timing of the introduction of various foods
- (2) The amount of food offered, the way it is prepared, and the way it is fed
- (3) The schedule of feeding.

Each of these aspects consists of more than one type of infant feeding practice, and each practice must be separately studied. However, the above categorization provides a means to organize infant feeding practices. As the infant matures, the infant feeding practices change in concert with the *maturational* and nutritional needs of the infant. The American Academy of Pediatrics (1993: 23-24) recognizes the following two important phases of infant nutrition:

- (1) **Nursing phase:** Breastmilk or a substitute such as infant formula is the sole source of nutrients for the infant.
- (2) **Transitional phase:** Specially prepared foods are introduced into the infant's diet, in addition to breastmilk and formula.

⁷ An additional question that may be considered is the “who” question; i.e., the identity of the person feeding the infant. For a vast majority of the infants, the mother is the primary caregiver and the person who assumes the primary responsibility for feeding the infant. WIC-IFPS allows the investigation of child-care use and feeding of the infant by the child-care provider as well. Nevertheless, this report primarily focuses on the feeding practices of the mothers. Information on child care is provided in Appendix F.

The WIC-IFPS provides information on both the nursing and transitional phases of infant nutrition. Progression through the phases of infant nutrition should ideally be determined by the rate of maturation of the infant's *nervous, musculo-skeletal, gastrointestinal, and renal systems*, as well as his or her cognitive and emotional maturation (American Academy of Pediatrics, 1993: 25, 32-33; Bedinghaus & Doughten, 1994; FNS, 1993a; Fomon, 1993: 457). Below, the nursing and transitional phases of infant feeding are discussed separately, with specific reference to the available WIC-IFPS data.

The Nursing Phase

Table III.1 summarizes the aspects of infant feeding practices analyzed that pertain to the nursing phase. This table also provides a brief list of the availability of WIC-IFPS data about each aspect of infant feeding during the nursing phase. Each aspect of infant feeding is discussed below. Choice of foods to be fed, the amount of food, and the schedule of feeding are likely to be closely associated.

Choice of foods and the timing of their introduction. The first important feeding decision is choosing whether to breastfeed or formula feed the infant. The significance of this choice cannot be overstated because of its health and nutritional implications for the infant. FCS encourages breastfeeding whenever possible (WIC regulation and FNS, 1993a). Indeed, promotion of breastfeeding is one of the objectives specified by the U.S. Department of Health and Human Services (*USDHHS*) in its *Healthy People 2000* report (USDHHS, 1990). Many other nutrition and health organizations, such as the American Academy of Pediatrics and the World Health Organization (*WHO*), strongly recommend

Table III.1. WIC-IFPS data on infant feeding practices in the nursing phase.

Aspect of Infant Feeding	Relevant WIC-IFPS Data
Choice of foods and the timing of their introduction	Breastmilk or formula, cessation of breastfeeding, choice of food for first feeding, hours to first breastfeed, introduction of formula among breastfeeding infants
The amount of food offered, and the way it is prepared and fed	Number of breastfeeds, frequency of breastfeeds, breastmilk expression, brand name of formula, addition of other foods or liquids into the formula, overdilution of formula
The schedule of feeding	Breastfeeding when infant is hungry versus on a set schedule

breastfeeding (American Academy of Pediatrics, 1993: 1; Bedinghaus & Doughten, 1994, WHO/UNICEF, 1991). There are many benefits of breastfeeding, including protection from respiratory illnesses, ear infections, and gastrointestinal illness; providing the right balance of nutrients to support growth and development; and psychological benefits that promote maternal and infant bonding (FNS, 1993a). Furthermore, breastfeeding is beneficial for the mother because it promotes quicker recovery from childbirth, is less expensive, and is more convenient (FNS, 1993a).

Breastfeeding generally begins during the immediate postpartum period (see Chapter V). Even within this short period, the timing of first breastfeeding is found to have implications for the eventual success and duration of breastfeeding (Riordan & Auerbach, 1993). In contrast, formula feeding may be initiated immediately after birth or sometime later during the nursing period in order to supplement or replace breastfeeding. The WIC-IFPS provides information regarding the use of formula among breastfeeding infants.

Breastfeeding is recommended through the nursing phase, into the transition phase and beyond. Because of the significance of breastfeeding in the nursing phase, the question of ultimate duration of breastfeeding is discussed under this heading. Almost all of the benefits of breastfeeding depend on the duration of breastfeeding. Recent evidence indicates that even some of the immunological benefits of breastfeeding cannot be observed if the duration of breastfeeding has been shorter than approximately three months (Bedinghaus & Doughten, 1994; Howie et al., 1990).

Amount of food offered and the way it is prepared and fed. The frequency of breastfeeding is known to be positively associated with its duration (Hill, 1991). Frequent feeding increases the stimulation of the breasts, leading to increased milk production and an enhanced *let-down reflex* (de Carvalho et al., 1982; Riordan & Auerbach, 1993). The WIC-IFPS provides information on daily number of breastfeeds. Mothers may need or want to express if the breasts are engorged, to collect milk if the mother will be away, or to collect milk for hospitalized or premature infants (FNS, 1993a). Breastmilk expression is expected to facilitate breastfeeding, especially for mothers who may be experiencing some nursing problems and mothers who have work or school commitments. Formula preparation may have important implications for infant nutrition during the nursing period. The choice of iron-fortified or non-fortified formula, excessive dilution with water, or addition of foods (e.g., cereal) or other liquids (e.g., fruit juice) to the formula may affect

Table III.2. WIC-IFPS data on infant feeding practices in the transitional phase.

Aspect of Infant Feeding	Relevant WIC-IFPS Data
Choice of foods and the timing of their introduction	The first supplemental food, fruit juice, sweet drinks, cereals, fruits, vegetables, meats, starchy foods, high-protein foods, snack foods
The way food is fed	Use of a cup, use of a spoon, use of an infant feeder, self-feeding

infant health (Queen & Lang, 1993). The WIC-IFPS collected detailed information regarding formula preparation. Data are available on whether formula is iron fortified, whether formula is ever overdiluted, whether other foods are added to the formula, and the brand name of the formula.

Schedule of feeding. The schedule of infant feeding in the nursing phase is thought to be important for establishing sound eating habits. The metabolic benefits of frequent feedings throughout a 24-hour period are thought to be significant (Fomon, 1993: 456-457). The impact of feeding when the infant cries or seems hungry as opposed to set-schedule feeding on the ultimate length of breastfeeding is not known, although it is generally believed that on-demand feeding is preferable because it permits the infant to regulate his or her nutrient intake and to stimulate further milk production as needed (Hill, 1991).

The Transitional Phase

The second phase of infant feeding is characterized by an increasingly complex diet that includes supplemental foods. There are several widely accepted nutrition recommendations for this phase. A brief review of these recommendations is provided below. Table III.2 summarizes the feeding practices of the transitional phase that can be analyzed using the WIC-IFPS data. The WIC-IFPS allows for the analyses of choice of foods, timing of their introduction, and the way foods are fed during the transitional phase. Because of the availability of detailed data on the feeding of various foods, the WIC-IFPS provides a unique opportunity to describe the transitional period, about which little epidemiological data exist.

Choice of foods and the timing of their introduction. The transitional phase of infant feeding is characterized by a mix of nursing (breast- and/or formula feeds) and other

supplemental foods. A gradual transition occurs from exclusive nursing to a modified adult diet. The transitional phase may take a substantial portion of the first year of the infant's life. During this period, many important choices are made regarding food types and the timing of their introduction.

There is general agreement that exclusive breastfeeding provides sufficient nutrition to the infant for four to six months (American Academy of Pediatrics, 1993: 12; Barness, 1994; Bedinghaus & Doughten, 1994; Fomon, 1993: 441; WHO/UNICEF, 1991). FCS advises that the nutritional needs of the infant can be met by exclusive breastfeeding during the first four to six months of life (FNS, 1993a). Although there is considerable individual variation, it has been documented that the dietary energy requirements for most infants can be met by breastmilk for at least four months (Whitehead, 1995).

There appears to be a consensus regarding the earliest time of initiation of foods other than breastmilk or formula. It is recommended that the decision regarding the initiation of supplemental foods be based on the physical, psychological, and physiological maturity of the infant (FNS, 1993a). An infant who can sit and independently support his or her head and neck, can draw in the lower lip as a spoon is removed from the mouth, can keep food in the mouth and swallow rather than pushing it back out, and is able to express *satiety*, is assumed to be ready to receive supplemental foods alongside nursing (American Academy of Pediatrics, 1993: 25, 32-33; Bedinghaus & Doughten, 1994; FNS, 1993a; Fomon, 1993:

457). The introduction of supplemental foods is not only significant for their nutritional content, but for establishing healthy eating habits and providing a transition to a modified adult diet. In order to establish sound eating habits and avoid inadvertent forced feeding, it is important that supplemental foods are not introduced before an infant can turn away from food and express satiety. On the other hand, it is recommended that supplemental foods be introduced by about six months of age (American Academy of Pediatrics, 1993: 25, 32-33). Delayed introduction may lead to difficulties of accepting foods at later ages (FNS, 1993a).

It is recommended that cereals be the first supplemental food that the infant receives. Iron-fortified cereals are recommended, especially for breastfeeding infants, who have lower iron content in their diets (American Academy of Pediatrics, 1993: 25-27, 32; FNS, 1993a; Fomon, 1993: 225). After cereals, fruits and vegetables are introduced to the infant's diet. The introduction of fruits and vegetables is recommended between six and eight months. Meats or other protein-rich foods are also recommended between six and eight months (FNS, 1993a).

There appears to be substantial difference in opinion on the introduction of fruit juices. While some sources say that fruit juices may be introduced as soon as an infant can drink from a cup with assistance (American Academy of Pediatrics, 1993: 27; FNS, 1993a), other sources emphasize the absence of nutritional value in fruit juices (Fomon, 1993: 450; Smith & Lifshitz, 1994). FCS indicates that fruit juices may be introduced when the infant can drink from a cup with assistance, but that juices should be offered in moderation and not in place of breastmilk or formula (FNS, 1993a). FCS also recommends observing the infant carefully for any food sensitivity after introducing each new type of juice.

Cow's milk is not recommended for infants.⁸ FCS's policy about feeding of cow's milk was issued on June 21, 1995, and went into effect on January 1, 1996, the time of completion of WIC-IFPS. Although it is possible that the gastrointestinal system of some infants may reach the maturity to digest cow's milk if cow's milk is introduced gradually after the ninth or tenth month, the

⁸ Cow's milk can lead to dehydration (due to its *high renal solute load*), iron deficiency (due to its low iron content and its high content of proteins and calcium, which inhibit iron absorption), and gastrointestinal blood loss.

feeding of cow's milk is not recommended under twelve months of age. Low-fat milk is discouraged because the infant will need to consume very large quantities in order to meet caloric and nutritional needs. FCS also recommends that the following foods are not fed to infants: sweetened foods, honey (because of the risk of botulism), desserts, caffeinated beverages, herbal teas, sweetened beverages, and artificially sweetened "diet" beverages (FNS, 1993a).

The mother or the caregiver must make many choices during the transitional phase of infant feeding regarding which foods to introduce, when to introduce them, and in what order. The WIC-IFPS offers an opportunity to describe the transitional phase in substantial detail, and to investigate the factors that contribute to maternal feeding practices that conform or do not conform to the recommended feeding guidelines. In the WIC-IFPS, the age of the infant at the time of introduction of a large variety of supplemental foods is known, unlike other studies that did not collect data prospectively. The focus of this report is to document whether inappropriately early introduction of supplemental foods occurs among the WIC mothers and, if so, the extent to which these feeding practices are prevalent. Introduction of any one of the supplemental foods before four months of age is considered to be "inappropriately early." The WIC-IFPS data also allow some examination of the order of introduction of supplemental foods.

The way food is fed. During the transitional phase, the method of feeding supplemental foods is significant because of its implications regarding the infant's health and the development of good eating habits. In general, it is recommended that no supplemental foods be fed by a bottle or an infant feeder (FNS, 1993a). Furthermore, there exists a consensus among medical professionals that fruit juices must not be given to infants with a bottle, due to the risk of dental caries (American Academy of Pediatrics, 1993: 27; Fomon, 1993: 450). WIC-IFPS data are available about the use of a cup (assisted or unassisted), the use of a spoon, the use of infant feeders, as well as self-feeding. These data allow comparison of the feeding practices adopted by WIC mothers to the recommendations of the FCS.

III.2. A General Model of Infant Feeding Practices

The analyses of infant feeding practices in relation to the factors that may influence these practices are guided by a general model. This model is based on one developed by Gray-Donald, Kramer, Munday, & Leduc (1985) that accounts for the factors that may

be associated with breastfeeding. This framework is expanded and generalized to apply to other feeding practices. Gray-Donald et al. recognize two types of factors that influence the decision to breastfeed: non-modifiable and modifiable factors. For program development purposes, the distinction between these factors is very important. A nutrition intervention program cannot change non-modifiable factors such as the social and cultural context of participating individuals, but may be able to educate its participants on the implications of various infant feeding practices, influence their attitudes and beliefs about certain feeding practices, and provide a supportive peer group and professional counsel. Hence, the distinction between modifiable and non-modifiable factors may be specific to the nature of a program. What may be a modifiable factor for a social program may be a non-modifiable factor for a nutrition program. In order to emphasize this issue, this study adopts a distinction between “non-program” and “program” factors, with specific reference to the components and goals of the WIC Program. Program factors are possible targets for the WIC Program. A change in the program factors may or may not be associated with a change in feeding practices, because these practices are also often grounded in non-program factors such as culture and *social context*. Therefore, a model of infant feeding practices must consider non-program as well as program factors.

Figure III.1 provides a general model of infant feeding practices that includes non-program and program factors as predictors of infant feeding practices. This figure also indicates the measures that are available from the WIC-IFPS on non-program and program predictors of infant feeding practices. A predictor is defined as a “program” factor if it is currently targeted by any components or policies implemented by the WIC Program. Infant feeding attitudes and beliefs, concurrent infant feeding practices, WIC food packages, and receipt of information from WIC staff regarding infant feeding are the program factors considered here. Factors that are not targeted by any components or policies of the WIC Program are defined as “non-program” factors. Socio-demographic characteristics of the mother (e.g., race/ethnicity, age, immigrant status, birth order of the infant, income level, employment status), health-related characteristics of the mother and the infant, social context of the mother (e.g., advice from family and friends), receipt of infant feeding advice from sources other than WIC, and hospital practices at the time of birth are the non-program factors considered here.

In the model depicted in Figure III.1, the linkages between program factors and infant feeding practices are of primary importance because of the following two reasons. First, the investigation of the linkages between factors such as WIC Program components will reveal their association with infant feeding practices. Information on the strength of these linkages may provide insight into future directions for the WIC Program. For example, if a strong positive association between WIC nutrition education programs and recommended infant feeding practices is documented, it can be concluded that WIC nutrition education programs appear to promote recommended feeding practices. While

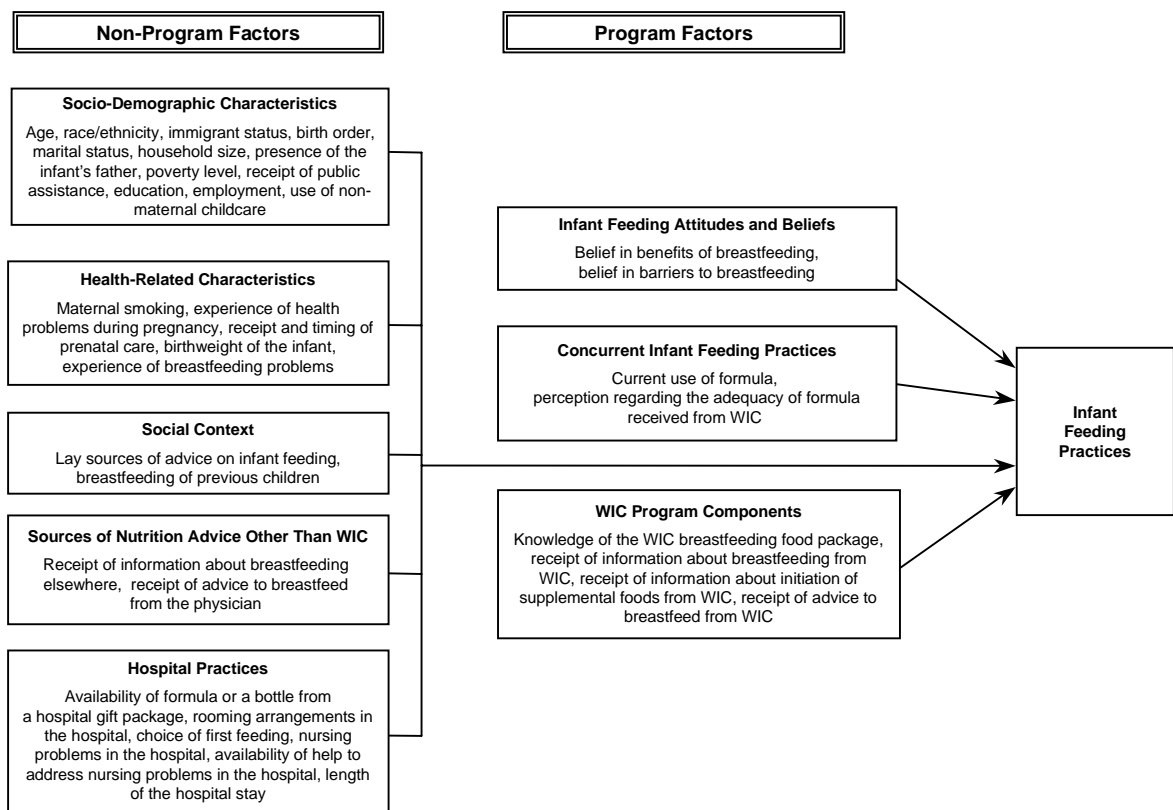


Figure III.1. A general model of infant feeding practices and the measures of predictors of infant feeding practices from the WIC-IFPS.

the WIC-IFPS was not designed to evaluate the WIC Program (there are no comparison groups and no objective measures of program participation), its results may help inform the program about the relative strength of the associations between its various components and infant feeding practices. Second, investigation of the association of program factors with infant feeding practices will provide information regarding the factors that may be considered as targets for WIC Program components. For example,

if a strong linkage between breastfeeding attitudes/beliefs and breastfeeding duration is documented, empirical support can be demonstrated for targeting breastfeeding attitudes and beliefs in order to promote longer durations of breastfeeding (NAWD, 1994).

In addition to the examination of the program factors, examination of the non-program factors is also important for two reasons. First, their inclusion in the model of infant feeding practices allows the estimation of net linkages between program factors and infant feeding practices, controlling for the variations in the non-program factors. For example, racial/ethnic group membership is a non-program factor that may be strongly associated with program factors such as concurrent infant feeding practices, participation in WIC Program components, and infant feeding attitudes and beliefs. It is important to be able to distinguish the extent to which these program factors are associated with infant feeding practices, if racial/ethnic differences (which may be representing cultural differences) are statistically controlled. In other words, it is important to address questions similar to the following: “If two mothers were equal in all characteristics except for their receipt of WIC breastfeeding education, to what extent would one expect their breastfeeding practices to differ?”

A second function of the non-program factors in the model presented in Figure III.1 is that they may indicate subgroups of WIC participants who tend to choose infant feeding practices that deviate from the recommended guidelines. The linkages between non-program factors and infant feeding practices are of substantive interest if they indicate an identifiable subgroup in need of programmatic intervention. For example, if the association between being a teenage mother and non-recommended infant feeding practices is large, regardless of the role of the program factors, this group can be identified as one that may need further programmatic focus. This conclusion remains true regardless of the *net* association of teen motherhood (in the presence of program factors) with infant feeding practices.

It is also conceptually possible that the non-program factors may influence the program factors. Although these linkages may be of interest, they are beyond the scope of this report, which focuses on the direct associations between non-program factors and infant feeding practices, and between program factors and infant feeding practices.

III.3. An Overview of the Statistical Analysis Methods

The main purpose of the WIC-IFPS is to describe the infant feeding practices of a nationally representative sample of mothers participating in the WIC Program. A quantitative description of infant feeding practices can be achieved in two ways:

- (1) Infant feeding practices of various subgroups of WIC mothers can be examined and compared. This approach is labeled *descriptive analysis*.
- (2) The association between infant feeding practices and a diverse set of program and non-program factors can be explored simultaneously, identifying the unique contribution of each factor to the infant feeding practice that is being examined. This approach is labeled *multivariate analysis*.

Descriptive Analyses

In this report, descriptive analyses are conducted using common summary statistics, such as percentages and means (or averages). Most of the descriptive analyses involve comparisons of various percentages. For example, in examining the choice between breastfeeding and formula feeding, percentages of mothers who choose to breastfeed rather than formula feed are examined, among mothers classified according to various observed characteristics (for example, African American, Hispanic, and white WIC mothers). The subgroups that are compared may be defined as finely as needed and as the sample size permits. The differences between percentages adopting a given feeding practice in different subgroups are tested for *statistical significance*, using a *chi-square test*. A significant chi-square test value indicates that it is highly unlikely that a difference in percentages between subgroups is the result of chance (random variation). For a few descriptive analyses, means (averages) are compared. In examining the mean values (e.g., mean number of breastfeeds per day), the differences between the means for each subgroup are statistically tested using the *F-test* of significance. A significant F-statistic indicates that it is highly unlikely that differences in the means between subgroups are due to chance (random variation).

Multivariate Analyses

All of the multivariate analyses of infant feeding practices presented here followed a common approach, although the particulars of the statistical techniques vary depending on the feeding practice being examined (for detailed information about multivariate statistical methods see Appendix G). These techniques allow identification of the unique association between a given factor (program or non-program) and an infant

feeding practice. All of the multivariate analysis techniques yield a set of estimates that quantify the relative contribution of each factor to the infant feeding practice being examined. These estimates are referred to as coefficients for a given factor, and they quantify how much infant feeding practices would differ between two mothers who differed only in terms of that factor. For example, the coefficient of the indicator for African American mothers quantifies how the specific infant feeding practice of a white mother and an African American mother would differ if those two mothers were identical with respect to all other relevant characteristics except race (e.g., age, education, health, employment status).

In all multivariate analyses, both non-program and program factors (see Figure III.1) were considered. However, these factors were included in the multivariate models progressively. First, all non-program factors (i.e., factors that are not targeted by the WIC Program components) were considered. An examination of the multivariate models with non-program factors allowed the identification of possible target groups who may be following infant feeding practices that are outside the recommended guidelines. Second, the program factors (those targeted by WIC Program components) were considered, sequentially and one at a time. This allowed examination of the relative significance of the associations of those factors that are or may be targeted by the WIC Program with the infant feeding practices of the WIC mothers.

While building multivariate statistical models, a common protocol was followed (see Appendix H). This protocol allowed the testing of the predictive power of groups of factors that are thought to be associated with infant feeding practices. These groups are indicated in Figure III.1, in boxes. Within each group, a particular measure was eliminated from a multivariate model if the following three conditions were satisfied: (1) that measure had no significant predictive power for the infant feeding practice being analyzed, (2) there was no strong conceptual justification for keeping that particular measure in the model, and (3) that measure was not of primary substantive interest.

Following this model-building protocol, models of infant feeding practices were constructed that are as simple as possible, yet able to provide program-relevant information. The results of these models are presented in Chapters IV through IX of this report.

Comparison of Descriptive and Multivariate Analyses

Both descriptive and multivariate analyses of WIC-IFPS data contribute significantly to the understanding of the infant feeding practices of the WIC mothers. Relative advantages of descriptive versus multivariate analyses are clarified with the following example: One may be interested in the association between being African American and the choice between breastfeeding or formula feeding. A descriptive analysis compares the percentages of African American WIC mothers who choose to breastfeed to the percentages of white and Hispanic WIC mothers who choose to breastfeed. African American mothers are significantly less likely to choose to breastfeed. For the purposes of describing the behavior of African American WIC mothers, this may suffice. However, this may not be sufficient for program development to address the breastfeeding support needs of African American mothers. These mothers may have lower rates of breastfeeding because of other factors. For example, African American mothers are less likely to be living with the father of their infants than mothers of other racial/ethnic groups. For purposes of program development and target group identification, it is important to identify whether the cultural factors in the African American community or the absence of a spouse/partner is the critical factor associated with lower preference for breastfeeding. Multivariate analyses can accomplish this purpose by yielding the net association between race/ethnicity and breastfeeding, controlling for other relevant factors (such as age, father presence, education, etc.).

CHAPTER IV

THE CHOICE BETWEEN BREASTFEEDING AND FORMULA FEEDING IN THE NURSING PHASE

IV.1. Overview

This chapter begins with an overview of the WIC Program breastfeeding promotion efforts. It then provides a description of the results from three sets of analyses addressing the choice between breastfeeding and formula feeding.

- Section IV.3 discusses the decision to breastfeed. This decision is the most important feeding choice of the nursing phase.
- Section IV.4 discusses attitudes of WIC mothers towards breastfeeding.
- Section IV.5 discusses the transition from breastfeeding (if initiated) to a combined breastmilk and formula diet.

Each of these results sections is organized in a similar manner:

- The section begins with a statement of the research question.
- A summary of the main findings follows. The findings are identified with checkmarks.
- The next subsection discusses the relevant literature.
- The next subsection discusses the statistical model that was used.
- Results are presented next. The main findings are repeated in the results subsection, so that readers can relate the brief finding to the corresponding discussion of results.
- Conclusions are presented in the last subsection.

IV.2. WIC Program Components that Pertain to the Choice Between Breastfeeding and Formula Feeding

FCS's policy encourages breastfeeding whenever possible (FNS, 1993a; NAWD, 1990, 1994). This recommendation is strongly supported by professional organizations of health care providers and nutritionists (American Academy of Pediatrics, 1993;

Bedinghaus & Doughten, 1994). Promotion of breastfeeding is one of the national health promotion objectives for the year 2000 (USDHHS, 1990). There are many benefits of breastfeeding, including protection from respiratory illnesses, ear infections, and gastrointestinal illness; providing the right balance of nutrients to support the infant's growth and development; and psychological benefits that promote maternal and infant bonding (FNS, 1993a). Furthermore, it has various benefits for the mother, such as convenience and lower cost (FNS, 1993a). The WIC-IFPS elicited information about two WIC Program components that support its breastfeeding policy:

- issuance of an enhanced food package for breastfeeding mothers
- provision of breastfeeding education and advice on breastfeeding to the mother.

The WIC Program provides food vouchers to postpartum non-breastfeeding and breastfeeding mothers and infants. The contents of these food packages may influence the decision of the mother regarding breastfeeding. State and local WIC agencies have substantial liberty in specifying the contents of the food packages. Less than one-half of the WIC state agencies use standard food packages and less than 5 percent only use the maximum allowable food packages (Abt Associates, 1995). The National Association of WIC Directors (NAWD) issued guidelines (NAWD 1990, 1994) that promote the use of food packages that do not undermine successful breastfeeding, advise against the use of any implicit or explicit messages that may encourage the use of formula, and discourage causing any perception that the breastfeeding mothers are getting less food than formula feeding mothers.

The 1994 NAWD guidelines also include the recommendation that breastfeeding women have the highest nutritional needs of any WIC participants and should receive food packages that address this need. Furthermore, NAWD specifies that infants of exclusively breastfeeding mothers should not receive vouchers for any infant formula, since formula vouchers may imply that the mothers are expected to supplement their breastmilk. For the mothers who wish to supplement breastfeeding, NAWD recommends that the infant's food package contain powdered formula as opposed to liquid formula, since powdered formula can be prepared in very small amounts and is not wasted if unused.

NAWD guidelines also address the ways in which WIC nutrition education programs can support breastfeeding. Almost all local agencies (97%) have increased the

emphasis on breastfeeding in their nutrition education programs since 1988 (Macro International and Urban Institute, 1995). According to the same source, changes in infant nutrition education include a variety of recent programs that promote breastfeeding and eliminate the promotion of formula feeding. Ongoing support for breastfeeding is recommended by the NAWD (1994), which also recommends information dissemination regarding the negative impact of formula supplementation on breastmilk supply. Breastfeeding education addressing the needs of working mothers and mothers experiencing breastfeeding problems is also recommended. Furthermore, it is recommended that the WIC staff who provide breastfeeding education be trained on an ongoing basis, as knowledge on breastfeeding management grows.

The NAWD makes specific recommendations regarding counselling of WIC participants. For example, it is recommended that WIC staff refrain from overt or subtle endorsements of use of formula and that formula not be kept in clear view of the participants.

In sum, it is expected that the breastfeeding education programs will inform women about breastfeeding, encourage them to breastfeed, provide ongoing support for breastfeeding, and refrain from encouraging the use of formula. The enhanced food package for breastfeeding women promotes and supports a mother's decision to breastfeed without supplementation.

IV.3. Initiation of Breastfeeding Among WIC Mothers

Research Questions

This section addresses the factors associated with the initiation of breastfeeding among WIC mothers. Initiation of breastfeeding is defined as having ever tried to breastfeed the infant. This definition conforms with that adopted by WIC.

The following questions are addressed:

- What proportion of WIC mothers initiate breastfeeding?
- Are there groups of WIC mothers who have a very low or very high likelihood of initiating breastfeeding?
- What non-program and program factors contribute to the likelihood of initiating breastfeeding?

As indicated in the general approach (Section III.2), both the non-program and program factors that are associated with the decision to breastfeed are of interest. These factors are presented in Figure IV.1. The non-program factors provide information about the existing differences in breastfeeding initiation between groups of WIC mothers. Hence, an examination of the non-program factors allows the identification of subgroups of WIC mothers who have particularly low rates of breastfeeding initiation. The examination of program factors provides information about the linkages between WIC

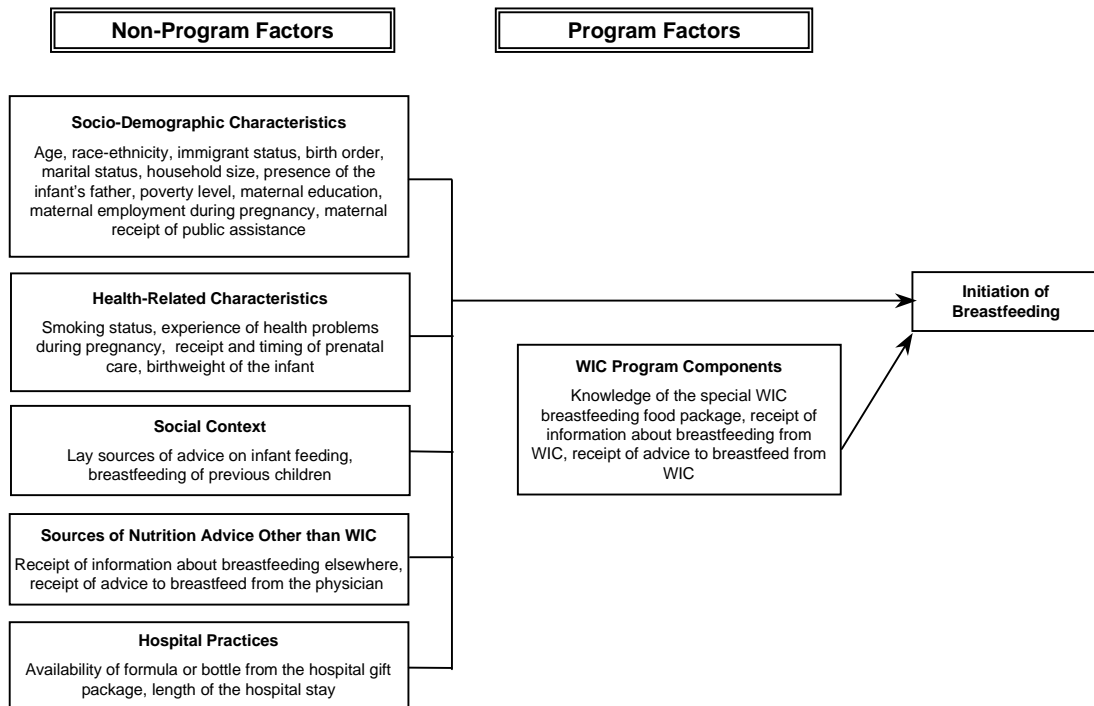


Figure IV.1. A model of breastfeeding initiation and the measures of its predictors available from the WIC-IFPS.

Program components and the decision to breastfeed, as well as possible factors that may be targeted by WIC to promote breastfeeding initiation. The association between program factors and the breastfeeding initiation rates are examined, net of the non-program factors, using multivariate statistical analyses.

Figure IV.1 displays a comprehensive list of all non-program and program factors examined as likely predictors of breastfeeding initiation. The only program factors examined are those describing the WIC Program components about which data were

collected in the study. Because information about attitudes and beliefs about breastfeeding were elicited only after the infant's birth, these program factors cannot be examined as predictors of breastfeeding initiation.

Main Findings

- ✓ Slightly over one-half of WIC mothers initiate breastfeeding.
- ✓ The estimated breastfeeding initiation rate for African American WIC mothers is two-thirds that of white mothers. Hispanic mothers breastfeed at a rate more than 1.5 times that of white mothers.
- ✓ Long hospital stays and low birthweight are associated with lower rates of breastfeeding initiation.
- ✓ Controlling for other socio-demographic markers, Hispanic ethnicity, immigrant status, presence of the infant's father in the household, and high maternal education are significant predictors of higher likelihood of breastfeeding initiation.
- ✓ Mothers who breastfed previously have a very high likelihood of breastfeeding again.
- ✓ Endorsement of breastfeeding by the immediate family of WIC mothers is strongly and positively associated with breastfeeding initiation.
- ✓ Receipt of information about breastfeeding from sources other than WIC and receipt of advice to breastfeed from a physician are positively associated with breastfeeding initiation.
- ✓ Among the mothers who do not receive advice to breastfeed from their physicians, those who receive information about breastfeeding from WIC are significantly more likely to initiate breastfeeding than those who do not receive information from WIC.

Previous Studies

There is a substantial body of previous research that addresses the factors associated with the initiation of breastfeeding. A review of related research is provided below, following the model (see Figure IV.1) that relates various non-program and program factors to the initiation of breastfeeding. A similar review is available in Janke (1993).

Socio-demographic characteristics. African Americans and younger women tend not to initiate breastfeeding (Bloom et al., 1982; Ryan et al., 1991a; Schwartz et al., 1992). Immigrants tend to initiate breastfeeding (Bevan et al., 1984; Romero-Gwynn & Carias, 1989), probably due to exposure to a culture where breastfeeding is a normal component of motherhood. Indeed, it is likely that much of the variation in infant feeding practices that are currently attributed to racial or ethnic group membership or to immigrant status is actually due to the differences in cultural context. Previous studies found that social pressure and norms are associated with the decision to breastfeed (Baranowski et al., 1986; Jacobson et al., 1991; Romero-Gwynn & Carias, 1989).

Married women tend to initiate breastfeeding more than unmarried women (MacGowan et al., 1991). The positive association with being married, however, may partly be due to factors that are associated with being married, such as the presence of a supportive husband or less pressure to resume employment after the birth of the infant. There is little research investigating the impact of birth order on infant feeding practices, and the findings are inconsistent (Gielen et al., 1992; Novotny et al., 1994; Tuttle & Dewey, 1994).

Although WIC mothers are uniformly of low socio-economic status, the variation in education, income, and employment among WIC participants has been shown to be associated with infant feeding practices. Maternal, as well as paternal education is found to be associated with higher likelihood of breastfeeding (Schwartz et al., 1992; Switzky et al., 1979). This may be because parents with higher education better understand the importance and consequences of their infant feeding choices. Maternal employment is demonstrated to be a barrier to breastfeeding (Auerbach & Guess, 1984; Ryan & Martinez, 1989). However, a study of WIC participants found that, among WIC mothers, employment did not predict the likelihood of breastfeeding (MacGowan et al., 1991).

Various studies of breastfeeding rates have been reported from local and state WIC agencies throughout the country. They are generally consistent in finding that women who have the following characteristics are less likely to breastfeed: young age (Gielen et al., 1992; MacGowan et al., 1991; Novotny et al., 1994); low education (Bevan et al., 1984; MacGowan et al., 1991; Novotny et al., 1994); African American race (compared to white) (Gielen et al., 1992; MacGowan et al., 1991); and not married and/or not living with the infant's father (Gielen et al., 1992; MacGowan et al., 1991)

Health-related characteristics. A mother's prenatal health influences her *postnatal* health, which in turn can influence feeding practices during the early postnatal period (Britton, 1993). Prenatal health deficiencies are linked to altered physical development as well as behavioral patterns of infants, so these deficiencies can influence not only nutritional status and nutritional needs, but feeding interactions as well (Britton, 1993). Low-birthweight and small-for-gestational-age infants have nutritional needs that are significantly different from a full-term newborn (Clark, 1993). These special needs may cause the mothers to decide against breastfeeding.

Social context. The immediate social network of the mother, including her family and peers, is likely to have a strong influence on her feeding choices. Numerous studies found that support from husband or immediate family is strongly associated with breastfeeding (Bevan et al., 1984; Fredrickson et al., 1993; Freed et al., 1992; Joffe & Radius, 1987; Jones et al., 1986, 1987; Matich & Sims, 1992). It is likely that the mother's peer reference group will also influence her decision regarding breastfeeding (NAWD, 1990; 1994). Exposure to a supportive peer group may partly account for the increased breastfeeding among mothers who receive prenatal classes and infant feeding education (Bloom et al., 1982). Mothers who have not breastfed previously are found to be less likely to breastfeed (Bevan et al., 1984; Grossman et al., 1990).

Sources of nutrition advice other than WIC. Breastfeeding education and prenatal classes are associated with increased breastfeeding (Bloom et al., 1982; Freed, 1993; Jelliffe & Jelliffe, 1988; Joffe & Radius, 1987; Winikoff & Baer, 1980). Black et al. (1990) found that knowledge of breastfeeding increased the likelihood of breastfeeding. The presence of a lactation consultant in the hospital is also associated with higher rates of breastfeeding initiation (Auerbach, 1985; Jones & West, 1985, 1986; Kistin et al., 1990).

Hospital Practices. Early hospital discharge negatively influences breastfeeding (Ryan & Martinez, 1989), probably because of a lack of opportunity to consult with professionals regarding any breastfeeding difficulties once the mother returns home. On the other hand, a long hospital stay may be indicative of maternal health problems that are also associated with lower levels of breastfeeding. For example, cesarean delivery is associated with significantly lower rates of breastfeeding (Romero-Gwynn & Carias, 1989).

Aggressive formula marketing interferes with breastfeeding by rendering formula more accessible (Oski & McMillan, 1991). Other studies found strong indication that formula availability may decrease breastfeeding (Bevan et al., 1984; Hill, 1991). Hospital

gift packages containing formula gifts may be inhibiting breastfeeding by making alternative foods available (Bergevin et al., 1983; Dungy et al., 1992). However, any impact of gift packages would more likely be on breastfeeding continuation than initiation, because breastfeeding initiation typically begins before hospital discharge and before receipt of the package.

WIC Program components. In a national study based on 1988 data from the National Maternal and Infant Health Survey (NMIHS), Schwartz et al. (1992, 1995) found that WIC breastfeeding education increased the incidence of breastfeeding among WIC participants. The WIC Breastfeeding Promotion Study and Demonstration provided information on breastfeeding rates at seven local WIC agencies throughout the country and documented the effects of various breastfeeding promotion activities (Sanders et al., 1990). Except for one site that experienced no differences, mothers in the intervention group were more likely to attempt breastfeeding than mothers in the control group. The enhanced food package for exclusively breastfeeding women is rather recent, and thus no previous studies documenting its association with the decision to breastfeed could be identified.

Statistical Methods

Two sets of analyses are presented in the results section: descriptive and multivariate. Descriptive analyses rely on comparisons of breastfeeding initiation rates (percentage of WIC mothers initiating breastfeeding). These comparisons were done using chi-square statistics for statistical significance. The chi-square statistics were computed accounting for the multistage *stratified* and *clustered sampling design* used in the WIC-IFPS, using the SUDAAN (Shah, Barnwell, Hunt, & LaVange, 1992) statistical software.

Multivariate analyses were conducted using logistic regression analysis that predict the log-odds of breastfeeding initiation. The *logistic regression models* take the following form:

$$\log \frac{p}{1-p} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \dots \quad (\text{IV.1})$$

where p is the predicted probability of breastfeeding initiation for a mother, and β is the estimated coefficient representing the association between a non-program or program

factor x and the breastfeeding initiation rate p . As can be seen from Equation IV.1, the odds of breastfeeding initiation can be expressed as:

$$\frac{p}{1-p} = e^{\beta_0} \cdot e^{\beta_1 x_1} \cdot e^{\beta_2 x_2} \cdot e^{\beta_3 x_3} \cdot \dots \quad (\text{IV.2})$$

Hence, the quantity e^{β} can be interpreted as the relative odds. In other words, the quantity e^{β} is equivalent to the odds that a mother with characteristic x will breastfeed as compared to the odds that a mother with characteristic $x-1$ will breastfeed.

For example, the β estimated for the non-program factor immigrant status is 1.71, and the relative odds are $e^{1.71}$, or 5.54 (see Table IV.2, Model I). This is interpreted as follows: the odds that a woman born outside the United States will breastfeed are 5.54 times the odds that an otherwise similar woman born in the United States will breastfeed. In other words, the likelihood (odds) of breastfeeding is greater by about 5.5 times for immigrant women. Relative odds greater than one imply that the characteristic considered is associated with higher odds of breastfeeding. Relative odds less than one imply that the characteristic considered is associated with diminished odds of breastfeeding.

In building multivariate models of breastfeeding initiation, a *protocol* was followed that tested the predictive power of groups of variables (indicated in Figure IV.1), and allowed the elimination of those variables if the following three conditions were satisfied: (1) they had no significant predictive power, (2) there was no strong theoretical justification for keeping them in the model regardless of their predictive power, and (3) they were not of primary substantive interest (also see Appendix H).

The multivariate logistic model of breastfeeding initiation is presented in four steps. The first step tests the association of maternal socio-demographic characteristics with breastfeeding initiation. The outcome of this step of model building is Model I, which provides information about markers (observable non-program characteristics) that are associated with significantly low or significantly high rates of breastfeeding. Model II introduces a set of non-program factors describing the social context of the mother, sources of nutrition advice other than WIC, and hospital practices. Model III introduces information about the linkages between WIC Program components and the breastfeeding initiation of WIC mothers. At the final step, Model IV includes variables describing the interaction between WIC Program components and receipt of advice from sources other

than WIC. This model helps identify the complex association of breastfeeding information received from WIC and other sources with initiation of breastfeeding, net of the association of other non-program factors.

The model of breastfeeding initiation does not include variables describing maternal attitudes because these attitudes were measured at the Month 2 interview of the WIC-IFPS. As such, they may be outcomes of initial breastfeeding experience as well as predictors of that experience.

Results

Descriptive Analyses. Table IV.1 provides a summary of breastfeeding initiation rates by selected socio-demographic and health-related characteristics of the mothers and infants. (For complete, detailed versions of all tables found in this report, see Appendix I. Appendix J includes the estimated standard errors of all statistics presented in the tables of Appendix I.)

✓ Slightly over one-half of WIC mothers initiate breastfeeding.

The overall breastfeeding initiation rate among WIC mothers is 56 percent (95% confidence interval: 49% - 62%). Initiation rates should be interpreted with care, however. The WIC-IFPS included a set of several questions eliciting information on initiation of breastfeeding. These questions were designed to identify any WIC mother who ever tried breastfeeding, even if only once. These questions elicited the following information: the first feeding, any breastfeeding during the week following birth, and breastfeeding status at the time of the first postnatal interview. This definition of breastfeeding initiation is consistent with the WIC Program's definition of breastfeeding.

The breastfeeding initiation estimate obtained from the WIC-IFPS is expected to be slightly higher than other estimates for the same population because of two reasons. First, the WIC-IFPS survey included a variety of questions eliciting information about any breastfeeding immediately postpartum, breastfeeding before leaving the hospital, and breastfeeding during the first few days postpartum. Because of the detailed prompting, it is expected that mothers who would otherwise report no breastfeeding may recall and report breastfeeding in the WIC-IFPS. Second, breastfeeding information was collected during the first postnatal interview, which occurred on average 49 days after the birth of the infant. With such a short duration between possible initiation of any breastfeeding

Table IV.1. Breastfeeding initiation rates by selected socio-demographic and health-related characteristics.

Characteristics	Breastfeeding Initiation Rate (Percent)	N
Total	56	874
SOCIO-DEMOGRAPHIC CHARACTERISTICS		
Race and ethnicity **		
White	53	449
African American	34	202
Hispanic	84	168
Other	62	55
Age of the mother at birth of child *		
14 - 19	45	201
20 - 25	57	382
26 or older	62	291
Immigrant status **		
Born in the U.S.	48	703
Born elsewhere	88	152
Marital status *		
Married	66	376
Post married ¹	51	102
Never married	46	376
Highest grade completed by the mother *		
9th grade or less	59	137
10th or 11th grades	49	186
12th grade	51	366
More than high school	71	168
HEALTH-RELATED CHARACTERISTICS		
Birthweight**2		
Low birthweight	33	64
Normal birthweight	56	783
High birthweight	77	26
Number of days in hospital postpartum *		
0 or 1	64	326
2	52	320
3	45	134
4 or more	55	78

Notes:

1. Divorced, separated, or widowed.
2. Low birthweight indicates 5 lbs 8 oz or less, normal birthweight indicates 5 lbs 9 oz to 9 lbs 14 oz, and high birthweight indicates heavier than 9 lbs 14 oz.

* Chi-square statistic testing the group differences is significant at $p < .05$.

** Chi-square statistic testing the group differences is significant at $p < .01$.

and the time of interview, it is likely that recall of breastfeeding was better in WIC-IFPS than in other studies that relied on long-term retrospective recall.

✓ The estimated breastfeeding initiation rate for African American mothers is two-thirds that of white mothers. Hispanic mothers breastfeed at a rate more than 1.5 times that of white mothers.

There are substantial group differences in breastfeeding initiation by maternal socio-demographic characteristics. Maternal race/ethnicity is strongly associated with breastfeeding (see Figure IV.2). Only one-third (34%) of African American mothers initiate breastfeeding, as opposed to over four-fifths (84%) of Hispanic mothers. Among the white mothers, the breastfeeding initiation rate is estimated to be 53 percent, slightly over one-half. The race and ethnicity differences in breastfeeding initiation are statistically significant ($p < .01$).

The observed differences in breastfeeding initiation by race and ethnicity may reflect cultural differences as well as differences in the other socio-demographic characteristics

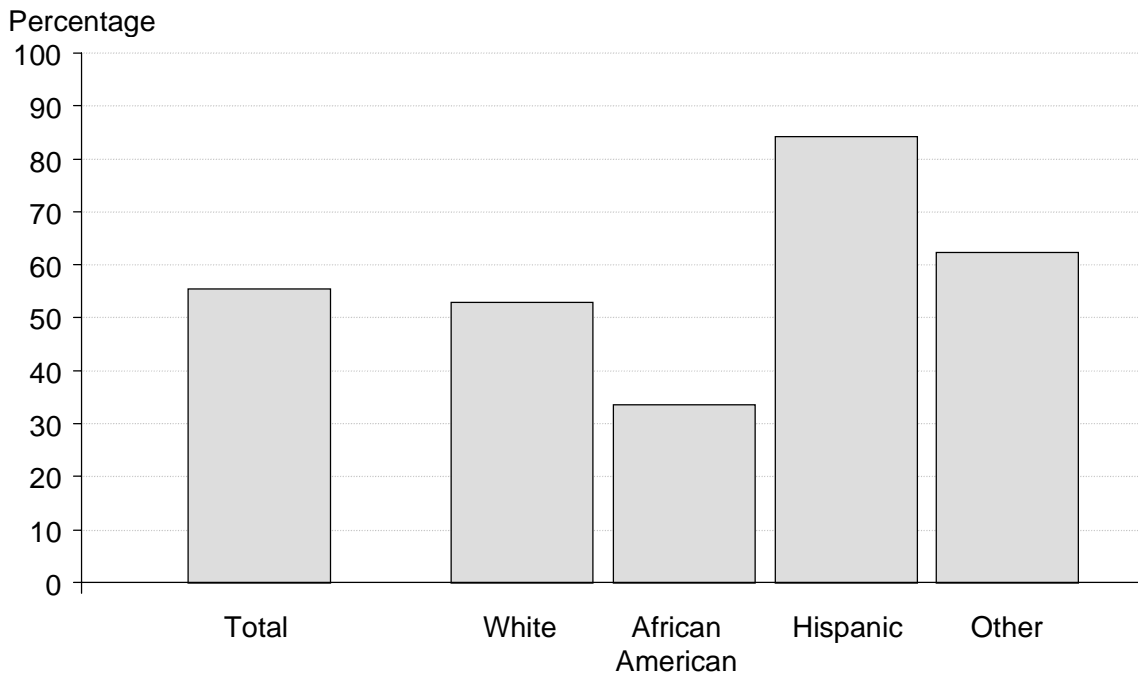


Figure IV.2. Breastfeeding initiation rates, by race and ethnicity of the mother.

of African American, Hispanic, and white mothers. For example, African American mothers are more likely to be unmarried, and the low rates of breastfeeding initiation may partly be attributed to marital status effects. Furthermore, African American mothers are more likely to be younger, another characteristic that is associated with low rates of breastfeeding (see next paragraph).

In addition to race and ethnicity differences, there are significant breastfeeding initiation rate differences by maternal age, immigrant status, marital status, and maternal education. The youngest group of WIC mothers breastfeed at lowest rates: less than one-half of teen-age mothers (45%) try breastfeeding, as opposed to three-fifths (62%) of the mothers who are 26 or older. Less than one-half (48%) of the mothers who were born in the United States initiate breastfeeding, as opposed to almost 90 percent of the mothers who were born elsewhere. A majority of never-married mothers choose not to breastfeed (initiation rate of 46%) whereas almost two-thirds (66%) of currently married mothers choose to initiate breastfeeding. Note that many of these socio-demographic characteristics are associated with each other. For example, maternal age and maternal race/ethnicity are associated. There are higher proportions of African American mothers in younger ages. Similarly, age, education, and marital status are associated.

The association between breastfeeding initiation and maternal education is not linear. The lowest-educated group of mothers (i.e., those who completed at most nine years of education) initiate breastfeeding at a somewhat higher rate than the mothers who had 10 or 11 years of education without high school completion. This may be partly because this group may consist disproportionately of immigrants.

Highly educated mothers are more likely to initiate breastfeeding, with 71 percent of mothers who had more than a high school education doing so. Birth order of the infant, household size, and maternal employment prior to the birth of the infant are not significantly associated with breastfeeding initiation.

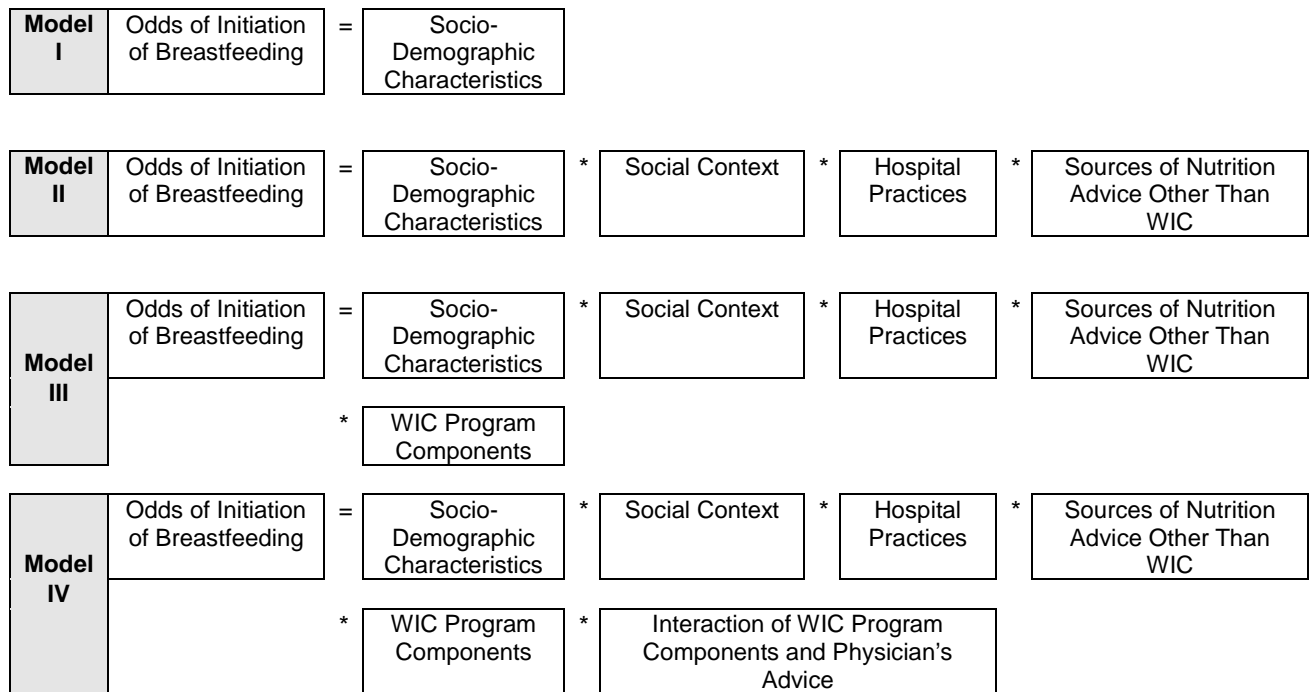
✓ Long hospital stays and low birthweight are associated with lower rates of breastfeeding initiation.

Association of several maternal and infant health-related characteristics with breastfeeding initiation rates was examined. Experience of health problems during pregnancy and the timing of the first prenatal visit to the physician appear not to be associated with breastfeeding initiation. Birthweight and maternal stay at the hospital

after the birth are significantly associated with breastfeeding initiation. Low-birthweight infants are substantially less likely to be breastfed (33%) than normal-birthweight and high-birthweight infants (56% and 77%, respectively). Note, however, that the total number of low-birthweight and high birthweight infants in the WIC-IFPS sample is small; therefore, the estimates pertaining to these groups are subject to large standard errors.

Longer hospital stay is also associated with lower rates of breastfeeding, probably because it is indicative of maternal health problems during birth and shortly thereafter. This finding is also confirmed by the multivariate analyses presented below.

Multivariate Analyses. In order to identify the factors that uniquely contribute to breastfeeding initiation rates, multivariate logistic models of breastfeeding initiation were estimated. The following models were tested:



The WIC-IFPS data provide fairly complete information on the non-program and program predictors of initiation of breastfeeding. Most of the characteristics that were considered are fixed characteristics, when considered postnatally; for example, maternal race/ethnicity, maternal age at the time of the birth of the baby, and maternal employment at any time during pregnancy. Other characteristics are related to the conditions surrounding the birth; for example, the length of the mother's hospital stay and infant's birthweight. Some other characteristics are measured postnatally. Examples of such

characteristics are poverty level⁹ and household size. When using these characteristics as predictors of breastfeeding initiation, one must make the assumption that they have been relatively fixed between the time of the infant's birth and the time of the interview.

- ✓ Controlling for other socio-demographic markers, Hispanic ethnicity, immigrant status, presence of the infant's father in the household, and high maternal education are significant predictors of higher likelihood of breastfeeding initiation.

Table IV.2 displays the results of multivariate logistic regression models of breastfeeding initiation. As described in the Statistical Methods section above, the estimated coefficients, which can be interpreted as relative odds, are presented. Model I includes non-program factors that may act as markers. Maternal race and

⁹ Poverty level measures the income of the respondent's family relative to the federal poverty level for a family of that size. Hence, a poverty level of one indicates a family income at the federally specified poverty level. To be income eligible for WIC, individuals' total family income cannot exceed 185 percent of the Federal poverty income guidelines for that family size. However, Congress authorized persons already receiving, or who have certain family members who receive benefits from the Food Stamp Program, Medicaid Program, or Temporary Assistance for Needy Families (formerly called Aid to Families With Dependent Children – AFDC) to be automatically considered income eligible for the WIC Program. As in many other surveys, some respondents (25%) were reluctant to report their income. In order to be able to include these respondents in the analyses, an indicator was constructed – whether a respondent reported her income. In the WIC-IFPS, a major concern about reporting income may be that the WIC Program has an income eligibility criterion. This may result in some concern about reporting income for the respondents who have higher levels of income. The poverty level indicator is entered in multivariate analysis models together with the indicator for income reported. The estimated coefficient of the poverty level indicator can only be interpreted for those respondents who reported their income. For these respondents only, this coefficient quantifies the association between poverty level and the outcome of interest.

Table IV.2 Estimates of the relative odds estimated by the logistic regression model of breastfeeding initiation (N=874).

Predictors	Relative Odds ¹			
	Model I	Model II	Model III	Model IV
SOCIO-DEMOGRAPHIC CHARACTERISTICS				
Age of the mother at birth of child	1.02	1.02	1.02	1.02
African American	.53*	.58*	.66	.63
Hispanic	2.90**	1.77*	1.95*	2.02*
Immigrant status - foreign born	5.54**	5.60**	5.48**	5.42**
Birth order of the infant - firstborn	1.18	2.71**	2.85**	2.86**
Father of the infant lives with the mother	1.93**	1.74*	1.79*	1.77*
Maternal education	1.15**	1.09*	1.08*	1.08*
Income reported	1.98*	2.87**	2.93**	2.90**
Poverty level	.75	.58*	.57*	.57*
SOCIAL CONTEXT				
Receipt of advice to breastfeed from the grandmother or relatives		1.83*	1.65*	1.68*
Mother breastfed previous children		8.40**	7.70**	7.76**
HOSPITAL PRACTICES				
Length of hospital stay of the mother		.87*	.86*	.86
Receipt of formula or bottle from the hospital gift package		.52	.51	.50
SOURCES OF NUTRITION ADVICE OTHER THAN WIC				
Receipt of advice to breastfeed from physician		2.39**	2.26**	4.23**
Receipt of information about breastfeeding elsewhere		1.96**	1.78**	1.75**
WIC PROGRAM COMPONENTS				
Knowledge of the special WIC breastfeeding food package ²			1.99**	1.92**
Maternal report on receipt of information about breastfeeding from WIC ³			1.26	1.64*
Maternal report on receipt of advice to breastfeed from WIC ⁴			1.14	1.16
INTERACTION OF WIC PROGRAM COMPONENTS AND PHYSICIAN'S ADVICE				
Effect of maternal report on receipt of information about breastfeeding from WIC, for those mothers who received breastfeeding advice from their physicians				0.40**

Notes:

1. Relative odds greater than one imply that the characteristic considered is associated with higher odds of breastfeeding initiation. Relative odds less than one imply that the characteristic considered is associated with lower odds of breastfeeding initiation.
2. The answer to the question "Have you been told that there is a special WIC food package for breastfeeding women who do not accept infant formula from WIC?" is "yes."
3. The answer to any one of the three questions "Have you received information or advice from the WIC office about (1) benefits of breastfeeding?, (2) how to breastfeed?, or (3) mother's diet while breastfeeding?" is "yes."
4. The answer to the question "Have WIC program staff told you that you should breastfeed?" is "yes."

* p≤.05

** p≤.01

ethnicity, as well as maternal immigrant status, are strong and significant predictors of the decision to breastfeed. As indicated by the previous studies, African American mothers are less likely to initiate breastfeeding (relative odds of 0.53) and Hispanic mothers, as well as foreign-born mothers, are more likely to breastfeed. Indeed, the odds of a Hispanic mother breastfeeding are almost three times that of a white mother breastfeeding. Mothers who were born outside the United States have odds of breastfeeding that are 5.5 times that for native-born mothers.

The presence of the father of the infant in the household (regardless of the marital status of the mother) is a significant contributor to the initiation of breastfeeding. If the father is present in the household, the mother's odds of breastfeeding are predicted to almost double.

Highly educated mothers are more likely to initiate breastfeeding. Each additional year of education is associated with a significant increase in the odds of breastfeeding. The relative odds associated with reporting of income and the measure of the poverty level must be jointly interpreted. Among the respondents who reported their income, higher income-to-poverty ratios are associated with lower odds of breastfeeding. While the poverty level measure is not significantly associated with the odds of breastfeeding in Model I, it is significant in Models II through IV, which control for additional non-program and program components. Those respondents who did not report their income have approximately the same odds of breastfeeding as those respondents who reported their income and who have an income that is 2.6 times the federal poverty level ($1.98/.75 = 2.6$).

✓ Mothers who breastfed previously have a very high likelihood of breastfeeding again.

Model II in Table IV.2 includes factors describing the social context of maternal breastfeeding decisions as well as the factors describing the hospital practices and receipt of nutrition advice from sources other than WIC. One of the most important predictors of breastfeeding is the previous breastfeeding history. Mothers who breastfed previous children have predicted odds of initiation of breastfeeding that are over eight times larger than those for mothers who did not breastfeed previous children.

- ✓ Endorsement of breastfeeding by the immediate family of WIC mothers is strongly and positively associated with breastfeeding initiation.

Mothers who receive advice to breastfeed from their own mothers or other relatives are significantly more likely to breastfeed. Such advice predicts an almost twofold increase in odds of breastfeeding. These findings underscore the importance of the social context of breastfeeding.

As expected, longer postnatal hospital stays, indicative of maternal postnatal health problems, are associated with a diminished likelihood of breastfeeding initiation. Every additional day of hospital stay is associated with a reduction in the odds of breastfeeding by 13 percent (relative odds .87). Receipt of formula or bottle from the hospital, controlling for other maternal characteristics, does not significantly predict breastfeeding initiation. For more information on hospital practices associated with breastfeeding, see Chapter V.

- ✓ Receipt of information about breastfeeding from sources other than WIC and receipt of advice to breastfeed from a physician are positively associated with breastfeeding initiation.

Model II also includes factors describing breastfeeding advice the mothers may have received from sources other than WIC. Two such sources are considered. Mothers who report receiving advice from their physicians to breastfeed have more than two times the odds of initiating breastfeeding as compared to the mothers who do not report receiving such advice. Furthermore, the mothers who receive information about breastfeeding somewhere other than in WIC (for example, hospital birthing classes) have almost double the odds of initiating breastfeeding.

In Model III, knowledge of the special WIC food package for breastfeeding women, report of receipt of information about breastfeeding from WIC, and receipt of advice to breastfeed from WIC are considered. Among these three program components, maternal knowledge about the special WIC food package for breastfeeding women is the only significant predictor of the odds of initiating breastfeeding. The women who know about this food package have almost double the odds of initiating breastfeeding.

Data on the knowledge of the WIC special breastfeeding package and receipt of information about breastfeeding from WIC were elicited in the Month 2 interview. It is

possible that the mothers who initiated breastfeeding found out about the breastfeeding package subsequent to their decision to breastfeed. It is also possible that some mothers received information about breastfeeding after the birth of the infant. By including these predictors in the model of breastfeeding initiation, the assumption that these predictors were fixed prior to the birth of the infant is implied. To the extent that this assumption may be incorrect, the coefficients estimated for these predictors must be cautiously interpreted. Additional analyses using limited data on prenatal WIC breastfeeding education in a subsample showed that the conclusions regarding the effects of WIC Program components remain unchanged when the analyses are limited to prenatal data.

The lack of a significant association between the report of receipt of information from WIC about breastfeeding and initiation of breastfeeding leads to some further consideration about the way WIC Program components may be related to breastfeeding initiation. When examined in a descriptive context, breastfeeding initiation rate is significantly associated with the receipt of information about breastfeeding from WIC. Among the WIC mothers who received information about breastfeeding from WIC, 61 percent initiated breastfeeding as opposed to 44 percent among those who did not receive information about breastfeeding.

The association between some WIC Program components and breastfeeding initiation may not be significant in the multivariate analyses because the receipt of these program components (for example, receipt of information about breastfeeding) may be a significant contributor to breastfeeding initiation in one group of WIC mothers but not another group. For example, if a group of WIC women has very high rates of breastfeeding initiation, WIC Program components may have a marginal effect in increasing the breastfeeding rates in that group.

A likely scenario is that the women who receive strong professional support for breastfeeding somewhere other than WIC (such as their health care providers) may not benefit from WIC Program components supporting breastfeeding as much as the women who do not receive breastfeeding support elsewhere. The following analyses support this hypothesis.

There is a much larger group of WIC mothers who receive information about breastfeeding from WIC (64%) than those who receive breastfeeding advice from their physicians (39%). Nevertheless, there is a considerable degree of overlap between the WIC mothers who receive information and advice on breastfeeding from WIC and those

who receive such information and advice from other sources. Among the mothers who receive breastfeeding information from WIC, 46 percent also receive advice to breastfeed from their physicians. In contrast, only one-quarter of the women who do not receive breastfeeding information from WIC receive breastfeeding advice from their physicians. It is possible that this association may arise because of the referral linkage between WIC clinics and prenatal care providers.

It is likely that the breastfeeding information received from WIC is most helpful in encouraging breastfeeding among women who do not receive such information from their physicians. This latter group of women constitutes about 35 percent of all WIC women. Only about 9 percent of women report receiving breastfeeding advice from their physicians but receiving no breastfeeding information from WIC.

✓ Among the mothers who do not receive advice to breastfeed from their physicians, those who receive information about breastfeeding from WIC are significantly more likely to initiate breastfeeding than those who do not receive information from WIC.

Model IV in Table IV.2 tests the hypothesis that receipt of breastfeeding information from WIC may differentially predict breastfeeding initiation rates depending on whether the mother received advice to breastfeed from a physician. It includes an indicator that quantifies the effects of receipt of breastfeeding information from WIC for those mothers who also received breastfeeding advice from their physicians. The relative odds estimated for this indicator are significant, supporting the hypothesis that the WIC breastfeeding education program may differentially influence breastfeeding initiation, depending on other sources of

professional breastfeeding support that a mother receives. The relative odds estimated for receipt of information about breastfeeding from WIC are significant, predicting a 1.6-fold increase in the odds of breastfeeding initiation among the mothers who do not receive breastfeeding advice from their physicians. In order to clarify the complex effects of these relative odds, predicted probabilities of breastfeeding initiation are estimated for women who received breastfeeding advice and information from different sources based upon the results of Model IV. Figure IV.3 displays these predicted relative odds of breastfeeding initiation for three groups of mothers:

- (1) Received no information about breastfeeding from WIC and no advice to breastfeed from the physician
- (2) Received information about breastfeeding from WIC but no advice to breastfeed from the physician
- (3) Received information about breastfeeding from WIC and advice to breastfeed from the physician.

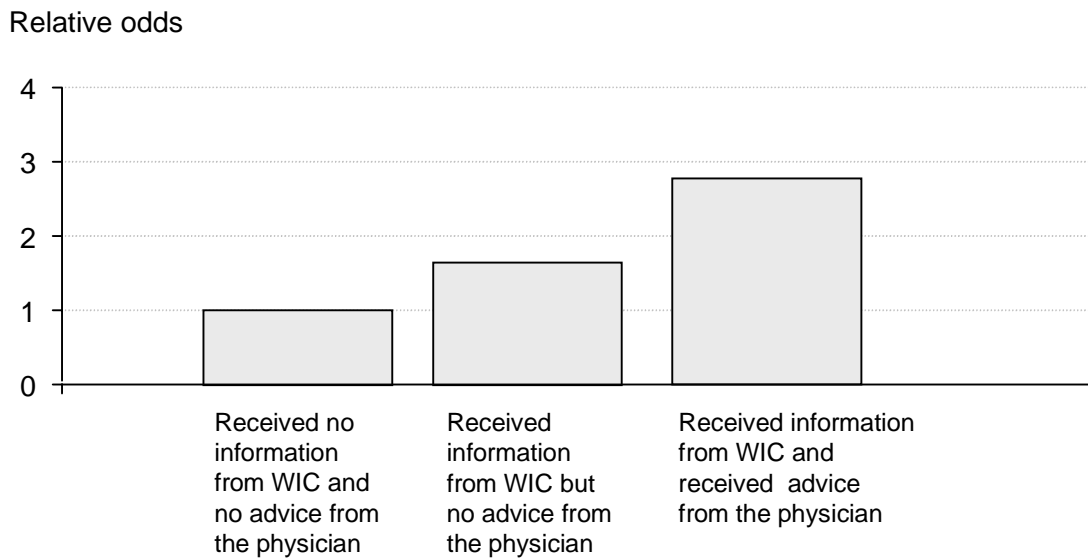


Figure IV.3. Relative odds of initiating breastfeeding for WIC mothers who received breastfeeding information and advice from different sources.

Although the relative odds of initiating breastfeeding for women who received breastfeeding advice from their physicians alone are estimated, this group of WIC mothers constitutes a very small minority (9%). As Figure IV.3 indicates, the WIC Program appears to have a significant contribution to the odds of initiating breastfeeding among the mothers who did not receive advice to breastfeed from their physicians.

Conclusions

Breastfeeding initiation appears to be increasing. Slightly over one-half of WIC participants initiate breastfeeding. This estimate is substantially higher than that by Schwartz et al. (1995), which dates back to 1988. It is possible that breastfeeding rates of WIC participants have increased between 1988 and 1995 the year of the WIC-IFPS data. Such an increase may be expected on the basis of the general trend of increasing rates of breastfeeding from the 1960s through early 1980s, slight decline until the late 1980s, and then modest increase in the early 1990s (GAO, 1993; Ryan et al., 1991b). This increase may also have been promoted by WIC's concerted breastfeeding support program since 1988 (Macro International & Urban Institute 1995). Although the breastfeeding rate of 56 percent is higher than past estimates, it is still lower than the targeted breastfeeding rate of nearly 75 percent (at hospital discharge) by the year 2000 (USDHHS, 1990).¹⁰

The analyses of the factors associated with breastfeeding initiation yield results that are consistent with the findings of previous studies. Race and ethnicity, immigrant status, age, education differentials, and differentials by father presence are significant. The estimated breastfeeding rate for African American WIC mothers is two-thirds that of white mothers. The analyses of non-program factors indicate that African American race and longer hospital stays (probably indicative of poor maternal health) are markers for a high likelihood of not breastfeeding. On the other hand, Hispanic ethnicity, being an immigrant, having higher education, living with the father of the infant, having support for breastfeeding from relatives, and having

¹⁰ Further information on breastfeeding rates at hospital discharge can be found in Chapter V.

breastfed previous children are characteristics that indicate higher likelihood of initiating breastfeeding.

In contrast to the findings by Ryan and Martinez (1989), no evidence was found that a short hospital stay is associated with lower rates of breastfeeding initiation. In fact, longer hospital stays are associated with lower rates of breastfeeding initiation, as suggested by Romero-Gwynn & Carias (1989). In the absence of further information from the WIC-IFPS regarding maternal health immediately following the birth, a longer hospital stay is interpreted as indicative of maternal health problems following birth.

The findings of this study support the role of the social context in shaping infant feeding practices. Mothers who breastfed their previous children have odds of breastfeeding that are about eight times those for the mothers who never breastfed. Previous research has similar findings (Bevan et al., 1984). This finding underscores the importance of first-time mothers as a potential target group for nutrition education programs in order to initiate a healthy pattern of infant feeding practices. It is likely that if a first-time mother is persuaded to initiate breastfeeding, not only does her firstborn infant benefit, but her future infants do as well. On the other hand, the firstborn children are significantly more likely to be breastfed than later-born children of mothers who have never breastfed. In sum, the mothers of later-born children who did not breastfeed their previous children constitute the group that is least likely to breastfeed. Mothers in this group may also be less likely to modify their behavior due to programmatic intervention, since they have established a behavioral pattern. Endorsement of breastfeeding by the immediate family of WIC mothers is also associated with higher odds of breastfeeding initiation. This conclusion has also been reached by other recent studies of breastfeeding initiation (Frederickson et al., 1993; Freed et al., 1992).

Receipt of information about breastfeeding and professional medical counselling on breastfeeding are positively associated with breastfeeding initiation. Other studies have found that only a minority of women report having received any advice on infant feeding from their health care providers (Losch et al., 1995). This is also true of the WIC mothers. Only two-fifths of WIC mothers report receiving breastfeeding advice from their physicians, even though such advice appears to be very effective. For the mothers who do not receive breastfeeding advice from their physicians, receiving breastfeeding information from WIC significantly increases the likelihood of initiation of breastfeeding. It appears that the WIC breastfeeding education program, by reaching a larger group of

mothers than that reached by physicians, is able to encourage a group of women to breastfeed. Similar results were found in the NMIHS analysis by Schwartz et al. (1992, 1995); mothers who reported having received advice to breastfeed from the WIC Program during the prenatal period were more likely to initiate breastfeeding.

Knowledge about the special food package for breastfeeding women is significantly and positively associated with initiation of breastfeeding. This finding should be carefully interpreted. A significant positive association may be due to two reasons. The special food package may act as an incentive, and the women who know about the availability of the special food package may want to benefit from it by breastfeeding. Alternatively, this finding may be due to the postnatal measurement of the indicator of knowledge of special breastfeeding food package. In other words, women who breastfeed may have received the special food package and may therefore report knowing about it.

IV.4. Attitudes and Beliefs About Breastfeeding

Research Questions

The purpose of this portion of the report is to describe the attitudes and beliefs of WIC mothers regarding breastfeeding. This is important because WIC serves a distinct population, one with many socio-demographic characteristics previously identified as being associated with low breastfeeding rates (Schwartz et al., 1995). Mothers' attitudes and beliefs are considered to be among the program factors associated with infant feeding practices (see Section III.2) and are therefore of great importance to WIC. A recent review article on the impact of attitudes on infant feeding decisions also notes that attitudes provide a great potential as intervention targets (Losch et al., 1995). The guidelines for breastfeeding promotion issued by the NAWD (NAWD, 1990, 1994) stress the need to monitor the attitudes of WIC mothers as one component of an effective breastfeeding promotion program. Specifically, the NAWD guidelines recommend that questions regarding breastfeeding attitudes be included in the annual participant survey in order to design more effective programs.

Thirty questions were asked at the Month 2 interview about breastfeeding attitudes and beliefs in the WIC-IFPS. The analyses of these data have three goals:

- (1) Summarize the information contained in the 30 attitude/belief questions of the WIC-IFPS.

- (2) Describe the breastfeeding attitudes/beliefs of WIC mothers with different socio-cultural backgrounds.
- (3) Identify attitudes and beliefs that indicate a relatively low level of support for breastfeeding.

Because all 30 attitudinal items cannot be used in multivariate analyses of infant feeding practices, summary measures were constructed for inclusion in the multivariate models. These summary measures are also described in this section.

Main Findings

- ✓ There are two dimensions of breastfeeding attitudes and beliefs. One group of items constitutes attitudes and beliefs about the perceived benefits of breastfeeding, and one group of items constitutes attitudes and beliefs about perceived barriers to breastfeeding.
- ✓ Hispanic women perceive more benefits of breastfeeding than any other group. African American women perceive more barriers to breastfeeding than any other group.
- ✓ Breastfeeding mothers are more likely than non-breastfeeding mothers to express positive attitudes/beliefs about breastfeeding.

See the Results section for more information on these findings.

Previous Studies

Losch and colleagues (Losch et al., 1995) have recently reviewed more than 200 papers on the relationships between maternal attitudes about infant feeding and choices regarding actual feeding patterns. They concluded that women who breastfeed are more likely to be aware of the benefits of breastfeeding (particularly the health benefits for the infants) and less likely to be concerned about issues such as embarrassment, fear of discomfort, limitations on freedom and social life, and potential lack of the father's involvement in feeding. The primary positive attribute of formula feeding is that mothers who choose this method believe it to be more convenient; however, breastfeeding women also tend to believe that their chosen method is more convenient. Formula-feeding mothers are also generally aware of the health benefits of breastfeeding, but perceive the other issues surrounding breastfeeding as barriers to successful breastfeeding.

Most of the studies that have examined infant feeding attitudes have been surveys conducted after the birth of the infant. A study among WIC clients in rural Maryland is unusual in that mothers were interviewed during pregnancy and then again one to three weeks postpartum (Gielen et al., 1992). The mothers' prenatal beliefs about various aspects of infant feeding (including both benefits and barriers issues), which the authors term "behavioral beliefs," were found to be significantly related to whether the infant was breastfed or formula fed. The largest differences between breastfeeding and non-breastfeeding mothers were for the questions about the ease and convenience of each feeding type. Prenatal responses indicated that the mothers believed their choice of feeding to be the easier and more convenient.

The most common reason for choosing to breastfeed among Missouri WIC mothers was that it was better for the baby's health (26%); the next most frequent responses were ease and convenience and expense (McClurg-Hitt & Olsen, 1994). When formula feeders were asked about the reason for their choice, the most common responses were that they did not feel comfortable about breastfeeding, they did not like the idea, or that they would be embarrassed.

A survey of teenage WIC mothers in Louisiana reported that most had positive attitudes about issues such as breastfeeding being better for the infant and making the mother and baby closer (Robinson et al., 1993), but less than 10 percent actually breastfed. Again, such issues as embarrassment, concern about appearance, belief that breastfeeding hurts, and statements about not knowing enough about breastfeeding were common.

A recent breastfeeding promotion project among pregnant WIC participants in North Carolina identified four barriers to breastfeeding: embarrassment, lack of family and social support, ignorance of how to breastfeed, and lack of awareness of WIC support for breastfeeding (Fredrickson et al., 1993). On average, they could correctly answer only 2.3 of the 10 questions about benefits of breastfeeding and how to breastfeed. These scores were significantly related to the intention to breastfeed.

Black and colleagues documented that, among women at a Georgia WIC clinic, a scale quantifying positive attitudes toward breastfeeding had the strongest impact on choice of infant feeding method (Black et al., 1990). Father's preferred method was the second most important variable.

Statistical Methods

Mothers were read a series of questions to ascertain their attitudes and beliefs about breastfeeding. For each statement, the respondent was asked to choose between “agree,” “disagree,” and “not sure.” The study design specified that these questions would be asked twice, at the prenatal and Month 2 interviews. However, due to difficulties in locating mothers prenatally, the non-response rate for the prenatal questionnaire is very high. Only the results from the Month 2 interview are presented here.¹¹

For the descriptive component of these analyses, the percentages of women who agreed, disagreed, and were unsure were estimated for each of the 30 questions, for the study group as a whole, for the racial/ethnic subgroups, and for women who did and did not breastfeed. Differences in the distributions of these percentages were compared for the four racial/ethnic groups and for the two breastfeeding strata. The group differences in these percentages were tested for significance using a chi-square test adjusted for clustered stratified sampling design.

Two alternative strategies were considered for incorporating the attitude/belief questions as predictor variables in the multivariate analysis of feeding: (1) selecting several of the items that were considered to be of greatest importance and including each of those items in the multivariate analyses, or (2) creating composite scales from large sets of related items. The latter approach was selected because the first approach discards information from many of the questions of interest. Furthermore, composite scales have *psychometric* properties that render them more desirable than single attitudinal items. For example, the *internal reliability* of a composite scale is always higher than that of a single item.

The composite scales of attitudes and beliefs must meet two criteria:

- They must quantify meaningful aspects of attitudes and beliefs; i.e., they must be conceptually valid.
- They must be empirically distinct from each other, or uncorrelated, so that each scale’s individual and unique contributions to feeding practices can be identified.

¹¹ Responses to the attitude questions were obtained from 344 women prenatally, of whom 304 were again interviewed at Month 2. Two-thirds of these women had approximately the same perceived benefits score at both times (defined as a postnatal score that was within 10 percentage points of their prenatal score) and three-fourths had about the same score on the perceived barriers scale. The correlation coefficient for prenatal-postnatal comparisons was 0.72 for each scale. Furthermore, breastfeeding status was not associated with whether the score had changed between prenatal and postnatal measurements.

In order to create these composite scales from the 30 individual attitude/belief questions, a factor analysis was conducted. A factor analysis identifies common patterns among groups of items and creates a composite “factor” for each such group. These factors are designed to be uncorrelated with each other.

The items that constitute each factor, as identified by the factor analysis, were then analyzed for *construct validity* and *internal reliability*. Items that did not appear to fit conceptually with the other items in that factor were eliminated. Next, reliability analysis was conducted to estimate the degree to which the items appear to be the indicators of a single construct. Finally, *additive scales* were constructed using the set of items that were identified as pertaining to each factor. The scores on each question within a factor (disagree = 1, not sure = 2, agree = 3) were summed. These additive scales were then rescaled to range from 0 to 100, for ease of interpretation. A score of 100 indicates that the mother agreed with all of the items incorporated in that scale; a score of 50 indicates that she, on average, agreed with half of the items.

After these composite summary measures were computed, they were used as predictor variables in multivariate models of infant feeding practices (see Sections IV.5 and VII.4).

Results

The WIC-IFPS questionnaire includes 30 items that were initially conceived as representative of attitudes or beliefs about five dimensions of breastfeeding: convenience, logistics, embarrassment, infant health, and other miscellaneous attitudes. Factor analysis was conducted to investigate whether, indeed, the responses to the 30 items aligned along these five dimensions.

- ✓ There are two dimensions of breastfeeding attitudes and beliefs. One group of items constitutes attitudes and beliefs about the perceived benefits of breastfeeding, and one group of items constitutes attitudes and beliefs about perceived barriers to breastfeeding.¹²

The analysis of 30 items indicates two major factors, rather than the five originally hypothesized. These two factors account for almost one-quarter of the variance of the collective set of 30 items. The two factors consist of questions related to the perceived

¹² Some of the 30 attitude/belief items do not contribute significantly to either factor.

Table IV.3. Items that constitute the perceived benefits of breastfeeding and perceived barriers to breastfeeding scales.¹

Perceived Benefits of Breastfeeding	Perceived Barriers to Breastfeeding
(1) Breastfeeding helps protect the baby from diseases.	(1) Breastfeeding takes too much time.
(2) Breastfeeding will protect your baby against ear infections.	(2) Breastfeeding would tie you down.
(3) Breastfed babies are healthier than bottlefed babies.	(3) Women who breastfeed have a hard time finding the right kind of clothes to wear.
(4) Breastfeeding will protect your baby against diarrhea.	(4) Breastfeeding interferes with people's sex lives.
(5) Breastfeeding is easier than bottle feeding.	(5) Breastfeeding means you can't go back to work or school.
(6) Breastfeeding brings a mother closer to her baby.	(6) Breastfeeding will make your breasts sag.
(7) Breastmilk alone gives a new baby all he/she needs to eat.	(7) Breastfeeding is painful.
(8) Breastfeeding helps women lose weight.	(8) A man feels left out if a woman breastfeeds.
(9) Breast pumps are easy to use.	(9) Breastfeeding means no one else can feed your baby.
	(10) Your breasts are too small to breastfeed.
	(11) You would be afraid breastmilk would leak onto your clothes.
	(12) With bottle feeding, the mother knows that the baby is getting enough to eat.
	(13) You would not want to breastfeed in public.

Note:

1. Some of 30 attitude/belief items do not contribute significantly to either factor.

benefits of breastfeeding and the perceived barriers to breastfeeding. After the elimination of the items that are conceptually different from the “benefits” and “barriers” dimensions, 9 items remain in the benefits scale and 13 in the barriers scale. Table IV.3 lists these items. The two additive scales constructed from the items indicated in Table IV.3 have high internal reliability, the coefficient measuring internal reliability (i.e., Cronbach’s alpha) being 0.7 (range 0 - 1).

In the multivariate analyses of infant feeding practices, the perceived benefits and perceived barriers scales are used as predictor variables. In other words, mothers who believe strongly that breastfeeding is beneficial (i.e., those who had higher benefit scale scores) are expected to have lesser likelihood of formula supplementation and longer durations of breastfeeding. Similarly, mothers who perceive more barriers to breastfeeding (i.e., those who had higher scores on the barriers scale) are expected to have a higher likelihood of formula supplementation and shorter durations of breastfeeding. These hypotheses are tested in Sections IV.5 and VII.4.

Mothers' responses to the individual questions incorporated in the benefits scale are shown in Table IV.4. The items that are statistically the most important in the perceived benefits scale are the four questions related to infant health.¹³ Three-fourths of mothers believe that breastfeeding helps protect the baby from disease, and two-thirds believe that breastfed babies are healthier than bottle-fed babies. However, there is less consensus regarding protection from specific diseases; just under half know that breastfeeding protects against ear infections and one-third know that it protects against diarrhea. About three-fourths believe that breastfeeding makes the mother and baby close and that breastmilk alone is

¹³ Statistical importance is defined as the items with the highest *factor loadings*.

Table IV.4. Percentage of mothers agreeing with the nine statements about perceived benefits of breastfeeding.

Maternal Attitudes and Beliefs	Percentage Agreeing with Statement						
	Total	Race/Ethnicity				Breastfeeding Status	
		White	African American	Hispanic	Other	Initiated Breastfeeding	Did not Breastfeed
Breastfeeding brings a mother closer to her baby.* ⁺	81	75	81	93	96	94	64
Breastfeeding helps protect the baby from diseases.* ⁺	77	76	64	93	80	92	58
Breastmilk alone gives a new baby all he/she needs to eat.* ⁺	71	69	59	86	73	85	53
Breastfed babies are healthier than bottlefed babies.* ⁺	61	51	62	86	63	77	42
Breastfeeding helps women lose weight. ⁺	53	52	42	70	52	68	35
Breastfeeding is easier than bottle feeding.* ⁺	50	43	40	76	63	73	23
Breastfeeding will protect your baby against ear infections* ⁺	46	39	44	66	52	60	30
Breast pumps are easy to use.* ⁺	44	36	38	68	41	57	27
Breastfeeding will protect your baby against diarrhea.* ⁺	36	25	33	65	53	48	22

Notes:

* Chi square statistic testing the race/ethnicity differences is significant at $p < .05$.

⁺ Chi square statistic testing breastfeeding status differences is significant at $p < .05$.

sufficient for a newborn. Half think that breastfeeding is easier than bottle feeding, that breast pumps are easy to use, and that breastfeeding helps mothers lose weight.

Mothers' answers to the questions in the perceived barriers scale are displayed in Table IV.5. Statistically, the most important items are breastfeeding takes too much time (34% agreement), breastfeeding would tie you down (41% agreement), breastfeeding women have trouble finding the right clothes (24% agreement), and breastfeeding interferes with people's sex lives (11% agreement).¹⁴ Only 13 percent believe that breastfeeding mothers cannot go back to school or work. About 30

¹⁴ The complete distribution of responses to all 30 attitudinal items for all women by race/ethnicity and by breastfeeding status is given in Appendix I.

Table IV.5. Percentage of mothers agreeing with the 13 statements about perceived barriers to breastfeeding.

Maternal Attitudes and Beliefs	Percentage Agreeing with Statement						
	Total	Race/Ethnicity				Breastfeeding Status	
		White	African American	Hispanic	Other	Initiated Breastfeeding	Did not Breastfeed
With bottle feeding, the mother knows that the baby is getting enough to eat.	76	75	75	78	72	74	77
You would not want to breastfeed in public.* ⁺	61	60	68	55	54	50	74
Breastfeeding means no one else can feed your baby.* ⁺	48	35	64	58	57	42	54
You would be afraid breastmilk would leak onto your clothes.* ⁺	46	45	61	36	36	39	56
Breastfeeding would tie you down. ⁺	41	41	50	34	37	33	51
Breastfeeding is painful.* ⁺	39	32	50	47	33	43	35
Breastfeeding takes too much time. ⁺	34	30	40	39	32	27	42
A man feels left out if a woman breastfeeds. ⁺	32	31	36	27	37	33	31
Breastfeeding will make your breasts sag.* ⁺	29	20	32	49	18	33	24
Women who breastfeed have a hard time finding the right kinds of clothes to wear. ⁺	24	21	28	27	23	22	26
Breastfeeding means you can't go back to work or school.	13	9	10	24	27	13	13
Breastfeeding interferes with people's sex lives. ⁺	11	10	11	16	7	13	9
Your breasts are too small to breastfeed. ⁺	11	7	9	23	13	10	13

Notes:

* Chi square statistic testing the race/ethnicity differences is significant at $p < .05$.

+ Chi square statistic testing the breastfeeding status differences is significant at $p < .05$.

percent are concerned that breastfeeding makes breasts sag and 40 percent believe that breastfeeding is painful. One-third believe a man would feel left out if a woman breastfed and half believe no one else could feed the baby. Just 11 percent believe that their breasts were too small to breastfeed. Half are concerned about breastmilk leakage and more than half are concerned about breastfeeding in public. Three-fourths believe that with bottle feeding the mother knows that the baby is getting enough to eat.

The following items were asked of the WIC-IFPS mothers but were not included in the composite attitude/belief scores, because they were not found to be conceptually related:

- You have enough breastmilk to feed the baby.
- You know a lot about breastfeeding.

- Any woman who wants to can breastfeed.
- There is too much pressure on women to breastfeed.
- Only poor women breastfeed.
- Bottle feeding is more expensive than breastfeeding.
- Women who breastfeed should not take birth control pills.
- Women who breastfeed shouldn't smoke.

✓ Hispanic women perceive more benefits of breastfeeding than any other group. African American women perceive more barriers to breastfeeding than any other group.

Composite scale scores were computed to obtain a score for perceived benefits of breastfeeding and a score for perceived barriers to breastfeeding. Differences by racial/ethnic group in the mean scores of perceived benefits of breastfeeding and perceived barriers to breastfeeding were examined. African American mothers and white mothers have similar scores on the benefits scale but African American mothers have the highest mean score on the barriers scale, indicating that they believe breastfeeding to be an inconvenient method of feeding. Hispanic mothers have the highest mean benefits scale score, indicating their strong belief that breastfeeding is beneficial for the mother and the infant. Nevertheless, their scores on barriers are higher than that for white mothers.

When examining individual attitude/belief items, the most common pattern among the racial/ethnic groups is that Hispanic mothers are the most likely to give responses that are supportive of breastfeeding, whereas African Americans are the least likely to do so; the ranking of whites is generally intermediate. In other words, on all of the perceived benefits items, the percentage who agree with the items is highest for Hispanics; in contrast, for a majority of the perceived barrier scale items, the percentage who agree is lowest for whites, followed by Hispanics. African American women usually have the lowest percentage agreeing with the benefits questions and the highest percentage agreeing with the barrier questions.

✓ Breastfeeding mothers are more likely than non-breastfeeding mothers to express positive attitudes/beliefs about breastfeeding.

Mean benefits and barriers scale scores were also compared for breastfeeding and non-breastfeeding women. The perceived benefits scale score is more strongly associated with breastfeeding status than the perceived barriers scale score, indicating the strong link between the belief in the benefits of breastfeeding and the decision to breastfeed. Nevertheless, a scale score indicating belief in the barriers to breastfeeding is also associated with breastfeeding status.

For virtually all of the 30 individual questions on attitudes and beliefs, mothers who choose to breastfeed express more positive attitudes regarding breastfeeding than did mothers who never initiated breastfeeding (see Appendix I for a table of all 30 items). The strongest relationship is for the question about the ease of breastfeeding; mothers who breastfeed are almost three times more likely than non-breastfeeders to state that breastfeeding is easier than bottle feeding (73% compared to 23%). For most of the other questions, breastfeeders are 1.3 - 2.0 times as likely to give favorable responses. Attitude/belief statements with which breastfeeding women are twice as likely to agree include, "Breastfeeding helps women lose weight," "Breast pumps are easy to use," "Breastfeeding will protect your baby against ear infections," and "Breastfeeding will protect your baby against diarrhea." Interestingly, both breastfeeding and non-breastfeeding mothers generally disagree with the statement that breastfeeding means you can't go back to school or work.

Mothers who do not breastfeed are much more likely to respond that they are not sure about the various attitude/belief statements. Again, this is shown dramatically by the question about whether breastfeeding is easier than bottle feeding; 19 percent of non-breastfeeders answered "not sure," compared to 2 percent of breastfeeders. For many of the questions, less than 5 percent of the breastfeeders said they were not sure, while much larger percentages of non-breastfeeders are unsure. For a few statements, more than 10 percent of breastfeeders, as well as non-breastfeeders, were unsure whether they agreed or disagreed. These statements included, "Breastfeeding helps women lose weight," "A man feels left out if a woman breastfeeds," "Breastfeeding will make your breasts sag," "Breast pumps are easy to use," "Breastfeeding will protect your baby against ear infections," and "Breastfeeding will protect your baby against diarrhea."

It should be noted that breastfeeding status for this analysis was categorized based on whether the mother breastfed her infant at all, not whether the mother breastfed for a long enough time to fully consider advantages and disadvantages of breastfeeding.

Thus, breastfeeding mothers who did not give favorable responses or who were unsure of their feelings on a given question may have breastfed their infants only briefly.

Conclusions

The findings of the WIC-IFPS with regard to breastfeeding attitudes and beliefs are similar to those of Baranowski et al. (1986). They report four attitudinal factors associated with the decision to breastfeed: benefits to the infant, social inconvenience, personal inconvenience, and physical inconvenience. Although the WIC-IFPS data do not indicate significant differentiation between social, personal, and physical inconvenience, they do support the basic distinction between a “benefits” category and a “barriers” or “inconvenience” category.

A recent extensive literature review (Losch et al., 1995) on the relationship between maternal attitudes and infant feeding practices notes that most women are aware of the benefits of breastfeeding, particularly those related to infant health. Those who formula feed are making that decision not because they want to formula feed but because they are rejecting breastfeeding, due to concerns about the process. The authors conclude that “it may ultimately be more important to increase the amount of information provided... about the practical aspects of the breastfeeding process (e.g., ease of night feedings, fathers’ ability to feed mother’s milk by bottle, lower cost, strategies to control leaking) than to rely solely on the positive health outcomes related to breastfeeding.”

For many of the questions in the WIC-IFPS, African American mothers are most likely to give the responses that are not supportive of breastfeeding; in other words, they are the least aware of the benefits of breastfeeding and the most concerned about the barriers to breastfeeding. African American mothers are also the least likely racial/ethnic group to breastfeed.

Comparison of responses to the questions about perceived barriers to breastfeeding in the present study between women who breastfed and those who did not also suggests numerous beliefs that distinguish these two groups. Breastfeeding women are more convinced that breastfeeding is relatively easy, indicating that concern about perceived barriers may be associated with the decision not to breastfeed. While there is no guarantee that changes in attitudes and beliefs will cause changes in breastfeeding practices, the results indicate that programmatic intervention, particularly addressing the perceived barriers, could encourage breastfeeding initiation.

Regarding their physical appearance, breastfeeding mothers are more likely to agree that breastfeeding helps women lose weight and less likely to agree that it will make their breasts sag. However, large percentages among both breastfeeding and non-breastfeeding mothers are unsure about the impact of breastfeeding on their physical appearance.

More than half of the non-breastfeeders report that they do not know a lot about breastfeeding. It is not clear whether the greater knowledge among breastfeeding mothers leads to the decision to breastfeed or is a result of having breastfed. Very few women in either group feel that their breasts are too small to breastfeed. However, many women, regardless of breastfeeding status, think that they do not have enough breastmilk. Belief in insufficiency of breastmilk may be an important barrier to breastfeeding (see Section VII.3. and also Hill & Aldag, 1993).

All of the attitudes and beliefs regarding the impact of breastfeeding on infant health have a strong association with breastfeeding status. Mothers who initiate breastfeeding are significantly more likely than non-breastfeeders to agree with the statements about breastfeeding protecting against disease; about breastfed infants being healthier; and about breastmilk giving a new baby all it needs. Again, while non-breastfeeding mothers may simply not want to accept these statements as being true, it is also possible that more knowledge about these topics may provide an incentive to breastfeed (FNS, 1993a).

The results pertaining to attitudes and beliefs that are presented here are those that were obtained at the Month 2 interview. Attitudinal data collected after delivery are believed to be affected by self-justification, i.e., the provision of responses that justify the (already-made) decision regarding a feeding choice (Aronson, 1965). Thus, the more positive responses expressed by breastfeeding women may have led to their breastfeeding in the first place, but mothers' answers may also be a result of self-justification. Nonetheless, comparison with the limited data available from the prenatal interviews is reassuring regarding the reliability of postnatal reports of breastfeeding attitudes. Thus, it seems that the comparisons presented here between breastfeeding and non-breastfeeding mothers can provide some useful information to guide development of breastfeeding education programs.

Many breastfeeding mothers are concerned about whether they are producing enough breastmilk for their infants, as discussed more extensively in Section VII.3 on nursing problems. Maternal perception of breastmilk insufficiency is widespread, particularly in industrialized countries (Gussler & Briesemeister, 1980; Hillervik-Lindquist, 1991). Although more than three-fourths of WIC mothers agree that any woman can breastfeed, just over half believe that she herself has enough milk. This concern about breastmilk sufficiency, and in particular the lack of agreement between what a woman thinks is possible in general terms, relative to her own insecurity of providing enough milk, has recently been given credence by recent media reports about the "milk insufficiency syndrome" (Wall Street Journal, 1994). It may also reflect transmitted concerns of family members (Duckett et al., 1993).

IV.5. Transition to a Combined Breastmilk and Formula Diet

Research Questions

Understanding the infant health and nutrition implications of breastfeeding requires information not only on whether an infant is breastfed, but also on the relative role of breastfeeding in the infant's diet. The health and nutrition implications of exclusive breastfeeding differ from those of *partial breastfeeding*. In this section, the transition from a breastmilk-only to a combined breastmilk-and-formula diet is examined. Every mother who initiates breastfeeding is assumed to initiate an exclusive breastfeeding diet even for a very short time (one day). The WIC-IFPS data allow the examination of the timing of initiation of formula supplementation.

The extent of breastfeeding is examined in two ways. First the components of the infant's *nursing diet* are examined. The nursing diet may consist of breastmilk only, breastmilk and formula, or formula only.¹⁵ In addition to the components of the nursing diet, *breastfeeding practices* are examined among all infants who breastfeed at all. Breastfeeding practices are divided into three categories: (1) exclusive or predominant breastfeeding (no supplemental foods, no formula); (2) breastfeeding with formula supplementation (no supplemental foods); and (3) complementary breastfeeding (with formula and supplemental foods). While the examination of the nursing diet focuses on the source of milk that the infant receives, the examination of breastfeeding practices focuses on the entire diet of breastfeeding infants.

The following research questions are addressed in this section:

- How do WIC infants' nursing diets change during the first year of life?
- Are the characteristics of the mothers associated with the nursing diets that they choose?
- Among the breastfeeding WIC infants, what percentages are exclusively or predominantly breastfed, breastfed with supplementary formula or milk, and breastfed with supplemental foods?
- How long do WIC mothers breastfeed without supplementing breastfeeds with formula?
- What non-program and program factors predict the likelihood of formula supplementation?

The WIC Program encourages mothers to breastfeed exclusively (FNS, 1993a). In fact, WIC counselors are advised not to give any unwanted or unneeded formula so that formula supplementation does not begin unnecessarily or become regarded as "normal" (FNS, 1993a; NAWD, 1994). Furthermore, the enhanced breastfeeding food package that was recently added to WIC food packages is designed to promote and support exclusive breastfeeding. NAWD (1994) recommends that mothers who breastfeed are provided with information about the negative impact of formula supplementation on the supply of breastmilk.

¹⁵ A very small portion of infants in early infancy receive neither breastmilk nor formula. This proportion is under 2 percent during the first 4 months.

Since there are concerns about inappropriate formula supplementation (FNS, 1993a), it is important to identify its predictors. Analyses presented in this section investigate the predictors of the initiation of formula supplementation. These analyses provide information about the relative role of breastfeeding attitudes/beliefs and WIC Program components in the initiation of formula supplementation. These analyses also indicate the subgroups of WIC mothers who are highly likely to initiate formula supplementation. The role of formula supplementation in the weaning process is examined in Chapter VII.

Figure IV.4 displays the non-program and program factors considered as predictors of initiation of formula supplementation among breastfeeding infants. The following non-program factors were considered:

- **Socio-demographic characteristics:** maternal age, race and ethnicity, immigrant status, birth order of the infant, maternal household size, father presence in the household, poverty level of the mother,¹⁶ maternal receipt of public assistance, education, maternal employment status, and use of non-maternal child-care¹⁷
- **Health-related characteristics:** experience of breastfeeding problems and birthweight of the infant
- **Social context:** receipt of advice to breastfeed from the grandmother, relatives, or friends, and breastfeeding of previous children

¹⁶ A variable was included that indicated if the mother reported her income.

¹⁷ Maternal employment status and use of child care may vary each month. They were incorporated in the model as a time-varying predictors.

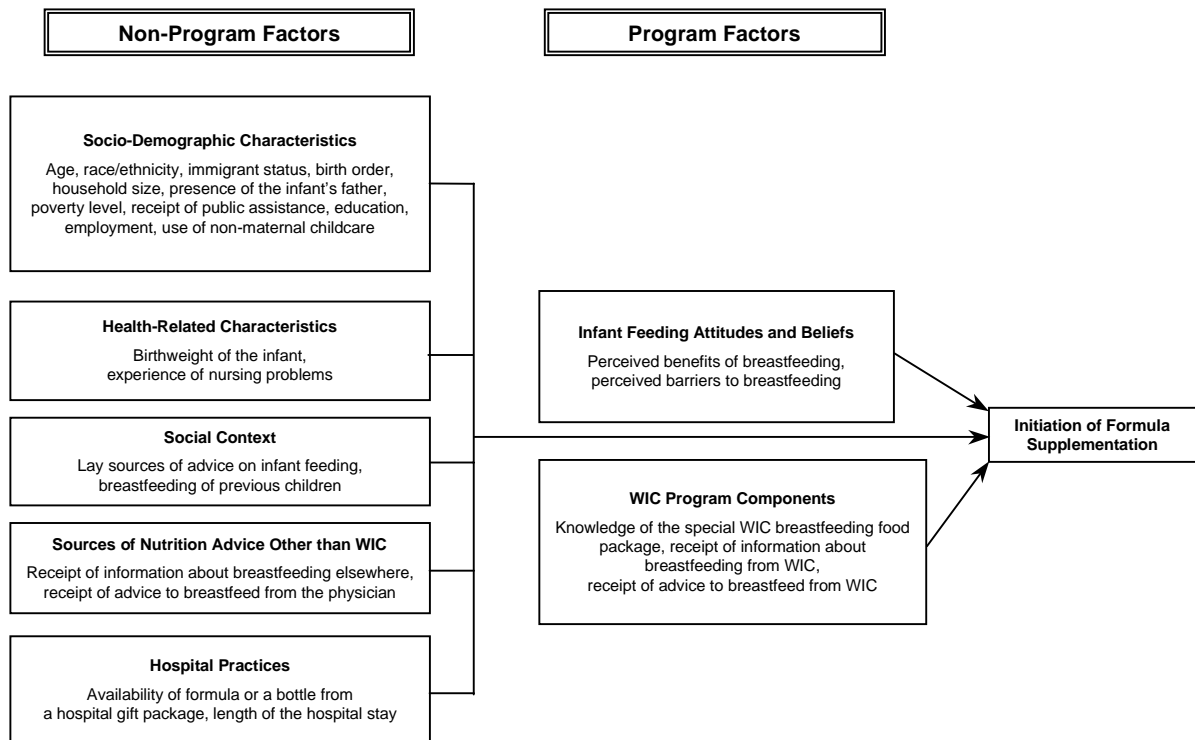


Figure IV.4. A model of initiation of formula supplementation and the measures of its predictors available from the WIC-IFPS.

- **Sources of breastfeeding advice other than WIC:** receipt of advice to breastfeed from the physician, and receipt of information about breastfeeding somewhere other than WIC
- **Hospital practices:** availability of formula or a bottle from the hospital gift package, and the length of the hospital stay.

In addition, the following program factors were considered:

- **Infant feeding attitudes/beliefs:** perceived benefits of breastfeeding and perceived barriers to breastfeeding
- **WIC Program components:** knowledge of the special WIC breastfeeding food package, receipt of information about breastfeeding from WIC, and receipt of advice to breastfeed from WIC.

Main Findings

- ✓ The percentage of WIC infants who are breastfed without formula supplementation through their infancy is very small.
- ✓ Maternal race and ethnicity, immigrant status, and maternal education are significantly associated with the choice of nursing diets. Hispanic mothers, mothers born outside the United States, and highly educated mothers are more likely to choose nursing diets that involve some breastfeeding.
- ✓ In addition to formula supplementation of breastfeeding, substantial proportions of breastfeeding infants also receive some supplemental foods during the first few months.
- ✓ Formula supplementation occurs quite early among breastfeeding mothers, with one-half initiating formula supplementation about the time their infants are two weeks old.
- ✓ Mothers who report having problems with their breastmilk are 70 percent more likely to initiate formula supplementation.
- ✓ Perceived benefits of breastfeeding are associated with lower likelihood of formula supplementation. Furthermore, the differences in formula supplementation between African American and white mothers appear to be mostly due to the differences in perceived benefits of breastfeeding.
- ✓ Knowledge of the special WIC breastfeeding food package is significantly associated with lower likelihood of initiating formula supplementation.

See the Results section for more information on these findings.

Previous Studies

The issues of formula supplementation and exclusive/partial breastfeeding have not been extensively studied, mainly for two reasons: (1) retrospective reporting of initiation of formula supplementation is not likely to be accurate and (2) longitudinal and frequent interviews are necessary to understand the changes in the nursing diets of infants. No such national studies existed prior to the WIC-IFPS. However,

NAWD (1994) recommends that the WIC nutritionists collect data on breastfeeding patterns to get a better picture of the infant feeding practices of the WIC mothers, and to better focus the breastfeeding promotion activities.

Formula supplementation is thought to be detrimental to breastfeeding. The introduction of formula among breastfeeding infants is thought to influence the ultimate duration of breastfeeding (American Academy of Pediatrics, 1993: 6; Oski, 1994). Other studies found strong indication that formula availability may decrease breastfeeding (Bevan et al., 1984; Hill, 1991).

In a study of milk insufficiency, it was found that higher proportions of breastfeeding mothers who reported milk insufficiency initiated formula supplementation than mothers who did not report insufficiency (Hill & Aldag, 1993). In a study of Hawaii WIC mothers, age of the mother was associated with exclusive breastfeeding, with mothers older than 29 years having the highest rates (Novotny et al., 1994). Evidence from local studies indicates that large proportions of breastfeeding WIC mothers introduce formula early in infancy. Hill (1991) found that 58 percent of breastfeeding mothers initiated formula by 14 days. Bevan et al. (1984) found that about half of the breastfeeders supplemented with substantial amounts of formula and two-thirds supplemented with supplemental foods. They also found that two-thirds of the mothers initiated formula by one month of age.

Statistical Methods

The WIC-IFPS elicited a variety of information about the nursing diet of the infant. First, at each month of interview, data were collected about the infant's nursing diet during the week preceding the interview. For each month of interview, the following four nursing diets can be delineated:

- infants who are receiving breastmilk and no formula
- infants who are receiving breastmilk and formula
- infants who are receiving formula only
- infants who are receiving neither breastmilk nor formula.

Among the breastfeeding infants (the first two groups listed above), WIC-IFPS data from each month of interview distinguish among the following three breastfeeding practices (Labbok & Krasovec, 1990; WHO/UNICEF 1991):

- infants who are exclusively or predominantly breastfeeding: These infants receive almost all nutrients from breastmilk. They do not receive formula, cow's milk, other milk, or supplemental foods. They may be receiving other liquids such as juice, water, or tea.
- infants who are supplementing breastmilk with formula: These infants receive breastmilk and formula. They may be receiving other liquids such as juice, water, or tea as well, but they do not receive any supplemental foods.
- infants who are receiving *complementary breastfeeding*: These infants receive breastmilk and supplemental foods such as infant cereal, fruits, vegetables, or meats. They may also be receiving formula, cow's milk, other milk, or other liquids.

For all infants whose mothers initiated breastfeeding, the day of initiation of formula is known from maternal reports. Hence, very accurate analysis of durations of breastfeeding without formula supplementation can be conducted for all infants whose mothers initiated breastfeeding. The methods for analyzing the timing of formula supplementation and the factors that are associated with formula supplementation are presented below.

Percentages of WIC mothers following each of the nursing diets (breastmilk, formula, mixed) were examined. The association of the nursing diet at each month with selected socio-demographic factors was tested using chi-square statistics that were computed by accounting for the multistage stratified and clustered sampling design of the WIC-IFPS. SUDAAN statistical software was used to estimate these percentages and chi-square statistics. In addition, among breastfeeding mothers, percentages by the type of breastfeeding practice (exclusive or partial) were examined over the first year of life for each month of interview.

The analysis of the timing of initiation of formula supplementation among breastfeeding mothers requires special methods of analysis, for three reasons:

- (1) Formula supplementation occurs over a period of time when mothers are gradually diminishing breastfeeds and initiating formula feeds. Unlike the initiation of breastfeeding, which occurs immediately following the birth within a condensed time period, formula supplementation occurs over early infancy, and some predictors of formula supplementation (for example, maternal

employment) may change over early infancy. The timing of formula supplementation may be associated with the timing of other changes in a mother's life. The method of analysis must accommodate this complexity.

- (2) A number of breastfeeding mothers never initiate formula supplementation. Data from these mothers must be included in the analysis because excluding them would lead to an overestimation of the extent of formula supplementation among WIC mothers. The method of analysis must account for this group of mothers who never supplement breastfeeding with formula.
- (3) A few mothers were lost from the study before they initiated formula supplementation. Partial information is available from these mothers, and their data must not be excluded from the analysis, because they may have some feeding practices that are different from the women who did not drop out of the study. The method of analysis must be able to include these truncated observations.

These requirements can be satisfied by "life table" methods. A life table provides a series of rates of occurrence of an event of interest at time points measured from an event of origin. In this case, life tables of formula supplementation provide a series of rates of initiation of formula supplementation at each time point since the infant's birth, measured in days. More specifically, at any given infant age, one can estimate the likelihood that a mother will initiate formula supplementation, given that she has not started formula supplementation until that day. These rates can be used to estimate various quantities. Most commonly, these rates are used to estimate the proportions (or percentages) of mothers who have not yet initiated formula supplementation at each age. On the basis of these proportions, the median age of formula supplementation is estimated. This is equivalent to the age when one-half of the infants' mothers have initiated formula supplementation, and one-half are still exclusively or predominantly breastfeeding.

To identify the unique contributions of socio-demographic, health-related, attitudinal, social contextual, WIC, and other program-related factors to the rates of formula supplementation, the basic life table methodology can be expanded. Multivariate life table methods of analysis were used to examine the timing of initiation of formula supplementation. These models are briefly described here. For a more detailed description, see Appendix G.

The models estimated by expanding the life table methodology are often labeled multivariate models of “hazard” rates (so called due to the original development of these models for engineering products’ expected life times). In this case, “hazard” rates refer to the rates of initiation of formula supplementation. These models take the following form:

$$\log h(t) = \log h_0(t) + \beta_1 x_1 + \beta_2 x_2(t) + \beta_3 x_3 + \dots \quad (\text{IV.3})$$

where $h(t)$ refers to the likelihood (rate) of formula initiation at time t , h_0 refers to the “baseline” rate (see below), and β refers to the estimated coefficient that represents the strength of the association between a given characteristic (x) and the likelihood of initiation of formula. The characteristics that predict formula supplementation may themselves be changing over time (e.g., maternal employment). Hence, x_2 in equation IV.3 may change depending on the time indicator t . In contrast, x_1 and x_3 are characteristics that remain constant over time (e.g., maternal race).

The coefficients estimated by the multivariate models of “hazard” rates are more easily interpreted if they are *exponentiated*. The exponentiated coefficients can be interpreted as the estimated *relative risk*. For example, if the coefficient of the variable such as African American race is exponentiated, it can be interpreted as the relative risk that an African American mother will initiate formula supplementation as compared to a white mother (comparison category) who is similar to the African American mother in all relevant aspects except for race. Below, in the discussion of the findings of the analyses of formula supplementation, all estimated coefficients are interpreted this way.

In building multivariate models of formula supplementation, a protocol was followed that tested the predictive power of groups of variables. This protocol is identical to that described in Section IV.3. The variables that were not significantly associated with the likelihood of formula supplementation and the variables that were not of primary substantive interest were eliminated from the models (see Appendix H for a description of this protocol).

Results

Nursing diet of WIC infants. Figure IV.5 illustrates the percentages of mothers, who, at the time of each monthly interview, were breastfeeding only, breast and formula feeding, or only formula feeding.

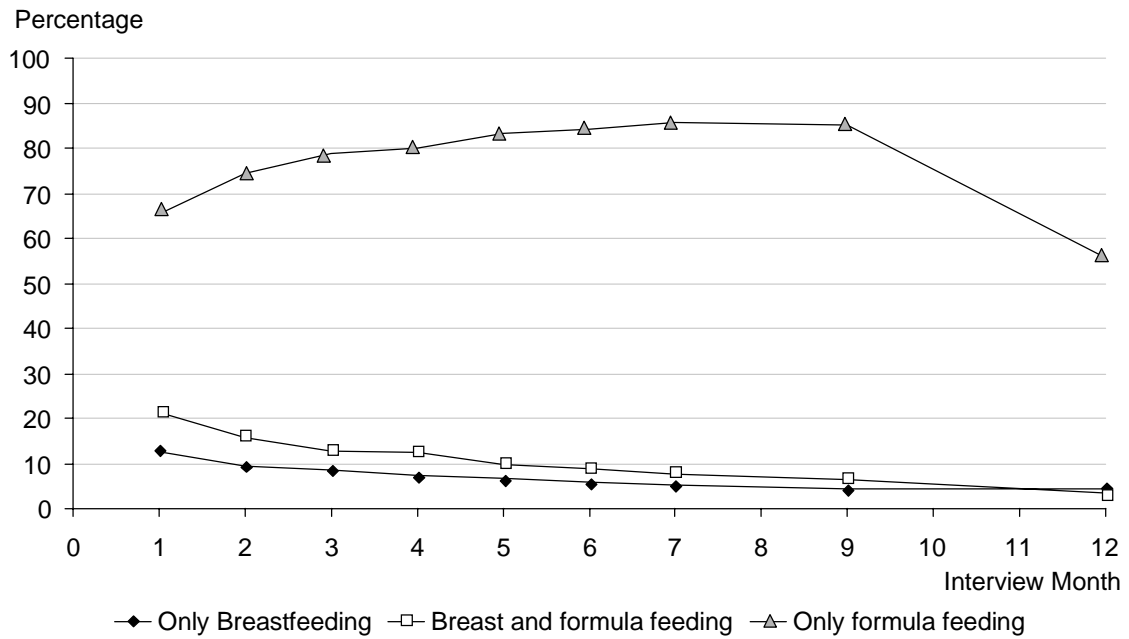


Figure IV.5. Percentages of only breastfeeding, combined breast- and formula-feeding, and only formula-feeding WIC mothers at each month of interview.

- ✓ The percentage of WIC infants who are breastfed without formula supplementation through their infancy is very small.

Only a small minority of WIC infants have nursing diets that consist of breastfeeding only. At the time of the Month 1 interview, only 13 percent of all infants receive breastmilk only, and an additional 20 percent receive breastmilk and formula. At that time, two-thirds of the WIC-IFPS infants have a nursing diet that consists of formula only. By the Month 2 interview the combined share of breastfeeding infants and infants on a combined breastmilk-formula diet drops to one-quarter of all infants. By the Month 3 interview, this proportion drops to just over one-fifth of all infants, with only 9 percent of the infants receiving breastmilk without formula and almost 12 percent of the infants receiving breastmilk and formula. By the Month 5 interview, the percentage of infants receiving breastmilk only is down to 7 percent; infants receiving breastmilk and formula is down to 9 percent.

- ✓ Maternal race and ethnicity, immigrant status, and maternal education are significantly associated with the choice of nursing diets. Hispanic mothers, mothers born outside of the United States, and highly educated mothers are more likely to choose nursing diets that involve some breastfeeding.

The investigation of the association between the socio-demographic characteristics of the mothers and their choice of nursing diets reveals some significant associations. Table IV.6 provides the differences in the nursing diets of the mothers at the time of the Month 1 and Month 3 interviews.¹⁸ Mother's race/ethnicity is significantly associated with the nursing diet, with a very small minority (3%) of African American mothers breastfeeding only, as compared to somewhat larger proportions of white and Hispanic mothers (15% each) at Month 1. While these race and ethnicity differences are mostly maintained through the months, the pattern of *change* in nursing diets differs between white and Hispanic

¹⁸ The complete table of nursing diets at each month is provided in Appendix I.

Table IV.6. Percentage distribution of the infants by nursing diets at the time of each interview month, by selected socio-demographic characteristics.

Characteristics	Nursing Diet				N ¹
	Only Breastfed	Breast and Formula Fed	Only Formula Fed	Neither Breast Nor Formula Fed	
MONTH 1					
Race and ethnicity**					
White	14	17	67	2	295
African American	3	14	82	0	125
Hispanic	15	33	51	1	125
Other	34	13	53	0	32
Immigrant status**					
Born in the U.S.	12	15	72	1	452
Born elsewhere	16	40	43	2	116
Age of the mother at birth of child					
14-19	8	9	82	0	135
20-25	14	40	61	2	247
26 or older	15	25	59	1	195
Highest grade completed by the mother*					
9th grade or less	11	22	64	3	90
10th or 11th grades	7	12	80	0	112
12th grade	14	17	68	2	242
More than high school	20	34	46	1	122
MONTH 3					
Race and ethnicity**					
White	8	9	82	1	392
African American	4	4	92	0	167
Hispanic	15	23	61	1	154
Other	11	20	69	0	42
Immigrant Status**					
Born in the U.S.	7	8	85	1	601
Born elsewhere	15	29	55	1	138
Age of the mother at birth of child					
14 - 19	6	4	89	1	175
20 - 25	9	12	78	1	332
26 or older	12	16	72	1	248
Highest grade completed by the mother**					
9th grade or less	11	13	74	2	121
10th or 11th grades	3	6	90	0	152
12th grade	9	9	81	0	323
More than high school	14	22	63	0	145

Notes:

1. Includes all infants whose mothers were interviewed that month.

* Chi-square statistic testing the group differences is significant at $p < .05$.

** Chi-square statistic testing the group differences is significant at $p < .01$.

mothers. Among the white mothers, the proportion of breastfeeding alone declines from 15 percent at Month 1 to 8 percent at Month 3. In contrast, this proportion is maintained at a constant level among the Hispanic mothers through the first three months.

In addition to the significant race and ethnicity differences in breastfeeding only, there are strong race and ethnicity differences in the proportions feeding a combined nursing diet of breastmilk and formula. One-third of Hispanic mothers choose this diet at the time of the Month 1 interview, as compared to about 15 percent of the mothers from other races or ethnicities (17% whites, 14% African Americans, 13% other mothers). Over the first three months, the proportions of breast-and-formula-feeding mothers of each race and ethnic group decline, with corresponding increases in the formula-feeding mothers. The only exception is the Hispanic mothers (proportions on a combined diet remain at about one-quarter level).

Immigrant status is also significantly associated with the maternal choice of nursing diets. The mothers who were born in the United States are more likely to be only formula feeding than mothers who were born elsewhere. This difference persists through the early infancy.

Maternal age is significantly associated with the choice of nursing diets when comparing teenage mothers to older mothers. Age differences among the mothers older than 20 are not significant. Nursing diets involving any breastfeeding are much less common among teen mothers than among older mothers. Less than one in ten teen mothers breastfeed only or feed a combined breastmilk-formula diet in Month 1. These rates compare to almost 15 percent breastfeeding only and almost one-quarter feeding a combined diet among older mothers.

There are significant differences in the choice of infants' nursing diets by mother's educational level. However, these differences do not appear to be linear. While highly educated mothers are more likely to adopt nursing diets that include some breastfeeding, the group of mothers with lowest education (9th grade or less) also maintain high levels of breastfeeding through early infancy. This may partly be attributed to other characteristics of lesser-educated mothers. It is likely that the group with the lowest education includes high proportions of immigrant mothers, who tend to have higher rates of breastfeeding.

Breastfeeding practices. Figure IV.6 provides an overview of the types of breastfeeding practices that WIC mothers adopt. The three types of breastfeeding practices are defined on page 84. The percentages of exclusively or predominantly breastfeeding mothers, partial breastfeeding mothers (who also feed formula, cow's milk, or other milk), and complementary breastfeeding mothers who also feed supplemental foods are displayed. The exclusive and predominant breastfeeders are combined in a single category because there are too few exclusive breastfeeders among WIC mothers.

✓ In addition to formula supplementation of breastfeeding, substantial proportions of

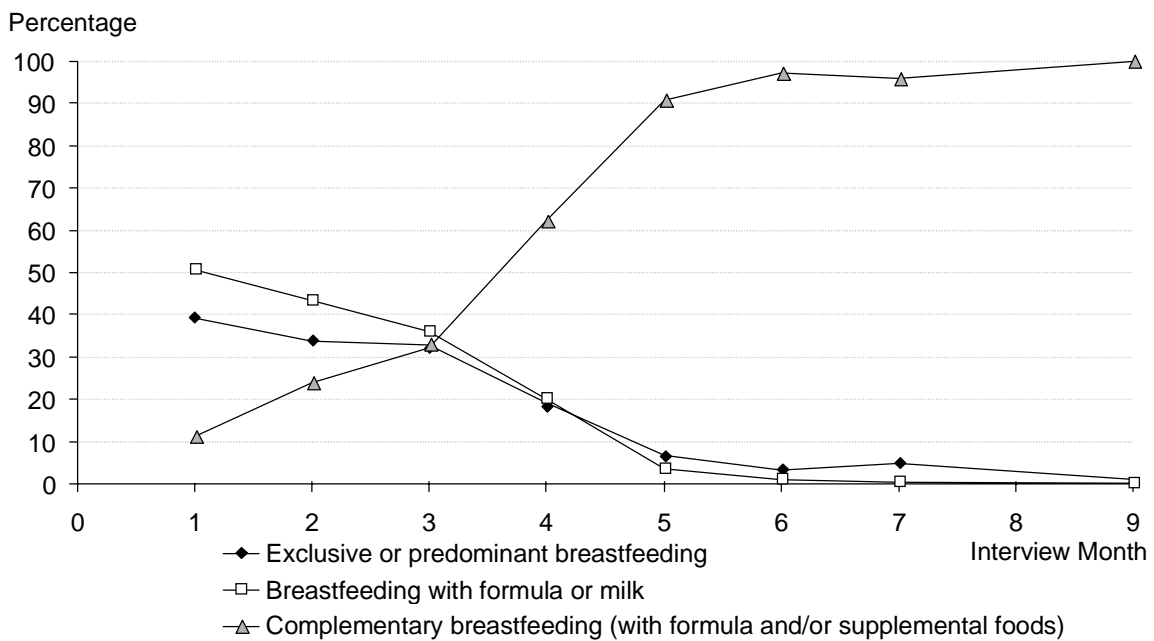


Figure IV.6. Percentages of breastfeeding WIC mothers, by type of breastfeeding practice at each month of interview.

breastfeeding infants also receive some supplemental foods during the first few months.

Among the WIC infants who are breastfeeding at all, the proportion of exclusive or predominant breastfeeders declines rapidly after Month 3, from 32 percent to 6 percent at Month 5. Breastfeeding infants who also receive formula decline steadily from Month 1 on, and the percentage of breastfeeding infants who also receive supplemental foods increases steadily. By the Month 2 interview, almost one-quarter (24%) of breastfeeding

infants receive some supplemental foods, and hence enter the transitional phase of infant feeding. By the Month 3 interview, the proportion of breastfeeding infants receiving supplemental foods is almost one-third. More than one-half of all breastfeeding infants receive formula or milk in addition to breastmilk by Month 1. By the Month 3 interview, breastfeeding mothers are almost evenly divided between those who practice exclusive or predominant breastfeeding, those who practice a combined breastmilk and formula diet, and those who practice complementary breastfeeding with supplemental foods.

Timing of the initiation of formula supplementation. The WIC-IFPS provides a unique opportunity to examine the introduction of formula to the nursing diets of breastfeeding infants. Using the WIC-IFPS, the proportion of breastfeeding infants at each age whose nursing diets do not include formula can be estimated.

- ✓ Formula supplementation occurs quite early among breastfeeding mothers, with one-half initiating formula supplementation about the time their infants are two weeks old.

The estimated percentages of infants whose mothers have not yet initiated formula at each age are displayed in Figure IV.7. About 50 percent of breastfeeding WIC mothers initiate formula supplementation by the time their infants are 16 days old. About one-quarter initiate formula supplementation by 5 days of age and three-quarters initiate formula supplementation prior to two months of age (49 days).

Table IV.7 shows the median age of the infants when their mothers initiate formula supplementation, by selected socio-demographic characteristics. One-half of breastfeeding African American infants receive formula supplementation by 12 days of age. Although Hispanic mothers maintain high levels of breastfeeding, one-half of them initiate formula supplementation when their infants are 13 days old.

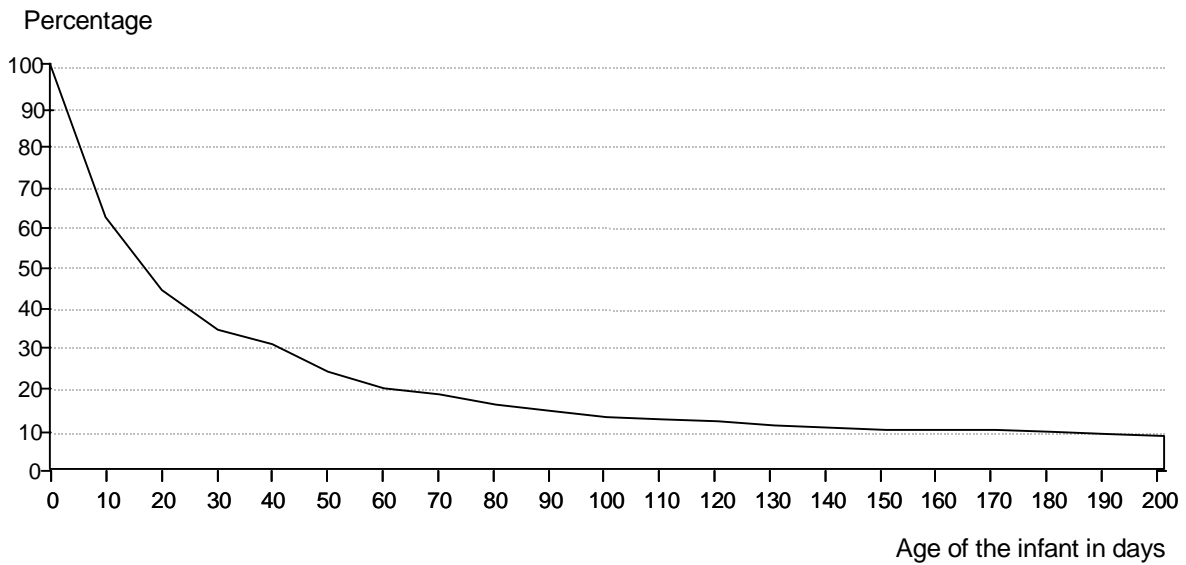


Figure IV.7. Percentages of breastfeeding WIC mothers who have not yet initiated formula, by the age of the infant.

Table IV.7. Median age in days of the infant at the time when formula supplementation is initiated, by selected socio-demographic characteristics.

Characteristics	Median Age in Days of the Infants at the Time Formula Supplementation is Initiated ¹	N
Total	16	477
Race and ethnicity		
White	20	233
African American	12	69
Hispanic	13	135
Other	24	40
Age of the mother at birth of child		
14 - 19	13	95
20 - 25	16	206
26 or older	20	176
Highest grade completed by the mother		
9th grade or less	12	75
10th or 11th grades	14	88
12th grade	16	184
More than high school	24	116

Note:

1. Age when 50% of the mothers have initiated formula supplementation.

Younger mothers initiate formula supplementation slightly earlier. Highly educated WIC mothers maintain breastfeeding without formula supplementation for longer durations, with one-half of the mothers who have completed schooling beyond high school postponing formula supplementation until their infants are 24 days old.

Predictors of initiation of formula supplementation. The multivariate models of rates of initiation of formula supplementation were estimated for all infants who breastfeed. Model I tests the association between maternal socio-demographic characteristics and initiation of formula supplementation. Model II includes all non-program factors: socio-demographic characteristics, health-related characteristics, factors describing maternal social context, sources of nutrition advice other than WIC, and hospital practices. Model III includes these non-program factors and the program factors: infant feeding attitudes and beliefs of the mothers and WIC Program components. The following equations describe the three models presented in Table IV.8.

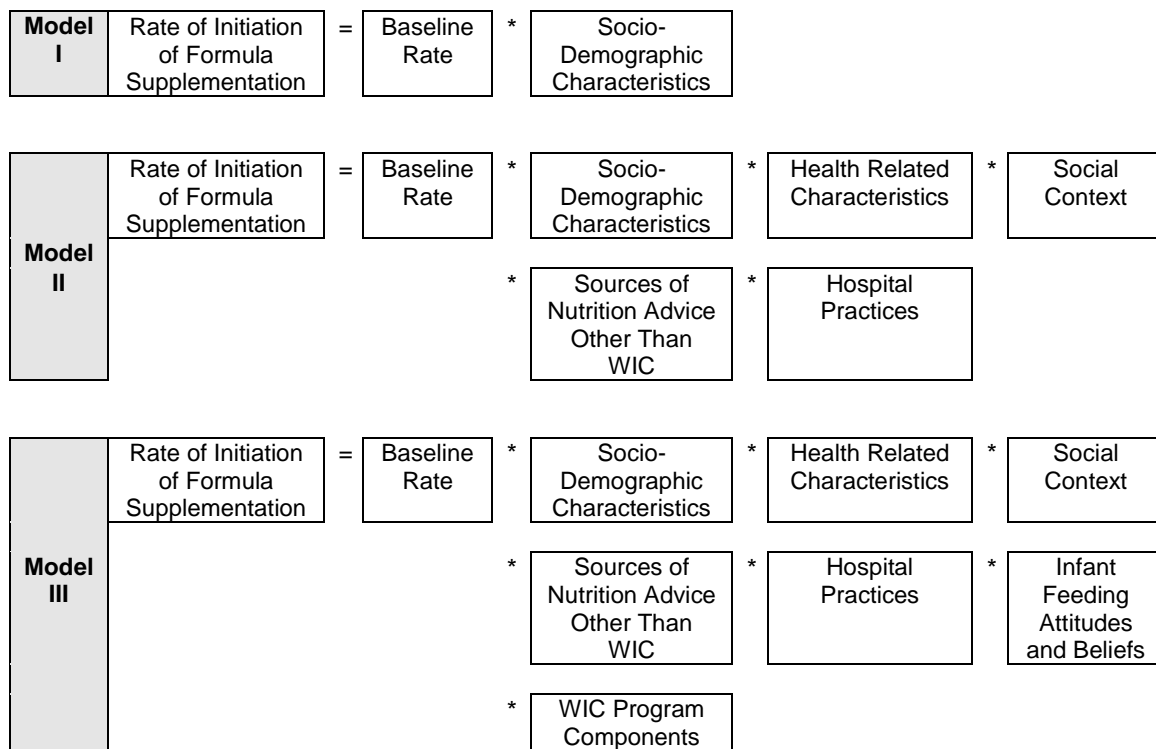


Table IV.8. Estimates of the relative risk¹ estimated by the multivariate models of rates of initiation of formula supplementation (N=477).

Predictors	Model I	Model II	Model III
SOCIO-DEMOGRAPHIC CHARACTERISTICS			
Age of the mother at birth of child	.98*	.98**	.98*
African American	1.50*	1.44*	1.17
Hispanic	1.12	1.05	1.06
Maternal immigrant status - foreign born	1.31	1.39	1.28
Birth order of the infant - firstborn	1.09	.60**	.60**
Use of non-maternal child care	2.30**	2.17**	2.22**
HEALTH-RELATED CHARACTERISTICS			
Birthweight of the infant		1.00	1.00
Reported problems with the breast or feeding		1.11	1.11
Reported problems with the breastmilk		1.70**	1.63**
SOCIAL CONTEXT			
Receipt of advice to breastfeed from relatives		.81	.87
Mother breastfed previous children		.45**	.50**
HOSPITAL PRACTICES			
Length of hospital stay of the mother		1.10	1.09
Receipt of formula or bottle from the hospital gift package		1.09	1.10
SOURCES OF NUTRITION ADVICE OTHER THAN WIC			
Receipt of advice to breastfeed from physician		1.00	.95
Receipt of information about breastfeeding elsewhere		.91	.91
INFANT FEEDING ATTITUDES AND BELIEFS			
Perceived benefits of breastfeeding			.99**
Perceived barriers to breastfeeding			1.01
WIC PROGRAM COMPONENTS			
Knowledge of the special WIC breastfeeding food package ²			.71*
Maternal report on receipt of information about breastfeeding from WIC ³			.98
Maternal report on receipt of advice to breastfeed from WIC. ⁴			1.16

Notes:

1. Relative risk greater than one implies that the characteristic considered is associated with higher likelihood of formula supplementation. Relative risk less than one implies that the characteristic considered is associated with lower likelihood of formula supplementation.
 2. The answer to the question "Have you been told that there is a special WIC food package from breastfeeding women who do not accept infant formula from WIC?" is "yes."
 3. The answer to any one of the three questions "Have you received information or advice from the WIC office about (1) benefits of breastfeeding?, (2) how to breastfeed?, or (3) mother's diet while breastfeeding?" is "yes."
 4. The answer to the question "Have WIC program staff told you that you should breastfeed?" is "yes."
- * p<.05
 ** p<.01

Among the socio-demographic markers, younger maternal age, African American race, and use of non-maternal child care are associated with higher likelihood of initiating formula supplementation. As indicated by Model I in Table IV.8, older maternal age is significantly associated with lower rates of initiation of formula among breastfeeding mothers. According to the estimates, each additional year of age reduces the rate of formula initiation by 2 percent (relative risk is 0.98). African American mothers are more likely to initiate formula supplementation. The likelihood that an African American mother will initiate formula supplementation is 50 percent higher than a comparable white mother. Although Hispanic mothers and mothers who were born outside the United States are more likely to adopt nursing diets that involve some breastfeeding (see above), among the breastfeeding mothers, Hispanic ethnicity is not associated with the likelihood of formula supplementation.

Both maternal employment and use of non-maternal child care are associated with the initiation of formula supplementation. Multivariate models including both of these indicators (not shown in Table IV.8) reveal that it is the use of non-maternal care (often associated with maternal employment) that predicts the initiation of formula supplementation. In other words, breastfeeding mothers who recruit others' help for caring for their infants are highly likely to begin formula supplementation regardless of their employment status. The rate of formula initiation among the mothers who use non-maternal child care is 2.3 times higher than the rate of formula initiation among the mothers who care for infants themselves.

✓ Mothers who report having problems with their breastmilk are 70 percent more likely to initiate formula supplementation.

Among the health-related characteristics, birthweight of the infant is not significantly associated with the likelihood of formula initiation. The association between the nursing problems and formula supplementation is examined using two indicators of such problems, as reported by the mothers: problems with the breasts or feeding (e.g., sore nipples, infant choking while breastfeeding) and problems with breastmilk (e.g., something wrong with the milk, not enough milk for the infant). A detailed description of nursing problems may be found in Section VII.3. Model II in Table IV.8 shows that the mothers who report problems with breastmilk are 70 percent more likely (relative risk 1.70) to initiate formula supplementation than the mothers who do not report such

problems. There is no significant association of formula supplementation with other nursing problems.

Mothers who breastfed previous children are about half as likely to initiate formula supplementation as the mothers who previously had children but did not breastfeed them. Firstborn children are about 40 percent less likely (relative risk is 0.60) to receive formula supplementation. Drawing together these results, it is concluded that the mothers who had children before but did not breastfeed them are most likely to start formula supplementation, even if they initiate breastfeeding, followed by the mothers of firstborn children, and the mothers who breastfed their previous children. Neither the length of the maternal hospital stay nor the receipt of gift packages with a bottle or formula are associated with formula supplementation. This latter finding regarding the gift packages, however, must be interpreted in light of the fact that almost all mothers receive such gift packages, making it difficult to measure the differences between the mothers who did or did not receive them (see Chapter V).

Physicians' advice to breastfeed and receipt of information about breastfeeding from sources other than WIC are not significantly associated with the initiation of formula supplementation, although these are associated with breastfeeding initiation (see Section IV.3). This finding is not surprising, because most of such information is disseminated through birthing classes that will have little effect after the infant is born.

Model III in Table IV.8 includes breastfeeding attitudes and beliefs as well as WIC Program components.

- ✓ Perceived benefits of breastfeeding are associated with lower likelihood of formula supplementation. Furthermore, the differences in formula supplementation between African American and white mothers appear to be mostly due to the differences in perceived benefits of breastfeeding.

Mothers who perceive more benefits of breastfeeding have reduced rates of initiation of formula. Each percentile point increase in the scale that measures the mother's belief in the benefits of breastfeeding is associated with a percentile point reduction in the relative risk of formula supplementation (relative risk is 0.99). When the effects of maternal attitudes toward breastfeeding are controlled, African American race is no longer significantly associated with formula supplementation. This finding indicates that the racial differences in formula supplementation may be attributed to the differences in

perceived benefits of breastfeeding that prevail among African American and white mothers.

- ✓ Knowledge of the special WIC breastfeeding food package is significantly associated with lower likelihood of initiating formula supplementation.

Maternal report on receipt of information about breastfeeding from WIC and receipt of advice to breastfeed from WIC are not associated with the likelihood of supplementing breastfeeding with formula. However, the mothers who know about the special WIC breastfeeding food package for the mothers who do not accept formula from WIC are about 30 percent less likely to initiate formula supplementation.

Conclusions

WIC mothers are not very likely to choose nursing diets that include breastfeeding, with the exception of Hispanic mothers. Among the breastfeeding mothers, those who exclusively or predominantly breastfeed are a small minority. Hispanic mothers not only choose nursing diets that include breastfeeding more than any other group, they also have a relatively stable level of breastfeeding during early infancy. Steady declines in the proportions of breastfed only and combined breast-and-formula fed infants were observed during the first few months of infancy, especially among the white and African American WIC mothers. The choice of nursing diets varies greatly between subgroups of WIC mothers. In general, however, nursing diets that involve any breastfeeding at all are relatively rare, and the percentages adopting these diets decline rapidly over early infancy.

Breastfeeding WIC mothers introduce formula to the nursing diet very early in infancy. The estimated proportions who introduce formula by two weeks and one month of age are one-half and two-thirds, respectively. These estimates are in close agreement with earlier estimates of Bevan et al. (1984), suggesting that while breastfeeding initiation rates may have been going up over the last few decades, *exclusive* breastfeeding may not have increased.

Use of non-maternal child care is a strong predictor of formula supplementation among breastfeeding mothers. Use of child care more than doubles the likelihood of formula supplementation, underscoring the importance of supporting continued breastfeeding among employed mothers and mothers who attend school. This finding

also highlights the importance of maternal leave policies, on-site day care policies, and the education of breastfeeding mothers to support continued breastfeeding even when the mother must be away from the infant for several hours a day.

Mothers who did not breastfeed previous children are highly likely to supplement breastfeeding with formula. These mothers are also much less likely to initiate breastfeeding (see Section IV.3). These two findings taken together point to two groups of mothers as targets for breastfeeding education and support programs: First, the mothers who have older children and who have never breastfed constitute a group who may need strong encouragement to initiate breastfeeding and support for exclusive or predominant breastfeeding. Second, the first-time mothers constitute a group who may be key to higher overall and exclusive breastfeeding rates. If a pattern of infant feeding practices that include breastfeeding may be established in this group, it will benefit future infants as well.

Maternal perception of problems with breastmilk predicts an increased likelihood of formula supplementation among breastfeeding mothers. One particular breastfeeding problem, i.e., milk insufficiency, was previously found to be significantly associated with formula supplementation among WIC participants (Hill & Aldag, 1993). This finding is supported by the WIC-IFPS.

Breastfeeding attitudes and beliefs are significantly associated with formula supplementation. Since the attitudes are shaped by a woman's breastfeeding experience, they should ideally be measured early during the breastfeeding career. In the WIC-IFPS, attitudes were measured at the time of the Month 2 interview. By including these measures in the models of initiation of formula among breastfeeders, an implicit assumption is made that these attitudes remain relatively constant after the initiation of breastfeeding. This issue is discussed in Section IV.4. Nevertheless, perceived benefits of breastfeeding predict a lower likelihood of formula supplementation.

Knowledge of the special WIC breastfeeding food package for mothers who do not receive formula from WIC is significantly and negatively associated with initiation of formula supplementation. This finding supports the hypothesis that this food package may be acting as an incentive for exclusive or predominant breastfeeding.

CHAPTER V

HOSPITAL PRACTICES AND NEONATAL CIRCUMSTANCES EXPERIENCED BY MOTHERS

V.I. Overview

This chapter describes of the experiences of WIC mothers and their infants during the period immediately after birth. It focuses on:

- the feeding decisions made by the mothers during the neonatal period
- the linkages between hospital practices and the feeding decisions of the mothers.

V.2. WIC Program Components that Pertain to the Neonatal Period

FCS's (as well as other pediatric and nutritional authorities') policy is to encourage breastfeeding whenever possible (FNS, 1993a). The WIC Program could influence hospital practices related to neonatal feeding by:

- informing the mothers prior to the birth of the infant about the benefits of breastfeeding and how to breastfeed
- coordinating breastfeeding promotion and support with health care providers and hospitals
- providing breastfeeding support during the immediate postpartum period (NAWD, 1994).

A recent GAO study (1993) indicated that 42 state WIC agencies had community task forces to promote breastfeeding. These task forces carried out activities such as training local health care providers and giving them educational materials, and encouraging hospitals to adopt policies supportive of breastfeeding. The report concluded that the WIC Program may have direct ways (i.e., targeting mothers) as well as indirect ways (i.e., targeting health care providers) of influencing feeding practices during the neonatal period, when the mother and the infant are still in the hospital.

V.3. Research Questions

This chapter presents the linkages between hospital practices and neonatal feeding. The following research questions are addressed:

- How long do the mothers and infants stay in the hospital and what are their rooming arrangements?
- How are the WIC infants fed at the time of their first feeding? How are maternal and infant characteristics associated with the choice of first feeding?
- Do mothers who initiate breastfeeding in the hospital experience nursing problems? If yes, do they receive any help from the hospital staff?
- Do WIC mothers receive gift packages from the hospital? What do these gift packages contain?
- What is the nursing diet of WIC infants at the time of hospital discharge? Are hospital practices associated with feeding practices at the time of discharge? Do WIC Program components predict feeding practices at the time of discharge?

In addressing the last study question listed above, multivariate models are estimated, predicting the feeding practices at hospital discharge based on a set of non-program and program factors. These models are derived from the general conceptual model presented in Chapter III. Figure V.1 depicts the models considered in predicting the feeding practices at the time of hospital discharge. These models are estimated separately for the mothers who breastfeed at the first feeding and for the mothers who formula feed at the first feeding.

V.4. Main Findings

- ✓ A majority of WIC infants spend one or two days in the hospital postnatally.
- ✓ The majority of WIC infants sleep away from their mothers during their hospital stay after birth.

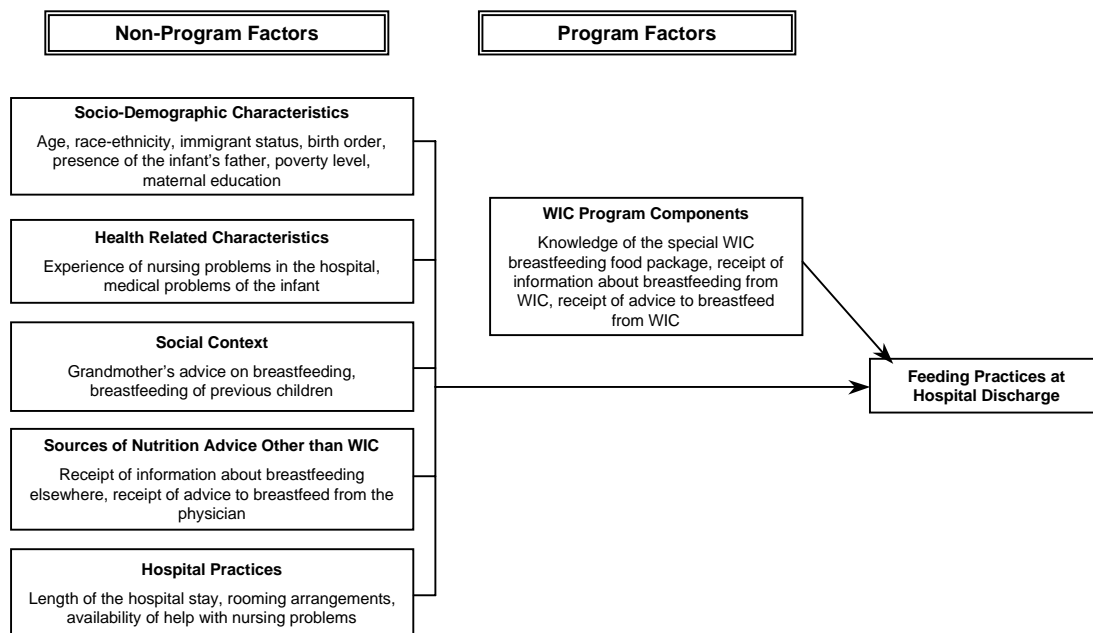


Figure V.1. A model of feeding practices at hospital discharge and the measures of its predictors from the WIC-IFPS.

- ✓ For the majority of the WIC infants, the first feeding in the hospital is formula, with slightly over one-quarter receiving breastmilk.
- ✓ One-half of the mothers who ever initiate breastfeeding do so within three hours of the birth.
- ✓ Almost three-quarters of the mothers who breastfeed in the hospital report experiencing some nursing problems. Up to one-third of the mothers experiencing specific nursing problems report receiving no help.
- ✓ Hospital gift packages almost always include an item that is considered to be unsupportive in the establishment of breastfeeding.
- ✓ Forty-five percent of WIC mothers report breastfeeding at the time of hospital discharge. Thirty percent report breastfeeding exclusively, and 15 percent report breast- and formula-feeding.

- ✓ African American mothers who initiate breastfeeding at the first feeding are seven times more likely to be using formula at the time of hospital discharge than comparable white mothers.
- ✓ Among the mothers who breastfeed at the first feeding, maternal perception of problems with breastmilk is a significant predictor of formula use at the time of hospital discharge. However, those mothers who receive help from the hospital staff to address their nursing problems are about half as likely to be feeding formula at the time of hospital discharge.
- ✓ An overnight stay in the hospital nursery doubles the odds of formula feeding at the time of hospital discharge among the mothers who breastfeed at the first feeding.
- ✓ Among the mothers who breastfeed at the first feeding, those who report that they received advice from WIC staff to breastfeed are significantly less likely to formula feed at the time of hospital discharge.
- ✓ Hispanic mothers and mothers who were born outside the United States are significantly more likely to be breastfeeding at the time of hospital discharge, even if they do not breastfeed at the first feeding.
- ✓ Knowledge of the special WIC food package for breastfeeding women is significantly and positively associated with the odds of breastfeeding at hospital discharge for the mothers who do not breastfeed at the first feeding.

V.5. Previous Studies

Neonatal circumstances and hospital practices are likely to have a strong impact on feeding practices during the nursing phase (Jelliffe & Jelliffe, 1988). Separation of the infant from the mother, feeding of formula or sugar water in the nursery (Glover, 1995), and insufficient breastfeeding support in the hospital are associated with decreased likelihood of breastfeeding (Ilollen, 1976; Michelman et al., 1990; Simon et al., 1988; Winikoff et al., 1986). Initiation of breastfeeding within ten hours of birth is found to be associated with higher rates of breastfeeding (Romero-Gwynn & Carias, 1989).

The “Baby-Friendly Hospital Initiative,” jointly sponsored by the World Health Organization (WHO) and UNICEF (United Nations Children’s Fund, formerly United

Nations International Children's Emergency Fund), encourages maternity services throughout the world to adopt policies and practices that have been shown to encourage breastfeeding (WHO, 1989). A survey of state WIC directors recommends that hospitals receiving federal funds (Medicare/Medicaid) be required to adopt these policies (GAO, 1993). The "Ten Steps to Successful Breastfeeding" specified by WHO and UNICEF include such items as help mothers initiate breastfeeding within a half hour of birth; give newborns no food or drink other than breastmilk; and allow mothers and infants to stay together 24 hours a day.

Early hospital discharge negatively influences breastfeeding (Ryan & Martinez, 1989), probably because returning home diminishes the mother's opportunity to consult with professionals regarding any breastfeeding difficulties. On the other hand, a long hospital stay may be indicative of maternal health problems that are also associated with lower levels of breastfeeding. Maternal health in the immediate postnatal period is found to have a significant effect on the feeding practices during the early nursing period. For example, cesarean delivery is associated with significantly lower rates of breastfeeding (Romero-Gwynn & Carias, 1989). Some studies found that the hospital gift packages containing formula gifts may promote early cessation of breastfeeding (Bergevin et al., 1983; Dungy et al., 1992).

Error! Not a valid filename.The WHO International Code for Infant Formula Marketing specifically prohibits distribution of hospital formula samples. This code is voluntary and not legislated in the United States, although it was affirmed in 1994. Numerous studies have examined the effect of hospital gift packs on breastfeeding rates, with mixed results. No effect on breastfeeding initiation would be expected, because breastfeeding should have begun before hospital discharge, but it is hypothesized that receipt of a gift pack containing formula and/or a bottle for feeding formula could be associated with shorter breastfeeding duration. A randomized, controlled trial among middle-class women in Iowa, for example, showed that women who received a breast pump in their gift pack continued breastfeeding, without supplementation, longer than mothers who received formula in their gift packs (Dungy et al., 1992). Similarly, a gift pack that did not contain formula was associated with significantly longer exclusive breastfeeding in a study of low-income mothers in Boston (Frank et al., 1987). Hispanic mothers in California were more likely to exclusively breastfeed if they had not received

any gift packs, compared to those who received the standard gift pack containing formula (Snell et al., 1992).

Various studies demonstrated that professional advice has strong influence on infant feeding choices throughout the nursing phase. The presence of a lactation consultant in the hospital is found to be associated with higher rates of breastfeeding initiation (Auerbach, 1985; Jones & West, 1985, 1986; Kistin, Benton, Rao, & Sullivan 1990).

V.6. Statistical Methods

Descriptive analyses presented in this chapter rely on comparisons of percentages of mothers who experienced a given hospital practice or who adopted a given feeding practice. For example, percentages of mothers who breastfeed at the first feeding are compared by racial/ethnic group membership. These comparisons were done using chi-square statistics that account for the multistage stratified and clustered sampling design of the WIC-IFPS.

Multivariate analyses consist of logistic regression analyses that predict the likelihood (log-odds) of a given nursing practice at the time of hospital discharge. For mothers who breastfeed at the first feeding, the log-odds of feeding formula at the time of hospital discharge were modeled. Similarly, for mothers who do not breastfeed at the first feeding, the log-odds of breastfeeding at hospital discharge were modeled.

Logistic regression models yield estimates of relative odds that are equivalent to the odds that a mother with a given characteristic will adopt a given feeding practice at the time of hospital discharge as compared to the odds for a comparable mother who is different only in that characteristic. For example, the relative odds that an African American mother who breastfeeds at the first feeding will be formula feeding at hospital discharge is 6.04 (the actual estimate from Table V.4 Model I). It is inferred that the odds that an African American mother who breastfeeds at the first feeding will be formula feeding at the time of hospital discharge is about six times that for a comparable white mother (white mothers constitute the comparison category in that model). Relative odds greater than one imply that the characteristic considered is associated with higher odds of the outcome that is being modeled. Relative odds less than one imply that the characteristic considered is associated with diminished odds of the outcome of interest.

In building multivariate models of type of feeding at hospital discharge, a protocol was followed that allowed testing of the predictive power of groups of variables, and allowed elimination of those variables if the following three conditions were satisfied: (1) they had no significant predictive power, (2) there was no strong theoretical justification for keeping them in the model regardless of their predictive power, and (3) they were not of primary substantive interest (also see Appendix H).

V.7. Results

Almost 98 percent of the mothers reported that their infants were born in a hospital. Only six mothers in the WIC-IFPS reported that their infants were born at home.

About 13 percent of the WIC mothers reported that their infants had serious medical problems associated with the birth. The mothers subjectively defined what they consider a “serious” medical problem (e.g., low blood sugar, jaundice, respiratory problems, heart murmur). The percentage of serious problems reported by WIC mothers appears to be substantially higher than that in the general population, in which slightly more than 3 percent of births were reported to have major abnormal conditions (Schmittroth, 1994). The medical problems of infants in the WIC-IFPS were not independently confirmed by medical records. The comparison of the percentage of major problems with other sources of data must, therefore, be cautiously interpreted. A small proportion (4%) of WIC infants return to the hospital as an in-patient shortly after birth because of medical problems such as jaundice or infection.

✓ A majority of WIC infants spend one or two days in the hospital postnatally.

Figure V.2 shows the distribution of number of days of hospital stay among WIC mothers and infants. Slightly higher percentages of mothers than infants stay in the hospital for one or two days, and higher percentages of infants than mothers stay in the hospital for seven days or longer. Although long hospital stays are not a norm, almost one in ten WIC infants stay in the hospital for one week or longer.

✓ The majority of WIC infants sleep away from their mothers during their hospital stay after birth.

Figure V.3 shows the rooming arrangements by race and ethnicity of the mother. Overall, 72 percent of the mothers spend at least one night away from their infants during their stay in the hospital. There are significant differences in the rooming arrangements between African American mothers on one hand, and white or Hispanic mothers on the other ($\chi^2=10.1$, $p<.05$).

- ✓ For the majority of the WIC infants, the first feeding in the hospital is formula, with slightly over one-quarter receiving breastmilk.

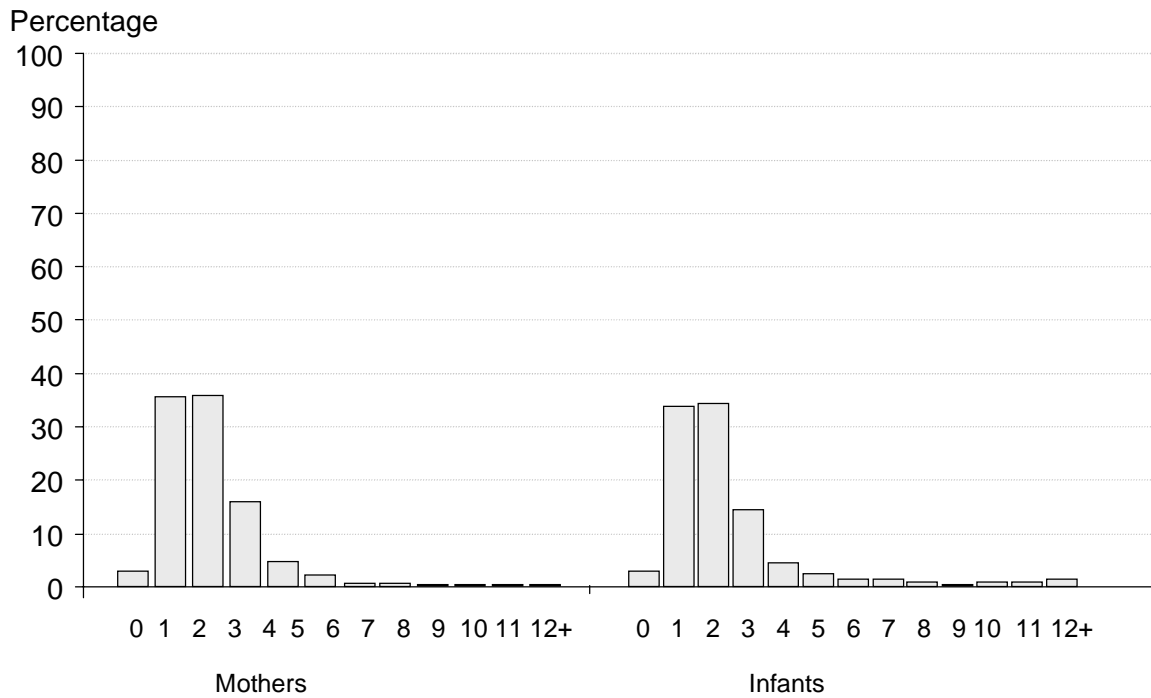


Figure V.2. Number of days of hospital stay for WIC mothers and infants.

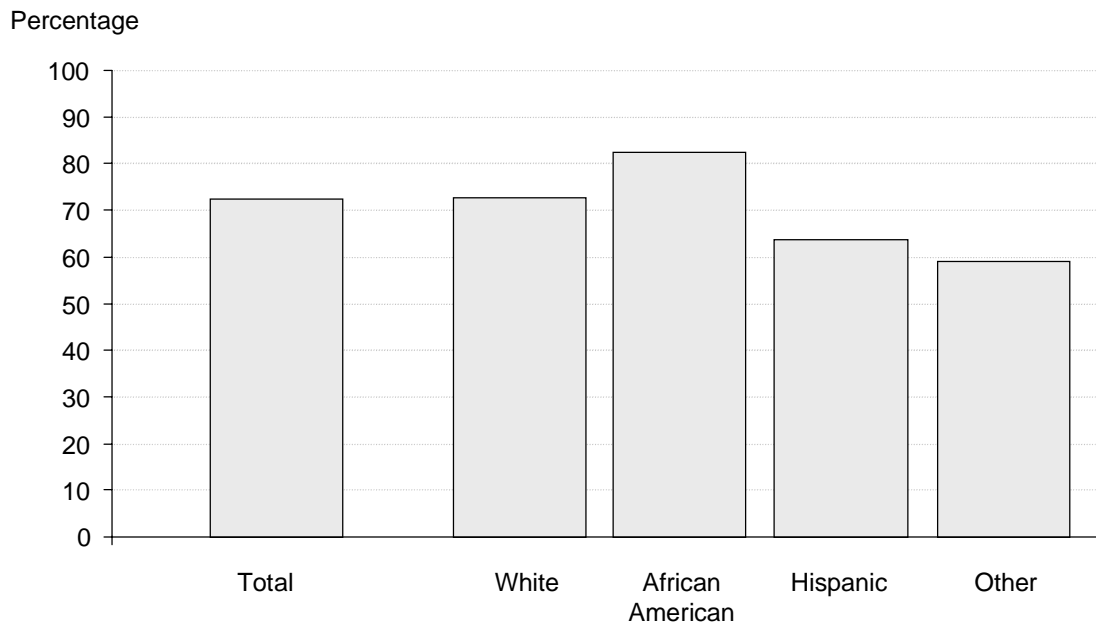


Figure V.3. Percentage of WIC infants who stayed in the nursery overnight, by race and ethnicity of the mother.

Table V.1 shows the percentages of WIC infants who receive formula, breastmilk, sugar water, water, or something else at the first feeding. Significantly higher percentages of African American infants than white or Hispanic infants receive formula at the first feeding in the hospital. Figure V.4 shows these differences. Overall, almost 60 percent of all WIC infants (and three-quarters of African American infants) receive formula at the first feeding. Even among the Hispanic infants, 84 percent of who are eventually breastfed (see Section IV.3), a majority (57%) receive formula at the first feeding. Only about 10 percent of the infants receive something other than formula or breastmilk at their first feeding. Sugar water and plain water are the most common other first feeds. Just under 30 percent of all WIC mothers breastfeed their infants at the first feeding. Among the mothers who do not breastfeed at the first feeding, over one-third (36%) try to breastfeed during the first week after the infant's birth.

Table V.1. Type of first feeding received by the WIC infants in the hospital.

Characteristics	Percentage Receiving					N
	Formula	Breastmilk	Sugar Water	Plain Water	Other	
Total	60	29	6	4	2	815
Race/Ethnicity						
White	55	34	6	4	1	419
African American	76	12	5	6	1	191
Hispanic	57	33	3	3	4	157
Other	41	36	9	11	4	48
Father of the infant lives with the mother*						
Yes	48	40	8	4	1	362
No	68	21	4	5	2	453
Number of days in hospital postpartum*						
0 or 1	50	38	6	4	2	305
2	60	28	6	5	1	296
3	74	16	5	4	1	127
4 or more	76	13	5	3	3	72

Note:

* Chi-square statistic for the subtable is significant at $p < .05$.

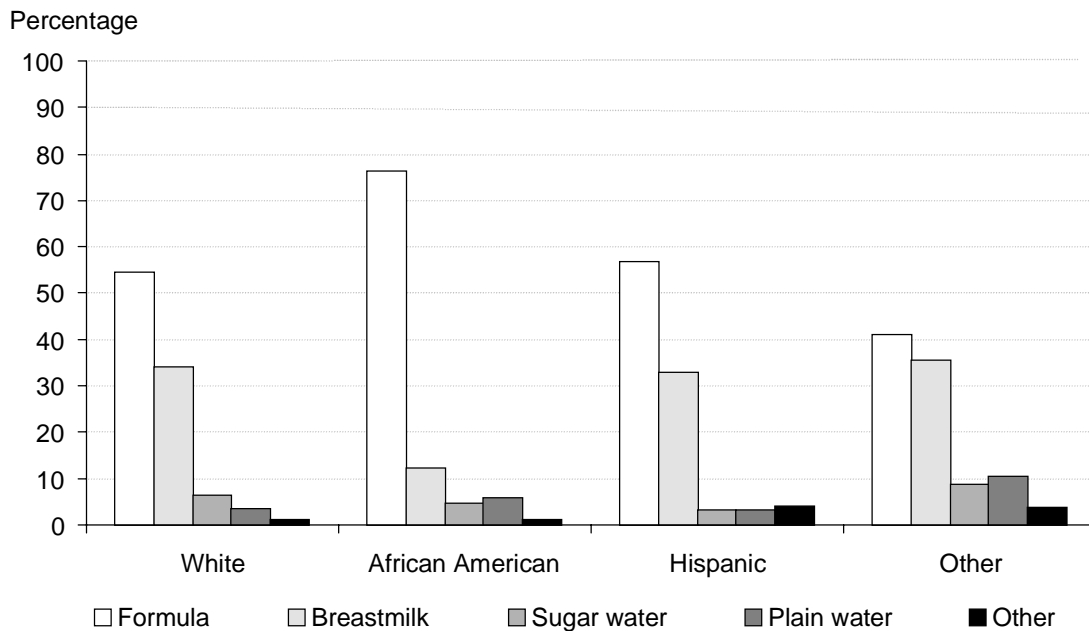


Figure V.4. The first feeding of the WIC infants in the hospital, by race and ethnicity of the mother.

The type of first feed is not significantly associated with the age of the mother, whether the mother is foreign born, birth order of the infant, marital status of the mother, maternal education, whether the mother was employed during pregnancy, and the birthweight of the infant. Only two of the characteristics examined are significantly predictive of type of first feeding: father's presence in the household and length of the maternal hospital stay. Table V.1 also shows the distribution of the type of first feeding by these two characteristics. A significantly higher proportion of infants whose fathers live with their mothers receive breastmilk at the first feeding than the infants whose fathers do not live with their mothers (40% versus 21%). It is possible that the fathers who live with the mothers are likely to be present during the delivery, and this may change the handling of the infant immediately after birth. Alternatively, father presence may provide support to the mother for breastfeeding.

The length of the mother's hospital stay is significantly associated with increasing percentages of formula at the first feeding and declining percentages of breastmilk at the

first feeding. This finding strongly suggests that the length of the hospital stay as well as the method of first feeding are associated with maternal health.

Many WIC infants receive formula, sugar water, and plain water sometime during their stay in the hospital. Over three-quarters (78%) receive formula, and almost one-quarter (24%) each receive plain water or sugar water (results not shown).

- ✓ One-half of the mothers who ever initiate breastfeeding do so within three hours of the birth.

The WIC-IFPS also provides information on the number of hours or days, postnatally, when breastfeeding was initiated. Among the mothers who ever initiate breastfeeding, just under one-fifth (19%) do so within an hour postpartum, and another 30 percent do so between one and three hours postpartum. Another 29 percent of the mothers initiate breastfeeding 13 or more hours postpartum.

There are no statistically significant group differences in the breastfeeding initiation rates by the number of hours postpartum. Nevertheless, some large differences are observed. For example, white mothers are most likely to initiate breastfeeding within an hour postpartum (26%), and African American mothers are least likely to do so (9%). Similarly, the mothers who cohabit with the infant's father are more likely to initiate breastfeeding sooner after birth than the mothers who do not cohabit with their infant's father. These results are similar to those reported about breastfeeding at the first feeding.

- ✓ Almost three-quarters of the mothers who breastfeed in the hospital report experiencing some nursing problems. Up to one-third of the mothers experiencing specific nursing problems report receiving no help.

Table V.2. Percentages of mothers reporting nursing problems while in the hospital.

Problem	Percentage
Reported Problems with the Breast and Feeding	
Sore nipples	46
Breasts were too full	25
Inverted nipples	8
Baby choked	3
Reported Problems with Breastmilk	
Not enough milk	39
Milk came in late	24
N	458

Substantial proportions of mothers report experiencing nursing problems while in the hospital. Table V.2 provides the percentages of mothers reporting various breastfeeding problems or problems with their milk, among those who initiate breastfeeding while in the hospital. The most commonly reported problem is sore nipples, experienced by close to one-half of breastfeeding mothers while in the hospital. Almost two-fifths of the mothers report that their infants are not getting enough milk. Almost one-quarter of the mothers report that their milk came in late. Overall, almost three-quarters of the mothers report experiencing at least one nursing problem while in the hospital.

A majority of the mothers who experience nursing problems receive some help in the hospital. Up to three-quarters of the mothers who experience some nursing problems report having a hospital staff person help them. Furthermore, 23 percent of the mothers who experience nursing problems also report pumping breastmilk while in the hospital (compared to 11% among those who do not report nursing problems). While there appears to be a high overall level of support provided to breastfeeding mothers in the hospital, substantial proportions of mothers reporting specific nursing problems do not receive help from the hospital staff. Figure V.5 provides the percentages of mothers, among those who report common nursing problems, who do not receive help from the hospital staff. Most importantly, about one-third (33%) of the mothers who report problems with their milk while breastfeeding in the hospital also report that they did not receive help from the hospital staff. The association between the reported problems with breastmilk and feeding practices at the time of hospital discharge is investigated below (see page 115). In Section IV.5, the role of problems with breastmilk in initiation of formula supplementation is investigated.

Percentage

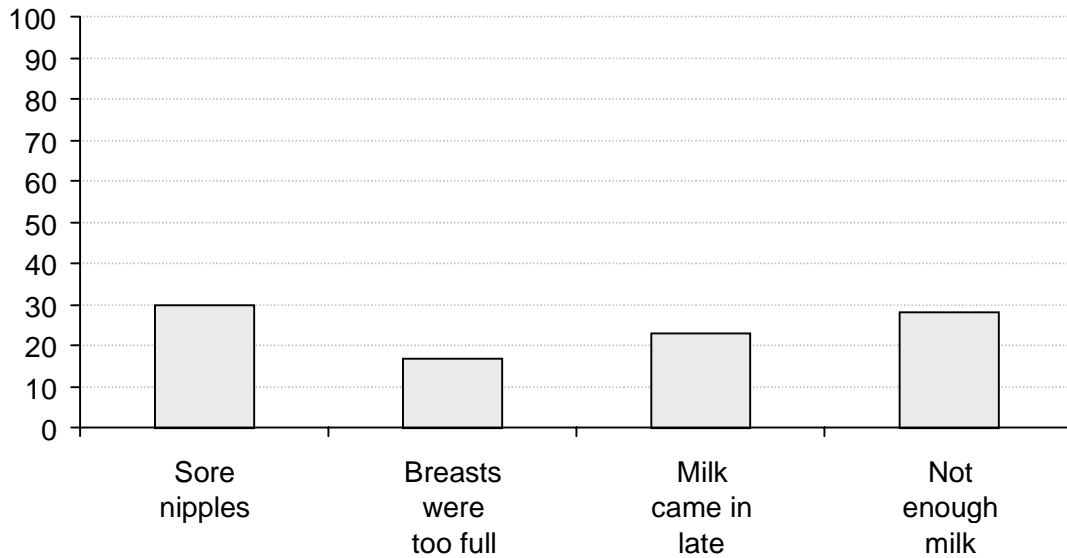


Figure V.5. Percentage of WIC mothers who did not receive help from the hospital staff among those who had common nursing problems.

✓ Hospital gift packages almost always include an item that is considered to be unsupportive in the establishment of breastfeeding.

Almost all mothers receive some type of a hospital gift package that includes some items known to discourage breastfeeding. Figure V.6 displays the percentages of mothers receiving various items in their gift packages. Overall, 93 percent of WIC mothers receive a gift package as they leave the hospital after birth. The most common item included in the gift package is formula (86%), followed by a pacifier (64%) and a toy (48%). Altogether, 92 percent of all WIC mothers receive some item in their gift package that is considered by the American Academy of Pediatrics to be unsupportive in the establishment of breastfeeding (bottle, formula, pacifier, or sugar water). In other words, virtually all mothers who receive a gift pack receive an item in that pack that is unsupportive of breastfeeding.

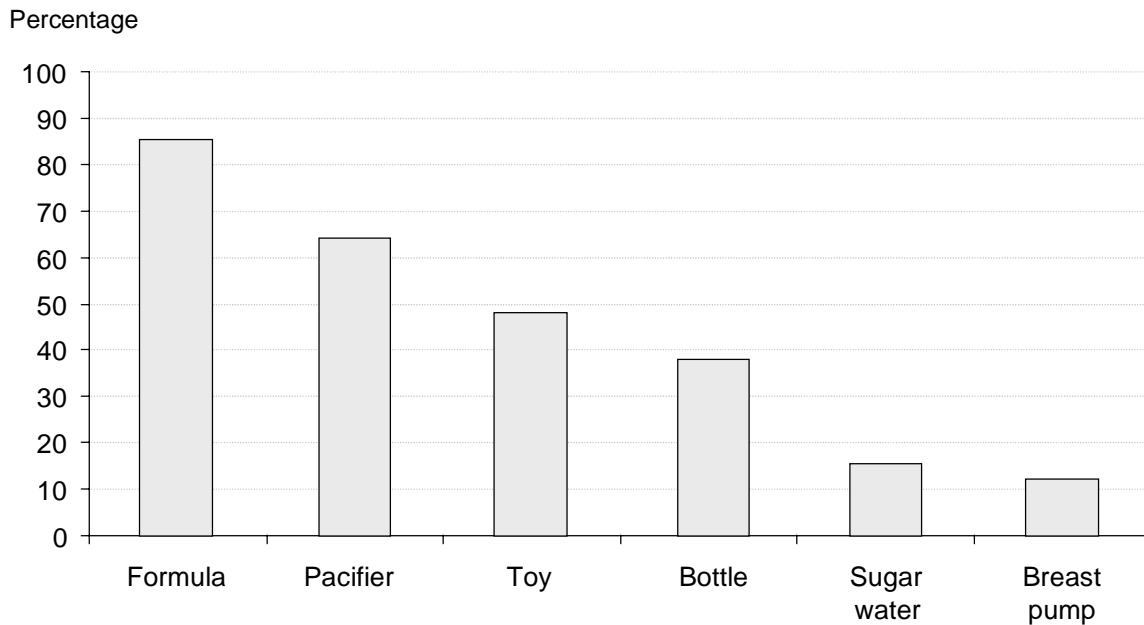


Figure V.6. Percentage of WIC mothers who reported receiving various items in their gift packages from the hospital.

✓ Forty-five percent of WIC mothers report breastfeeding at the time of hospital discharge. Thirty percent report breastfeeding exclusively, and 15 percent report breast- and formula-feeding.

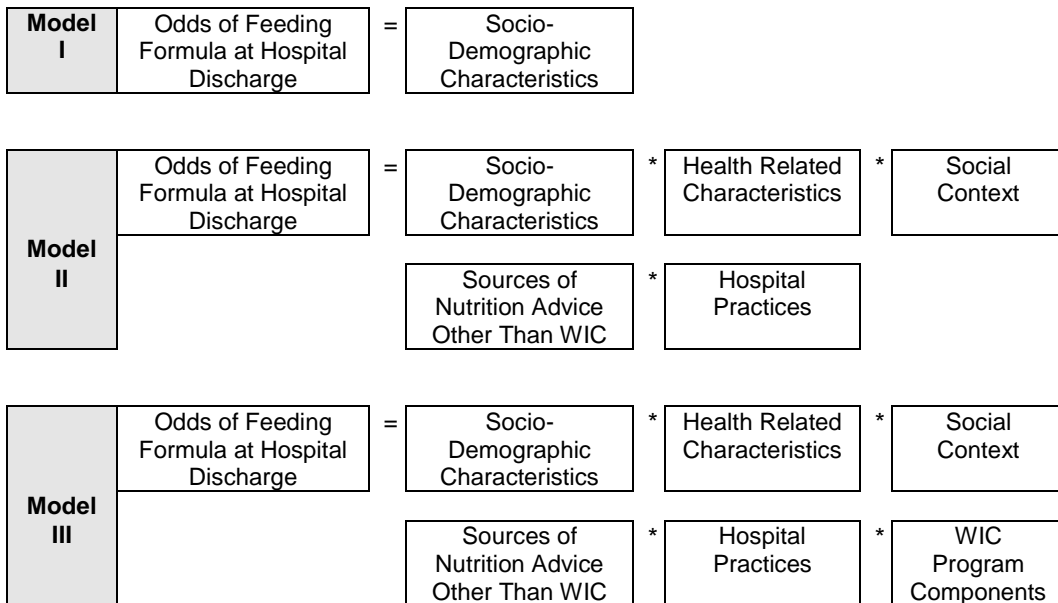
At the time when they leave the hospital, about 30 percent of the WIC mothers are breastfeeding only, 55 percent are formula feeding, and the remaining 15 percent are both breast- and formula feeding. Not surprisingly, the nursing diet at the time of hospital discharge is strongly associated with the type of first feeding. Table V.3 provides the percentages of WIC mothers who are breastfeeding, formula feeding, or both at hospital discharge relative to three different types of first feeding. About 20 percent of the infants who receive formula at their first feeding receive breastmilk at the time of the hospital discharge, but a vast majority of these infants are only partially breastfed. Similarly, almost one-fifth of the infants who receive breastmilk at the first feeding are only partially breastfed at the time of hospital discharge. Only 3 percent of the infants whose first feeding is a breastfeed are exclusively formula feeding at the time of hospital discharge.

Table V.3. Percentages of type of feeding at hospital discharge by type of first feeding.

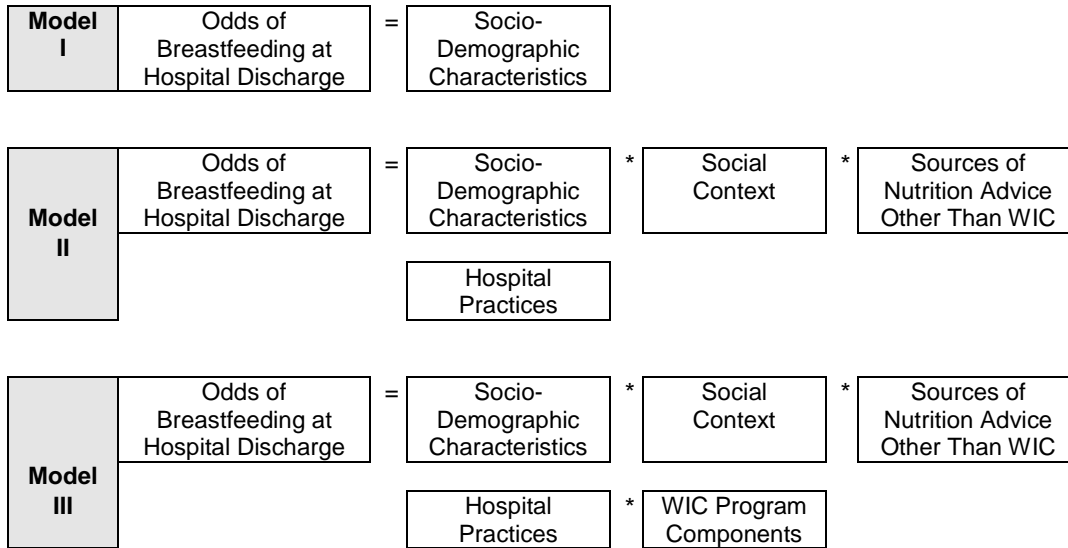
Type of First Feeding	Type of Feeding at Hospital Discharge			N
	Breastfeeding	Breast- and Formula Feeding	Formula Feeding	
Breastfeeding	79	18	3	251
Formula	6	14	80	448
Other	33	9	58	103
Total	30	15	55	823

Multivariate logistic regression models were estimated in order to investigate the association of the type of feeding at the time of hospital discharge with maternal characteristics and hospital practices. Two sets of models were estimated: Models for the mothers who breastfeed at the first feeding and models for the mothers who feed something other than breastmilk at the first feeding. It was necessary to estimate the models separately for mothers who do and do not breastfeed at the first feeding, because as shown in Table V.3, the type of first feeding very strongly determines the feeding practices at hospital discharge.

The following set of models were estimated for the mothers who breastfeed at the first feeding:



For the mothers who do not breastfeed at the first feeding:



Mothers who breastfeed at the first feeding. Table V.4 shows the odds ratios that predict the odds of initiating formula while in the hospital among the mothers who breastfeed at the first feeding. The feeding of formula at the time of hospital discharge defines the outcome of these models. Model I in Table V.4 includes socio-demographic characteristics of the mother.

✓ African American mothers who initiate breastfeeding at the first feeding are seven times more likely to be using formula at the time of hospital discharge than comparable white mothers.

African American mothers are not only more likely to give formula at the first feeding, but even among those mothers who breastfeed at the first feeding, African American mothers are the racial/ethnic group most likely to be using formula by the time of hospital discharge. The poverty level of the mother is significantly and negatively associated with the odds of formula use at hospital discharge, indicating that the mothers who are economically better off are less likely to feed formula at the time of hospital discharge. The odds of formula use diminish by about three-quarters for a unit increase in the income-to-poverty ratio (i.e., poverty level) of the maternal household.

Table V.4. Relative odds¹ of formula feeding at hospital discharge for WIC mothers who breastfeed at the first feeding (N=251).

Predictors	Model I	Model II	Model III
SOCIO-DEMOGRAPHIC CHARACTERISTICS			
African American	6.04**	6.12**	7.15**
Hispanic	1.65	1.53	1.44
Maternal immigrant status - foreign born	3.15	3.13	4.16*
Birth order of the infant - first born	1.22	1.22	1.45
Father of the infant lives with the mother	1.78	1.76	1.69
Income reported	3.73**	4.56**	5.11**
Poverty level	0.23*	0.22*	0.21*
HEALTH RELATED CHARACTERISTICS			
Reported problems with the breast and feeding	--	1.73	1.69
Reported problems with the breastmilk	--	1.89*	1.76*
SOCIAL CONTEXT			
Mother breastfed previous children	--	0.85	0.91
Receipt of advice to breastfeed from the grandmother	--	0.82	1.05
SOURCES OF NUTRITION ADVICE OTHER THAN WIC			
Maternal report on receipt of advice to breastfeed from her doctor	--	--	--
HOSPITAL PRACTICES			
Length of the hospital stay of the mother	--	1.39*	1.36*
Stayed in the nursery overnight	--	2.01*	1.83
Received help from the hospital staff to address breastfeeding problems	--	0.56	0.54*
WIC PROGRAM COMPONENTS			
Knowledge of the special WIC food package ²	--	--	0.99
Maternal report on receipt of information on breastfeeding from WIC ³	--	--	0.91
Maternal report on receipt of advice to breastfeed from WIC ⁴	--	--	0.41*

Notes:

1. Relative odds greater than one imply that the characteristic considered is associated with higher odds of the outcome. Relative odds less than one imply that the characteristic considered is associated with lower odds of the outcome.
2. The answer to the question "Have you been told that there is a special WIC food package for breastfeeding women who do not accept infant formula from WIC?" is "yes."
3. The answer to any one of the three questions "Have you received information or advice from the WIC office about (1) benefits of breastfeeding?, (2) how to breastfeed?, or (3) mother's diet while breastfeeding?" is "yes."
4. The answer to the question "Have WIC program staff told you that you should breastfeed?" is "yes."

* p <.05

** p <.01

Model II in Table V.4 includes all of the non-program factors, predicting formula use at hospital discharge.

- ✓ Among the mothers who breastfeed at first feeding, maternal perception of problems with breastmilk is a significant predictor of formula use at the time of hospital discharge. However, those mothers who receive help from the hospital staff to address their nursing problems are about half as likely to be feeding formula at the time of hospital discharge.

Maternal perception of problems with breastmilk is a significant predictor of formula use (see Model II). The odds of formula use for the mothers who report problems with their breastmilk are about 80 percent higher than those for mothers who do not report such problems. As indicated in Model II, the availability of hospital staff to address nursing problems counteracts the detrimental impact of experiencing such problems. Among those mothers who have nursing problems, those who receive help from the hospital staff have about one-half the odds of formula feeding at hospital discharge as compared to those who do not receive help. Breastfeeding of previous children or receipt of advice to breastfeed from the grandmother of the infant do not significantly predict formula use at hospital discharge among the mothers whose first feeding is a breastfeed.

Length of the hospital stay is positively associated with formula use at the time of hospital discharge. Each additional day of stay in the hospital predicts an increase in the odds of formula use by over 40 percent. This may be due to two reasons: First, the length of the hospital stay may be associated with maternal health. The mothers who stay in the hospital longer may have experienced complications after the birth that interfere with breastfeeding. Second, the length of hospital stay may be associated with hospital practices. Those hospitals where new mothers are allowed to stay longer may be more inclined to offer formula to the infants. It should be noted that the presence of medical problems with the infant, controlling for other relevant characteristics, is not a significant predictor of feeding status at hospital discharge. The relative odds associated with this variable are not displayed in Table V.4.

- ✓ An overnight stay in the hospital nursery doubles the odds of formula feeding at the time of hospital discharge among the mothers who breastfeed at the first feeding.

The measure indicating if the infant stayed in the hospital nursery overnight is

Table V.5. Relative odds¹ of breastfeeding at hospital discharge for WIC mothers who formula feed at the first feeding (N=551).

Predictors	Model I	Model II	Model III
SOCIO-DEMOGRAPHIC CHARACTERISTICS			
African American	0.90	0.90	1.05
Hispanic	3.35**	2.36*	2.64*
Maternal immigrant status - foreign born	3.19**	3.70**	3.75**
Birth order of the infant - first born	1.31	2.29**	2.55*
Father of the infant lives with the mother	1.83*	1.67*	1.73*
Income reported	1.39	1.52	1.61
Poverty level	1.06	0.97	0.87
SOCIAL CONTEXT			
Receipt of advice to breastfeed from the grandmother	--	1.28	1.21
Mother breastfed previous children	--	4.26**	4.12**
SOURCES OF NUTRITION ADVICE OTHER THAN WIC			
Maternal report on receipt of advice to breastfeed from her doctor	--	2.28**	2.15*
HOSPITAL PRACTICES			
Length of the hospital stay of the mother	--	1.13	1.12
Stayed in the nursery overnight	--	1.00	0.98
Received help from the hospital staff to address breastfeeding problems	--	--	--
WIC PROGRAM COMPONENTS			
Knowledge of the special WIC food package ²	--	--	2.52**
Maternal report on receipt of information on breastfeeding from WIC ³	--	--	1.07
Maternal report on receipt of advice to breastfeed from WIC ⁴	--	--	1.24

Notes:

1. Relative odds greater than one imply that the characteristic considered is associated with higher odds of the outcome. Relative odds less than one imply that the characteristic considered is associated with lower odds of the outcome.
2. The answer to the question "Have you been told that there is a special WIC food package for breastfeeding women who do not accept infant formula from WIC?" is "yes."
3. The answer to any one of the three questions "Have you received information or advice from the WIC office about (1) benefits of breastfeeding?, (2) how to breastfeed?, or (3) mother's diet while breastfeeding?" is "yes."
4. The answer to the question "Have WIC program staff told you that you should breastfeed?" is "yes."

* p <.05

** p <.01

breastfeed at the first feeding. Model I in this table includes socio-demographic characteristics of the mother.

- ✓ Hispanic mothers and mothers who were born outside the United States are significantly more likely to be breastfeeding at the time of hospital discharge, even if they do not breastfeed at the first feeding.

Model II in Table V.5 includes the non-program predictors of breastfeeding at hospital discharge. The odds of breastfeeding at hospital discharge for Hispanic and immigrant mothers are 2.5 and three times that of white mothers and non-immigrant mothers, respectively. The firstborn infants are more than twice as likely to be breastfeeding at the time of hospital discharge than infants of higher birth order whose mothers have not breastfed previous children. Breastfeeding previous children predicts a fourfold increase in the odds of breastfeeding at hospital discharge.

Among the mothers who do not breastfeed at the first feeding, the length of hospital stay is not significantly associated with the likelihood of breastfeeding at hospital discharge. For the same group of mothers, an overnight nursery stay is also not significantly associated with the likelihood of breastfeeding at hospital discharge.

The indicator showing the receipt of advice to breastfeed from the physician is significantly and positively associated with breastfeeding at hospital discharge. The mothers who formula feed at the first feeding and who report receiving such advice are more than two times as likely to breastfeed at hospital discharge.

- ✓ Knowledge of the special WIC food package for breastfeeding women is significantly and positively associated with the odds of breastfeeding at hospital discharge for the mothers who do not breastfeed at the first feeding.

Model III in Table V.5 includes the indicators of WIC Program components. Among the mothers who do not breastfeed at first feeding, those who know about the special breastfeeding package are about 2.5 times as likely to breastfeed at hospital discharge than those who do not know about the package. Receipt of information on breastfeeding and receipt of advice to breastfeed from WIC staff are not significantly predictive of the odds of breastfeeding at hospital discharge in this group of mothers.

V.8. Conclusions

While a hospital stay following the birth is a nearly universal experience for WIC mothers and their infants, many experiences during this stay are not conducive to the establishment of breastfeeding. Some neonatal experiences in the hospital may be due to the policies and established practices of the hospitals while others may be due to the stated preferences of the mothers. Although it is not possible to distinguish maternal preferences from the hospital practices imposed on mothers, it is evident that a number of neonatal experiences that appear to be common among the WIC mothers are detrimental to the establishment of healthy breastfeeding patterns (FNS, 1993a). Examples of such experiences are the choice of first feeding, the rooming arrangements in the hospital, and the inclusion of supplementary food items in the hospital gift package.

Maternal race and ethnicity is significantly associated with the hospital experiences that may influence nursing practices. For example, African American infants are more likely to spend time away from their mothers in the nursery and more likely to receive formula at the first feeding. WIC-IFPS data on prenatal feeding intentions are limited, so the hypothesis of differential hospital practices controlling for infant feeding preferences prior to birth cannot be thoroughly tested. However, among the mothers who prenatally reported that they wanted to exclusively breastfeed their infants (N=122), a higher proportion of white than African American and Hispanic mothers ended up breastfeeding at the first feeding (74%, 57%, and 34%, respectively). These data, while limited, may be indicative of some race/ethnicity-specific hospital practices. Similarly, low rates of breastfeeding at the first feeding among foreign-born mothers who intended to exclusively breastfeed indicate that there may also be some communication problems between the hospital staff and the mothers, or that these mothers are following the customary practices of their homeland in giving prelacteal feeds (Morse et al., 1990).

A very large proportion of mothers who initiate breastfeeding while in the hospital experience some nursing problems. About one-third of these mothers do not receive help from the hospital staff. Some nursing problems such as sore nipples and breasts being too full are common and often of little consequence for the nursing practices of the mothers during the neonatal period. Other problems, however, especially those that pertain to the maternal perception of problems with her breastmilk, have significant negative consequences for continued breastfeeding. The WIC-IFPS data indicate that

about one-third of the mothers who report such problems do not receive support from the hospital staff. Furthermore, the WIC-IFPS data also indicate that, other things being equal, the neonatal breastfeeding practices of the mothers significantly benefit if they do receive help from the hospital staff addressing their nursing problems.

WIC Program components are significantly associated with neonatal feeding practices, controlling for the method of first feeding. Among the mothers who breastfeed their infants at the first feeding, formula supplementation during the neonatal period is substantially less likely if they receive advice from WIC to breastfeed. Among the mothers who do not breastfeed their infants at the first feeding, initiation of breastfeeding during the neonatal period is substantially more likely if they know about the special food package for breastfeeding women. These findings indicate that WIC Program components positively contribute to the shaping of neonatal nursing diets of the WIC infants by promoting increased breastfeeding.

CHAPTER VI

BREASTFEEDING AND FORMULA-FEEDING PRACTICES IN THE NURSING PHASE

VI.1. Overview

This chapter describes the results from two sets of analyses addressing the breastfeeding practices and formula-feeding practices of WIC mothers. The analysis of breastfeeding practices addresses issues such as the schedule of breastfeeding, number of breastfeeds, and the extent of breastmilk expression.

The analysis of formula-feeding practices addresses issues such as the use of iron-fortified formula, addition of other foods and liquids to the formula, and overdilution of formula. The findings pertaining to the breast- and formula-feeding practices are presented in two separate sections.

VI.2. WIC Program Components that Pertain to Breastfeeding and Formula-Feeding Practices

FCS provides guidance regarding breastfeeding and formula-feeding practices. Specifically, regarding breastfeeding, FCS advises that (FNS, 1993a):

- Infants be breastfed often through the day and night to increase milk production, to keep the breasts from being engorged, and to promote optimal growth
- Infants be breastfed whenever they are hungry
- Infants be breastfed as long as they want to nurse
- Mothers may express milk to plan for time away from the infant or to relieve engorged breasts.

Regarding formula feeding, FCS advises that (FNS, 1993a):

- Iron-fortified formula be fed
- Cereal, other supplementary foods, or fruit juices not be mixed with formula in the bottle

- Formula not be overdiluted. (If the infant has a need for additional water, it should be provided separately, and not in excessive amounts.)

The next two sections present the findings about breastfeeding and formula-feeding practices of WIC mothers from the WIC-IFPS.

VI.3. Breastfeeding Practices

Research Questions

In addition to the choice of nursing diets, WIC mothers make choices regarding the schedule of feeding, how often and how many times to feed, and whether to feed directly from the breast or to express breastmilk. The analysis of breastfeeding practices of WIC mothers informs program implementation for breastfeeding education and support. Furthermore, breastfeeding practices are likely to have implications for the ultimate duration of breastfeeding (American Academy of Pediatrics, 1993). In this section, the breastfeeding practices of WIC mothers are described over the period of infancy for the nationally representative WIC-IFPS sample, and for subgroups of mothers defined by their socio-demographic characteristics. The following research questions are addressed:

- Do WIC mothers breastfeed on a set schedule or when their infants seem hungry?
- How many times a day do WIC mothers breastfeed?
- What percentage of WIC mothers express milk?
- What are the factors associated with the daily number of breastfeeds?

The daily number of breastfeeds is an important factor to stimulate milk production and ensure continued breastfeeding. Therefore, an understanding of non-program and program factors associated with the daily number of breastfeeds is valuable. To address this issue, a multivariate analysis of the daily number of breastfeeds was conducted. The models estimated for these analyses were derived from the conceptual model depicted in Figure VI.1.

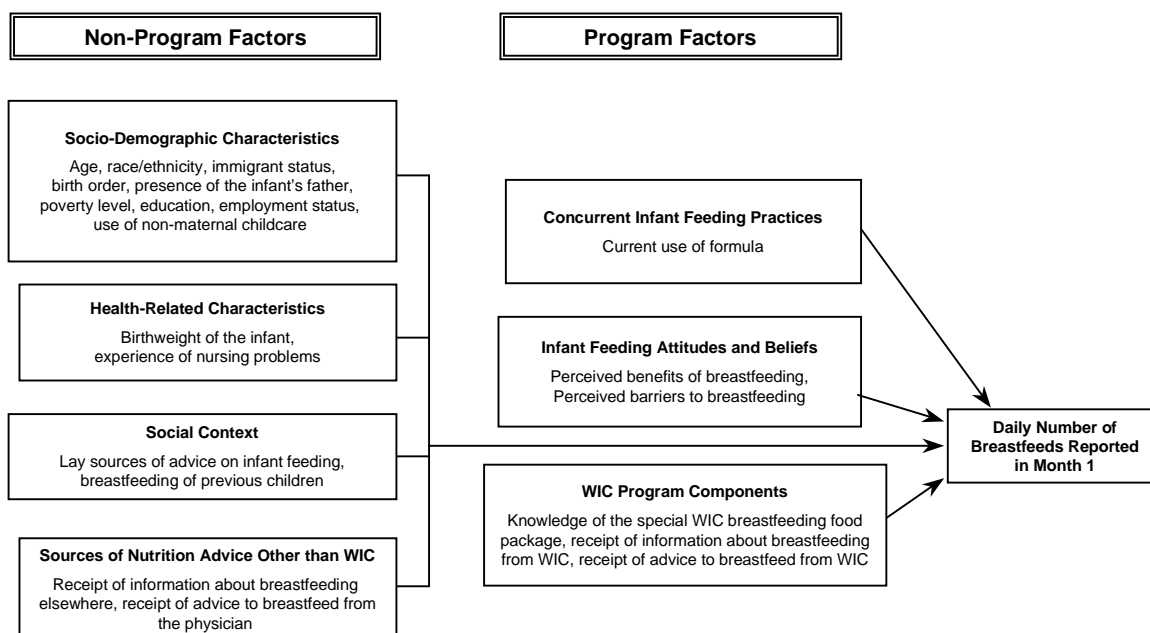


Figure VI.1. A model of daily number of breastfeeds at Month 1 interview and its predictors available from the WIC-IFPS.

Main Findings

- ✓ A majority of WIC mothers breastfeed their infants when they cry or seem hungry.
- ✓ Socio-demographic characteristics are not significantly associated with the schedule of breastfeeding.
- ✓ The average frequency of breastfeeds among WIC mothers is below the level recommended for exclusive breastfeeders; six times per day compared to the recommended 8 to 12, depending on the age of the infant.
- ✓ One-third of breastfeeding WIC mothers report having expressed breastmilk. Most mothers express breastmilk in order to be able to leave the infant in someone else's care or to relieve engorged breasts.
- ✓ Mothers who report receiving advice from a physician to breastfeed, breastfeed more frequently.

- ✓ Concurrent formula supplementation has a large and significant negative effect on the daily number of breastfeeds.

See the Results section for more information on these findings.

Previous Studies

Few studies to date have collected information on breastfeeding practices. No studies were found that investigated the factors associated with choices of schedule of breastfeeding, number of breastfeeds, and breastmilk expression. Several sources indicate the consequences of breastfeeding practices for the ultimate success of breastfeeding: on-demand breastfeeding, frequent breastfeeding, and breastfeeding during the night are known to promote continued breastfeeding because these practices stimulate milk production and are said to be better suited to meet the needs of the infants (American Academy of Pediatrics, 1993; FNS, 1993a; Hill, 1991). Hill and Aldag (1993) found that the mothers who breastfeed frequently are less likely to report milk insufficiency. Although the result was not statistically significant, Hill and Aldag (1993) also report a higher number of daily breastfeeds among white than among African American WIC mothers.

Statistical Methods

WIC-IFPS questions on breastfeeding practices elicited the following information:

- Whether the mother breastfed on a set schedule, when the infant cried or seemed hungry, or on a mixed schedule
- The usual daily number of times the mother breastfed
- Whether the mother expressed milk during the week preceding each monthly interview.

Descriptive and multivariate analyses of these data are presented below.

Descriptive analyses consist of the following:

Comparisons of the percentages of the mothers who adopted given breastfeeding practices by selected socio-demographic characteristics: These comparisons were done using chi-square statistics that are computed accounting for the multistage stratified and clustered sampling design of the WIC-IFPS, using the SUDAAN statistical software.

Comparisons of mean usual number of breastfeeds by selected socio-demographic characteristics: These comparisons were done using the Satterthwaite-adjusted F-

Table VI.1. Breastfeeding schedules of WIC mothers over the first five months of their infants' first year.

Interview Month	Set Schedule	When the Infant Cries or Seems Hungry	Mixed Schedule	N ¹
Month 1	23	64	12	198
Month 2	19	67	13	185
Month 3	19	69	12	163
Month 4	12	72	16	165
Month 5	12	70	17	143

(VI.1)

Note:

1. Breastfeeding mothers who were interviewed at that month only.

statistics. These statistics were computed accounting for the multistage stratified and clustered sampling design of the WIC-IFPS, using the SUDAAN statistical software.

In addition, multivariate analyses of usual daily number of breastfeeds were conducted using a linear regression model. The linear regression models take the following form:

where y is the predicted usual number of breastfeeds per day for a mother who has the relevant non-program or program characteristics indicated by x_1, x_2, x_3, \dots ; β is the estimated coefficient representing the association between a characteristic x and the usual number of breastfeeds per day. The β coefficients represent the change in the predicted number of breastfeeds for a unit change in the characteristic x . For example, the estimated coefficient for the variable that indicates whether the mother is using child care is -1.4 (Model 1 in Table VI.4). This is interpreted as follows: a mother who is using child care will breastfeed 1.4 fewer times per day, on average, than a similar mother who is not using child care.

The multivariate models were built by following a protocol that allowed testing of the predictive power of groups of variables, and that allowed elimination of the variables that had no significant association with the daily number of breastfeeds and that were not of primary substantive or programmatic interest.

Results

Descriptive Analyses. Table VI.1 shows the percentage of mothers who breastfeed on a set schedule, when the infant cries or seems hungry, and on a mixed schedule during the first five months of infancy.

✓ A majority of WIC mothers breastfeed their infants when they cry or seem hungry.

At the time of the Month 1 interview, just under one-quarter of the mothers reported breastfeeding on a set schedule and almost two-thirds reported breastfeeding when the infant seemed hungry. Only about one in ten mothers follow a mixed schedule (i.e., feeding occasionally when the infant seems hungry and occasionally on a set schedule). The changes in the percentages of mothers breastfeeding on these three alternative schedules are examined in Figure VI.2. The percentage of mothers feeding on a set schedule declines steadily from 23 percent in Month 1 to 12 percent in Month 5. In contrast, the percentage of mothers who breastfeed when the infant seems hungry increases slightly, from 65 percent of breastfeeding mothers in Month 1 to 70 percent in Month 5.

✓ Socio-demographic characteristics are not significantly associated with the schedule of breastfeeding.

There are no significant differences in breastfeeding schedules by race and ethnicity, maternal age, birth order, maternal immigrant status, presence of the father in the household, poverty level, or maternal education (results not presented).

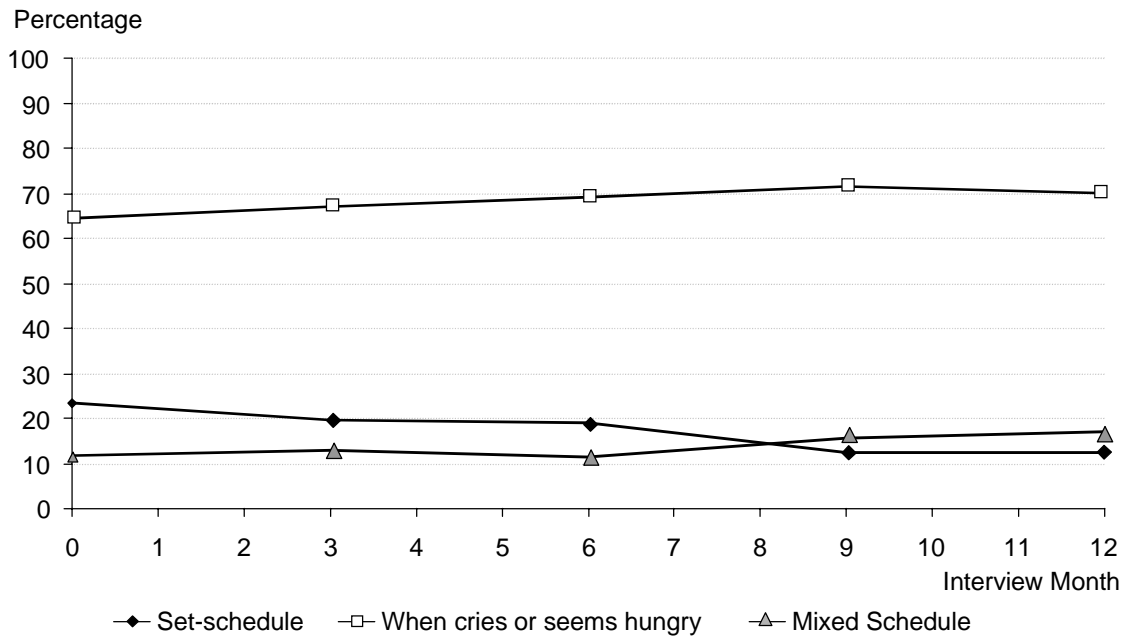


Figure VI.2. Percentages of WIC mothers who breastfeed on a set schedule, when the infant cries or seems hungry, and on a mixed schedule.

✓ The average frequency of breastfeeds among WIC mothers is below the level recommended for exclusive breastfeeders; six times per day compared to the recommended eight to twelve, depending on the age of the infant.

Table VI.2 provides the mean number of daily breastfeeds for breastfeeding mothers. The WIC-IFPS elicited information specifically about the “usual” number of daily breastfeeds, as well as the number for the day preceding the day of the interview. In this chapter, results pertaining to the usual number of breastfeeds are presented. Breastfeeding WIC mothers nurse their infants approximately six times per day, with the frequency decreasing somewhat from almost seven times in the first month to just under six by Month 5. These averages are well below the recommendation that exclusive breastfeeders feed eight to twelve times per day, depending on the age of the infant (FNS, 1993a).

Table VI.2. Usual number of daily breastfeeds, by selected maternal socio-demographic characteristics.¹

Socio-Demographic Characteristics	Interview Months				
	Month 1	Month 2	Month 3	Month 4	Month 5
Total	6.87	6.59	6.66	6.12	5.97
Immigrant status		*			
Born in the U.S.	7.45	7.05	7.01	6.28	6.28
Born elsewhere	5.88	5.90	6.15	5.94	5.46
Father of the infant lives with the mother	*	*			
Yes	7.73	7.18	7.02	6.40	5.98
No	6.06	6.02	6.35	5.90	5.96
Poverty level	*	*			
< 50%	5.99	5.11	6.94	5.82	6.12
50 - 100%	7.25	7.08	6.16	6.40	5.99
100% or more	7.62	6.68	6.53	5.66	5.14
N ²	196	186	163	165	143

Notes:

1. Numbers presented are means.
 2. Breastfeeding mothers who were interviewed at that month only.
- * F-statistic comparing the means for this month is significant at p<.05.

Table VI.2 also shows the number of breastfeeds by selected socio-demographic characteristics. Race/ethnicity, maternal age, birth order of the infant, and educational attainment of the mother are not significantly associated with usual daily number of breastfeeds (see Appendix I). Mothers who were born in the United States breastfeed more times per day than immigrant mothers. This difference is significant in Month 2. Mothers who live with their infant's father have a significantly higher daily frequency of breastfeeds during the first two months of infancy. Poverty level is significantly associated with the daily number of breastfeeds during the first two months. During these months mothers with income levels at less than 50 percent of the federal poverty level have the lowest breastfeeding frequency.

✓ One-third of breastfeeding WIC mothers report having expressed breastmilk. Most mothers express breastmilk in order to be able to leave the infant in someone else's care or to relieve engorged breasts.

Table VI.3 provides the percentages of WIC mothers who express milk by hand or using a manual or electric pump. About one-third of breastfeeding mothers report expressing milk in the first two months. This percentage decreases somewhat in Month 3, to 24 percent. Mothers who have older children, mothers who were born outside of the United States, and mothers who do not live with their infant's father are less likely to express breastmilk than other mothers. There are no significant differences by race/ethnicity, age, poverty level, or education in percentages of WIC mothers expressing

Table VI.3. Percentage of WIC mothers who report expressing milk during the past week, by selected maternal socio-demographic characteristics.

Characteristics	Interview Months		
	Month 1	Month 2	Month 3
Total	36	32	24
Birth order of the infant	*		*
First born	37	39	37
Second born	56	34	21
Third born or younger	24	26	16
Immigrant status	*	*	*
Born in the U.S.	43	40	34
Born elsewhere	23	18	8
Father of the infant lives with the mother			*
Yes	45	37	34
No	27	27	16
N ¹	198	186	163

Notes:

1. Among the mothers who were breastfeeding and who were interviewed at that month only. Although the numbers who were breastfeeding at each monthly interval were not large, the differences between subgroups are large enough that they are significant.
- * Chi-square statistic testing the group differences for that month is significant at $p < .05$.

breastmilk (see Appendix I). Breastmilk expression is significantly more common among mothers of firstborn infants than among mothers of later-born infants; an exception to this is the second-born infants in Month 1. Immigrant status is also statistically significantly associated with breastmilk expression. Mothers born in the United States are more likely to express milk than foreign-born mothers. Mothers living with the infant's father also have a higher prevalence of breastmilk expression; this difference is significant in Month 3.

In addition to leaving the infant in someone else's care and relieving engorged breasts, the mothers cite mixing cereal, training the infant to use a bottle, stimulating breastmilk production, and avoiding embarrassment while feeding in the presence of company as reasons for expressing breastmilk. Over 80 percent of the mothers who express milk use electric or manual pumps. Percentage of breastfeeding WIC mothers expressing milk by using manual pumps, electric pumps,

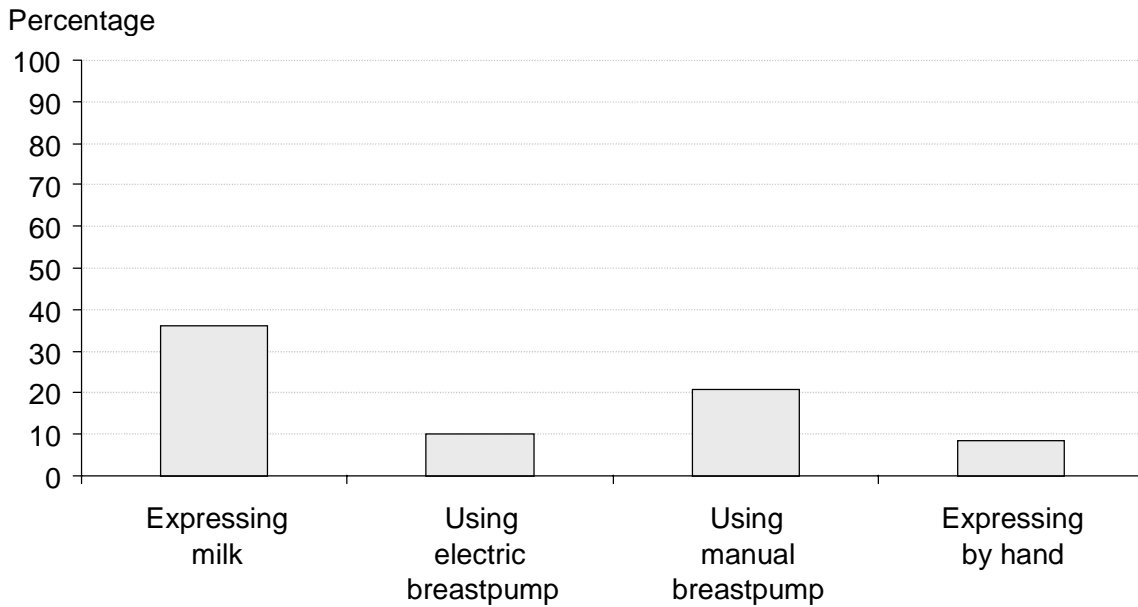
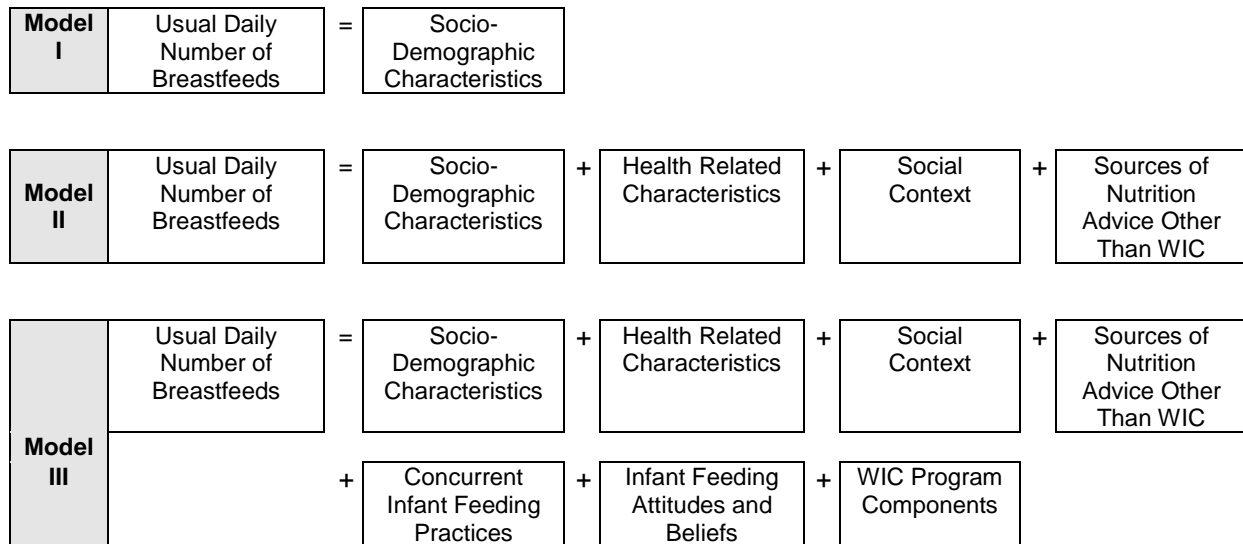


Figure VI.3. Percentage of breastfeeding WIC mothers expressing milk, using electric breastpumps, using manual breastpumps, and expressing milk by hand.

or by hand are provided in Figure VI.3. Most WIC mothers express milk using a manual breast pump.

Multivariate Analysis. Multivariate analysis of the usual daily number of breastfeeds was conducted to examine the unique contributions of various non-program and program factors to the frequency of breastfeeds. The following models are presented:



As mentioned previously, the number of mothers in the WIC-IFPS who were breastfeeding at the time of the Month 1 interview is quite low. In the following months,

these numbers diminish even further because of the high rates of breastfeeding cessation. The results from the model of usual number of breastfeeds must be interpreted with caution because of the small size of the sample (N=196) for these analyses¹⁹. These results are presented in Table VI.4. A complete list of all variables tested to arrive at the models presented in Table VI.4 can be found in Figure VI.1.

Model I includes socio-demographic factors only. Maternal race/ethnicity and maternal immigrant status are not significantly associated with breastfeeding frequency in Month 1. Maternal poverty level and use of non-maternal child care are significantly associated with the frequency of breastfeeds. An increase in the poverty level (household income divided by the federally determined poverty cutoff for a household of that size) by one is associated with an increase of over 1.5 breastfeeds per day. Among the WIC mothers who reported on their income, mothers with low levels of income breastfeed less frequently than mothers with high levels of income. As expected, the use of non-maternal child care is associated with significantly diminished number of breastfeeds per day (about 1.4 breastfeeds). This is likely to be associated with the number of hours per day an infant spends in non-maternal care (see Appendix F).

✓ Mothers who report receiving advice from a physician to breastfeed, breastfeed more frequently.

Model II in Table VI.4 includes all non-program factors that were considered for these analyses. Mothers who perceive problems with their breastmilk breastfeed less frequently. Mothers who breastfed previous children breastfeed 1.2 times per day more. Physician's advice to breastfeed has a significant, large, and positive impact on the frequency of breastfeeds. Mothers who receive advice from their

¹⁹ Power analysis indicates that N=196 is sufficient to detect an effect size of 0.106 (standardized beta) in a regression model with 15 predictors as in the case of Model III in Table VI.4.

Table VI.4. Relative contribution of selected non-program and program factors to the usual daily number of breastfeeds reported at Month 1 interview (N=196).

Predictors	Model I	Model II	Model III
SOCIO-DEMOGRAPHIC CHARACTERISTICS			
African American	-1.19	-.68	-.02
Hispanic	-.92	-.51	-.16
Maternal immigrant status - foreign born	-1.07	-1.13*	-.56
Birth order of the infant - firstborn	.07	.87	.69
Income reported	-1.15*	-1.12*	-.91
Poverty level	1.66**	1.42**	1.40**
Use of non-maternal child care	-1.42*	-1.31*	-.46
HEALTH-RELATED CHARACTERISTICS			
Reported problems with the breastmilk		-.82*	-.32
SOCIAL CONTEXT			
Mother breastfed previous children		1.20*	1.03
SOURCES OF NUTRITION ADVICE OTHER THAN WIC			
Receipt of advice to breastfeed from physician		1.42**	1.69**
CONCURRENT INFANT FEEDING PRACTICES			
Currently supplementing with formula			-1.29**
INFANT FEEDING ATTITUDES AND BELIEFS			
Perceived barriers to breastfeeding			-.03
WIC PROGRAM COMPONENTS			
Knowledge of the special WIC breastfeeding food package ¹			.07
Maternal report on receipt of information about breastfeeding from WIC ²			.27
Maternal report on receipt of advice to breastfeed from WIC. ³			-.87

Notes:

1. The answer to the question "Have you been told that there is a special WIC food package from breastfeeding women who do not accept infant formula from WIC?" is "yes."
2. The answer to any one of the three questions "Have you received information or advice from the WIC office about (1) benefits of breastfeeding?, (2) how to breastfeed?, or (3) mother's diet while breastfeeding?" is "yes."
3. The answer to the question "Have WIC program staff told you that you should breastfeed?" is "yes."

* p<.05,

** p<.01

physician breastfeed, on average, 1.4 additional times a day (Model II). This effect is even larger when WIC program factors are accounted for (Model III). When other non-program factors are controlled, immigrant status is significantly associated with the frequency of breastfeeds, with foreign-born mothers breastfeeding less frequently than the mothers who were born in the United States.

- ✓ Concurrent formula supplementation has a large and significant negative effect on the daily number of breastfeeds.

Model III in Table VI.4 includes three groups of program factors: concurrent infant feeding practices, infant feeding attitudes and beliefs, and the WIC Program components. Infants who receive formula breastfeed 1.3 less times a day. This finding indicates that breastfeeding WIC mothers do not complement breastfeeds with formula (i.e., feed some formula after breastfeeding) but rather supplement breastfeeds (i.e., substitute some breastfeeds with formula feeds). This information is important in understanding the use of formula among breastfeeding WIC mothers, and in inferring its likely effects on continued breastfeeding. When concurrent formula supplementation is controlled, the associations between non-maternal child care, perceived problems with breastmilk, and breastfeeding of previous children with the frequency of breastfeeds are no longer significant, indicating that these factors predict the frequency of breastfeeds only because they predict formula supplementation.

Perceived barriers to breastfeeding and WIC Program components do not significantly predict the frequency of breastfeeds.

Conclusions

About a two-thirds majority of the WIC mothers who breastfeed do so when their infants cry or seem hungry. This feeding schedule is recommended by FCS and other sources (FNS, 1993a; American Academy of Pediatrics, 1993). With an average of six nursing episodes per day, those WIC infants who are breastfed are presumably receiving a large proportion of their nourishment from breastmilk. The mean number of breastfeeds through the first five months indicates that most WIC infants are not "token" breastfeeders (i.e., infants breastfeeding only once or twice a day while receiving almost all nutrient needs from other sources).

WIC-IFPS data indicate that WIC mothers may not be breastfeeding often enough to stimulate milk production. It is particularly important for stimulation of breastmilk production that the daily frequency be high in the first month postpartum. During the first

few weeks, it is recommended that infants breastfeed at least eight to twelve times per day (i.e., every two to three hours) (FNS, 1993a; Queen & Lang, 1993; Riordan & Auerbach, 1993). The mean number of daily breastfeeds among these WIC-enrolled infants in Month 1 is almost seven, suggesting that many of these infants do not nurse sufficiently often to adequately stimulate milk production. This may contribute to short durations of breastfeeding common among WIC mothers (see Chapter VII).

The multivariate analyses of usual number of breastfeeds per day reveal that concurrent formula feeding is a very important factor that is associated with reduced breastfeeding frequency. It appears that supplementary rather than complementary use of formula is common among WIC mothers. The significant, positive impact of physicians' breastfeeding advice indicates that breastfeeding frequency may be a feeding practice that responds to nutrition advice from a health care provider.

Breastmilk expression is quite prevalent among WIC mothers, practiced by about one-third of breastfeeding mothers. The mothers who are least likely to express milk, who could therefore benefit from more information about breastmilk pumping, include foreign-born mothers who may perceive cultural barriers and mothers who do not live with the fathers of their infants. This latter group of mothers may not have sufficient social support to continue breastfeeding when they have to be away from their infants because of work or school.

VI.4. Formula-Feeding Practices

Research Questions

The mothers who choose to formula feed face many choices regarding formula feeding practices, such as the choice of the type of formula and preparation of the formula. These practices may have far-reaching consequences for the nutritional status of the infant. For this reason, WIC offers nutrition advice to mothers on the preparation and feeding of formula. In this section, formula-feeding practices of the WIC mothers are described over the period of infancy.

The following questions are addressed:

- What percentage of WIC infants receive iron-fortified formula?
- Do WIC mothers add other foods or liquids into the bottle with the formula?
- Do WIC mothers overdilute formula?

- What brand names of formula are most commonly used by the WIC mothers?

Main Findings

- ✓ More than 90 percent of the formula-fed infants receive formula that is fortified with iron; this percentage increases over early infancy.
- ✓ Mothers who receive advice from a health care provider about how to prepare formula are significantly more likely to feed iron-fortified formula.
- ✓ About one-quarter of the WIC mothers report adding other foods or liquids to the bottle with formula by Month 3. African American and teenage mothers are significantly more likely to add other foods. Less than one in ten WIC mothers report overdiluting the formula to make it last longer.
- ✓ The most commonly reported reasons for switching formula brands are spitting up or other digestive problems, allergies or intolerance, doctor's recommendations, change in WIC vouchers, and cost.

See the Results section for more information on these findings.

Previous Studies

Formula-feeding practices have not been studied before, mostly because of lack of data and because breastfeeding practices have taken priority in research. This lack of research on formula-feeding practices may have been misplaced, because by the end of the first month of infancy, a majority of the low socio-economic status mothers in the United States are formula feeding rather than breastfeeding (see Section III.2). Hence, the prevalent formula-feeding practices may influence the nutritional status of a very large proportion of infants.

Most research on formula-feeding practices is concerned with recommended formula-feeding guidelines, as opposed to the investigation of such feeding practices in the general population. FCS advises formula-feeding mothers to feed iron-fortified formula, to avoid adding foods or liquids other than water into the bottle with formula, and to always follow the directions regarding the recommended amount of water to be added to formula (FNS, 1993a). Information is also provided about the possibility of water intoxication due to overdiluting. For breastfed infants, FCS also suggests using powdered infant formula as opposed to concentrated or ready-to-eat liquid formula. FCS does not advise the use of one brand of formula over another.

Statistical Methods

WIC-IFPS questions on formula-feeding practices elicited the following information from all mothers who fed any formula to their infants over the past seven days:

- at each month of interview, whether the mother fed iron-fortified or non-fortified formula
- at each month of interview, whether the mother added anything else into the bottle together with the formula other than water
- at Month 2, whether the mother added more than the prescribed amount of water into the formula to make it last longer
- at each month, the brand name of the formula that the mother is currently using.

Descriptive analyses of these data are presented below. These analyses consist of comparisons of the percentages of the mothers who feed iron-fortified formula, who add other foods or liquids into the bottle with formula, and who overdilute the formula. These percentages are also provided for subgroups of mothers by their socio-demographic characteristics and by whether they received information about formula feeding from WIC or from another health care provider. In addition, a distribution of the formula-feeding WIC mothers by their use of brand names of formula is provided. Comparisons were made using chi-square statistics that are accounted for the multistage stratified and clustered sampling design of the WIC-IFPS, using SUDAAN statistical software.

Results

- ✓ More than 90 percent of the formula-fed infants receive formula that is fortified with iron; this percentage increases over early infancy.

The percentage of WIC infants receiving iron-fortified formula increases slightly from 91 percent in Month 1 to 92 percent in Month 3, to 95 percent in Month 6. There are few differences among socio-demographic subgroups. The proportions of WIC mothers who feed iron-fortified formula are not significantly different by race/ethnicity, maternal age, birth order of the infant, immigrant status, whether the mother lived with the father of the infant, poverty level, educational attainment, or birthweight of the infant.

- ✓ Mothers who receive advice from a health care provider about how to prepare formula are significantly more likely to feed iron-fortified formula.

Receipt of information from WIC about formula feeding is not significantly associated with the feeding of iron-fortified formula. However, mothers who received advice from a health care provider other than WIC about how to prepare formula were significantly more likely to feed iron-fortified formula at the time of the Month 1 interview than the mothers who received that information from lay sources or from reading formula labels (100% versus 90%).

- ✓ About one-quarter of the WIC mothers report adding other foods or liquids to the bottle with formula by Month 3. African American and teenage mothers are significantly more likely to add other foods. Less than one in ten WIC mothers report overdiluting the formula to make it last longer.

The percentage of mothers who report adding other foods or liquids into the bottle with the formula increases from 11 percent in Month 1 to 24 percent in Month 3 (see Table VI.5). Figure VI.4 shows maternal race/ethnicity and age differences in adding other foods into the bottle with formula. African American mothers are significantly more likely than other racial and ethnic groups to add other foods or liquids to the formula. Teenage mothers are most likely to add other foods into the infant's bottle; the percentages by maternal age decrease significantly in

Table VI.5. Percentage of WIC mothers who add other foods or liquids into the bottle with the formula by selected socio-demographic characteristics.

Characteristics	Interview Months	
	Month 1	Month 3
Total	11	24
SOCIO-DEMOGRAPHIC CHARACTERISTICS		
Race/ethnicity	*	**
White	12	22
African American	16	36
Hispanic	6	18
Other	4	12
Age of the mother at birth of child		*
14 - 19	14	28
20 - 25	12	25
26 or older	9	18
Immigrant status	*	**
Born in the U.S.	14	26
Born elsewhere	2	14
Highest grade completed by the mother	*	*
9th grade or less	3	18
10th or 11th grades	12	28
12th grade	13	23
More than high school	13	25
N ¹	478	674

Notes:

1. Among the mothers who were formula feeding and who were interviewed at that month only.

* Chi-square statistic testing the group differences for this month is significant at $p < .05$.

** Chi-square statistic testing the group differences for this month is significant at $p < .01$.

Month 3. Addition of other foods or liquids during the first three months is significantly more common among mothers born in the United States than among those born elsewhere. During the first three months, this feeding practice is least prevalent for the least educated mothers. The differences by educational level are significant. Addition of other foods does not significantly differ by infant birth order, poverty level, or infant birthweight.

It may be hypothesized that adding other foods and liquids into the bottle may be associated with not having received professional advice on formula feeding. This hypothesis is not supported by the WIC-IFPS data. Adding other foods or

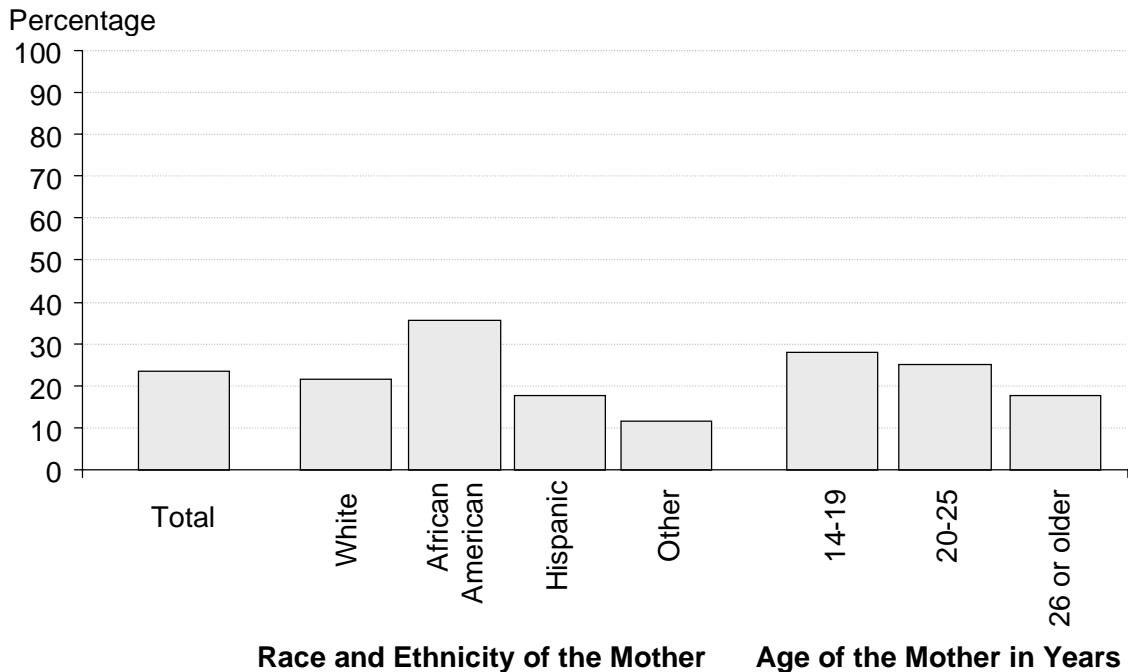


Figure VI.4. Percentage of mothers who report adding other foods or liquids in the bottle with the formula at Month 3.

liquids into the bottle is not significantly associated with the receipt of information from WIC about formula feeding or receipt of similar information from a health care provider other than WIC.

The WIC-IFPS did not inquire about the nature of the foods or liquids added to the formula. This information may be inferred from the maternal reports on what other foods mothers were feeding their infants at each interview. These data indicate that infant cereal is the most common addition to the formula. At the Month 3 interview, over 85 percent of the mothers who reported adding other foods into the bottle with formula also reported feeding cereal to their infants.

From the Month 2 interview, information is available about overdilution of formula. Almost 8 percent of WIC mothers reported having overdiluted formula to make it last longer. The group differences by socio-demographic and health-related characteristics are not statistically significant. However, additional analysis (not presented) of proportions overdiluting showed a significant association with birthweight such that a higher birthweight (measured in ounces as opposed to

low-, normal-, and high-birthweight categories) predicted a higher likelihood of overdilution. Overdiluting the formula is not significantly associated with receiving information from WIC about formula feeding or receiving similar information from a health care provider other than WIC.

The WIC-IFPS included a question about the mother's perception about the amount of formula she receives from WIC. The mothers who were receiving formula from WIC reported whether they perceived that the amount of formula was more than enough, the right amount, or not enough. In Month 1, 62 percent of WIC mothers who are receiving formula vouchers perceive that the amount of formula is more than enough, 24 percent perceive that it is the right amount, and 14 percent perceive that it is not enough. There is a significant association between this perception and adding other foods or liquids in the bottle with the formula at Month 1. This association is no longer significant in Month 2 or later. Figure VI.5 shows the percentages of mothers adding other foods in the formula among the mothers who perceive the amount of WIC formula as more than enough, the right amount, or not enough. The mothers who perceive that WIC formula is the right amount are the least likely to add other foods. This perception is not significantly associated with overdiluting the formula. It is likely that some mothers

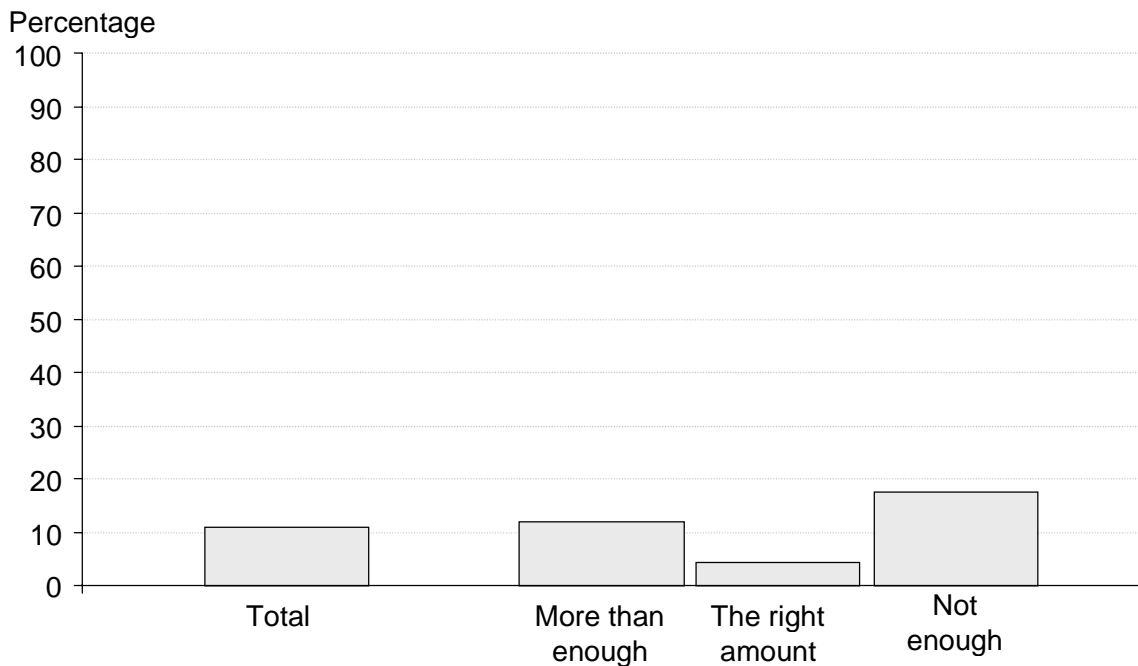


Figure VI.5. Percentage of mothers who report adding other foods in the bottle with the formula at Month 1 among those who think that the amount of formula given by WIC is more than enough, the right amount, or not enough.

perceive receiving excess formula because they add other foods (e.g., cereal) to increase the volume of the formula.

- ✓ The most commonly reported reasons for switching formula brands are spitting up or other digestive problems, allergies or intolerance, doctor's recommendations, change in WIC vouchers, and cost.

An investigation of the brands of formula used by the WIC mothers was conducted. It must be noted that formula use may be determined by WIC formula contracts as well as the physician's prescriptions and maternal preferences. Similac is the most common brand used by the WIC mothers throughout the infancy, given to 30-40 percent of infants in Months 1-9, with the percentages decreasing steadily over time (Table VI.6). Enfamil is the second-most popular brand, given to at least 20 percent of infants at each month. These two brands account for more than one-half of the infants. SMA and Isomil are each given to about 10 percent of WIC infants at each month. The WIC-IFPS also elicited information about the reasons why the mother changes the formula brand. The most commonly reported reasons are spitting up or other digestive problems, allergies or intolerance, doctor's recommendations, change in WIC vouchers, and cost.

Conclusions

WIC mothers generally give their infants formula that is iron fortified. Less than 10 percent of WIC infants receive formula that is not iron fortified.

More than one in ten WIC mothers add other foods or liquids in the bottle with the formula at Month 1 and about one in four do so by Month 3. There is seldom any reason to add anything other than water to infant formula during early infancy, and thus it is of concern that this practice is so common. It is noteworthy that this practice increases with the age of the infant—perhaps mothers think that older infants need other foods. The increase in addition of other foods over early infancy suggests that mothers may not be learning or agreeing that this type of supplementation is not necessary, and may even be harmful.

Table VI.6. Percentage distribution of formula-feeding WIC mothers by brand name of formula.

Brand Name	Interview Month			
	Month 1	Month 3	Month 6	Month 9
Similac	42	36	33	31
Enfamil	24	22	22	22
SMA	12	12	10	10
Isomil	10	10	11	12
Prosobee	6	8	9	10
Good Start	2	3	4	4
Nursoy	2	3	4	4
Nutramigen	0	2	3	2
Other	2	3	4	4
N ¹	478	674	746	747

Note:

1. Formula feeding mothers interviewed at that month only.

Mothers may decide that the bottle is an easy route for the introduction of cereal, particularly for infants who are not developmentally ready to eat from a spoon. They may want to begin feeding cereal as early as possible, in part due to the belief that the infant may sleep for longer periods of time. Clinicians may recommend "thickening of the formula" with cereal in order to minimize problems of mild gastroesophageal reflux (Carré, 1985; Vardenplas, et. al., 1996). Anecdotally, this practice appears to be beneficial, and is recommended by the American Academy of Pediatrics. Adverse effects of this practice are associated with inappropriately early feeding of supplemental foods (see Chapter VIII).

WIC mothers in some socio-demographic subgroups are more likely to add other foods or liquids to the formula than others. The WIC-IFPS data identify African American mothers and teenage mothers as target groups who are likely to adopt this feeding practice, which is not advised by the FCS or other infant nutrition authorities (FNS, 1993a). The WIC-IFPS data suggest that the mothers who regard the formula they receive from WIC as the right amount are less likely to add other foods to the formula. This finding indicates that addition of foods into the formula may partly be motivated by the perception that the infant needs more food.

It is of concern that 8 percent of WIC mothers report overdiluting the formula to make it last longer. It is likely that the true percentage is somewhat higher than this, since some underreporting of this information is expected due to the social undesirability of the response.

CHAPTER VII

NURSING PROBLEMS, CONTINUATION AND CESSATION OF BREASTFEEDING

VII.1. Overview

This chapter addresses the issues regarding continuation of breastfeeding. As stated before (see Section IV.2), there are many benefits of breastfeeding, including protection from respiratory illnesses, ear infections, and gastrointestinal illness; optimal weight gain; and psychological benefits that promote maternal and infant bonding. Furthermore, the economic benefits of breastfeeding may be significant particularly for low-income families. Almost all of the benefits of breastfeeding depend on its duration. Recent evidence indicates that even some of the immunological benefits of breastfeeding cannot be observed if the duration of breastfeeding has been shorter than approximately three months (Bedinghaus & Doughten, 1994; Howie et al., 1990). Therefore, breastfeeding cessation prior to three months of age may reduce the ultimate benefits of breastfeeding.

There is no agreed-upon optimal age for ceasing breastfeeding. FCS advises that this is left up to the mother and the infant (FNS, 1993a). However, if the infant is under one year of age and a decision is made to wean, it is advised that breastmilk be substituted with formula rather than cow's milk. FCS and the NAWD (1990, 1994) advise that the infant be breastfed as long as the mother wishes to continue breastfeeding. If the decision is made to cease breastfeeding, FCS advises that breastfeeding cessation be accomplished gradually, so that the infant and the mother have adequate time to adjust and that the mother experiences less discomfort.

Although breastfeeding cessation may be because of maternal choice, it is sometimes an outcome of problems associated with nursing. Mothers may experience a variety of problems ranging from engorged breasts to infected breasts. It is important to understand the extent of the prevalence of these problems as well as their role in the decision to cease breastfeeding.

This chapter includes the following sections:

- Section VII.2 discusses WIC Program components that pertain to the continuation of breastfeeding, breastfeeding problems, and breastfeeding cessation.
- Section VII.3 discusses nursing problems among WIC mothers.
- Section VII.4 discusses the process and timing of breastfeeding cessation.

VII.2. WIC Program Components that Pertain to Continuation of Breastfeeding, Nursing Problems, and Cessation of Breastfeeding

Two program components of WIC are expected to promote the continuation of breastfeeding:

- breastfeeding education and counseling
- enhanced food package for breastfeeding women.²⁰

An important goal of the WIC nutrition education program is to promote the initiation and continuation of breastfeeding (FNS, 1993a). The enhanced breastfeeding women's food packages are also expected to help promote longer durations of breastfeeding. The WIC clinics are encouraged to provide on-going support to breastfeeding women regardless of whether they are exclusively or partially breastfeeding (NAWD, 1990; 1994). For example, WIC clinics provide support for nursing problems. FCS suggests a series of simple and effective remedies for nursing problems (FNS, 1993a).

WIC clinics are encouraged to minimize the use of supplemental formula, and instead to provide peer support and professional support through referral to local health care providers as well as through WIC Programs. Furthermore, to prolong breastfeeding to the extent possible, clinics are encouraged to address the needs of breastfeeding women who are employed or who attend school. WIC clinics are

²⁰ Another WIC Program component that promotes the continuation of breastfeeding is the provision of breast pumps. The WIC-IFPS elicited information about WIC breast pumps from currently breastfeeding mothers in the Month 3 interview. At that time, 47 mothers reported expressing milk and only nine reported receiving a breast pump from WIC.

also encouraged to coordinate their breastfeeding support activities with those of other health care providers (NAWD, 1994).

NAWD guidelines (1994) recommend that breastfeeding women receive food packages that address their high level of need for nutrients. Furthermore, NAWD specifies that the WIC food packages for exclusively breastfeeding mothers should not contain any vouchers for infant formula. For the mothers who wish to supplement breastfeeding with formula, it is recommended that the infant's food package contain powdered formula as opposed to liquid formula, because powdered formula can be prepared in very small amounts and is not wasted if unused.

VII.3. Nursing Problems

Research Questions

In this section, analyses describing the prevalence of nursing problems among the WIC mothers are presented. The following two questions are addressed:

- (1) What is the overall prevalence of nursing problems over the first half of infancy?
- (2) Are there group differences in the prevalence of nursing problems by race/ethnicity and age of the mother?

One of the major breastfeeding support activities provided by WIC addresses nursing problems. While some of these problems are common and not very severe, others may be quite severe and interfere with the continuation of breastfeeding. It is important to understand the prevalence of these problems in order to assess the extent of need among WIC mothers for breastfeeding support and counseling. The role of nursing problems in the process of breastfeeding cessation is investigated in Section VII.4.

Main Findings

- ✓ During their early breastfeeding experience, WIC mothers report sore nipples and not having enough milk as the most common nursing problems.
- ✓ There are no significant differences in the experience of nursing problems by socio-demographic characteristics.

See the results section for more information on these findings.

Previous Studies

While a national study of prevalence of nursing problems does not exist, regional studies have been conducted. One-third of the WIC mothers in a Missouri study of nursing problems in the hospital had such problems (McClurg-Hitt & Olsen, 1994). The most common problems were improper latch-on, sleeping or uninterested baby, and sore nipples. The same study indicated that the primary complaint after hospital discharge was sore nipples.

The nursing problem that has been most studied is the suspected insufficiency of milk. Clinical research identifies a number of symptoms that may be indicative of inadequate milk supply, such as low infant weight gain and small number of wet diapers. Low breastfeeding frequency and formula supplementation may lead to insufficient milk supply (American Academy of Pediatrics, 1993; Freed, et al., 1991; Riordan & Auerbach, 1993).

It has been suggested that an “insufficient milk syndrome” has developed in industrialized countries, for which there is a “biocultural explanation” (Gussler & Briesemeister, 1980). Components of this explanation include the lack of supportive social networks; changing patterns of infant care, which involve leaving infants alone in a crib while asleep, rather than being together with their mothers; attempting to establish a feeding schedule, rather than nursing whenever the infant shows any signs of being hungry; and maternal anxiety, which can simultaneously be caused by her concern about sufficient milk and inhibit the let-down reflex, hindering release of milk from the breast. The antecedents and consequences of insufficient milk supply syndrome have been studied extensively by Hill and Aldag (1993). Milk insufficiency predicted shorter durations of breastfeeding.

Breast infection, or mastitis, while not very common, is a severe nursing problem requiring treatment with antibiotics (Freed et al., 1991). It is recommended that breastfeeding continue during the period of infection, with frequent nursing episodes.

Statistical Methods

WIC mothers reported experience of each of eight different nursing problems in the Month 1, Month 3, and Month 5 interviews. The eight breastfeeding problems were choking of the infant while breastfeeding, sore nipples, cracked nipples, breasts that are

too full, breasts that leak, breast infections, milk insufficiency, and the maternal perception that there was something wrong with the milk.

The nursing problems were considered under two categories: problems with the breast or feeding, and problems with breastmilk. Percentages were estimated of mothers who reported experiencing any problems with the breast or feeding, and those who reported having problems with breastmilk. These percentages were compared across subgroups of WIC mothers distinguished by socio-demographic characteristics. The differences in subgroups were tested using chi-square statistics that were computed by accounting for the multistage stratified and clustered sampling design of the WIC-IFPS. SUDAAN statistical software was used to estimate these percentages and chi-square statistics.

In coding the nursing problems into two summary indicators (i.e., problems with breasts/feeding, and problems with the milk), leaking of milk was not coded as a “problem” because of two reasons. First, it is unclear that this problem interferes with breastfeeding. Some leaking is normal in that, especially during early weeks of breastfeeding, milk may be let down due to a variety of stimuli. Second, a very large majority of the mothers report leaking of the breasts (see below). Hence, leaking of the breasts may not be a very good indicator for discriminating between the mothers who have nursing problems and those who do not.

Results

Table VII.1 provides the proportions of breastfeeding women who report experiencing a set of eight different nursing problems. This table also provides the proportions of women reporting problems with breasts/feeding, and problems with the milk.

- ✓ During their early breastfeeding experience, WIC mothers report sore nipples and not having enough milk as the most common nursing problems.

Table VII.1. Reported nursing problems by WIC mothers at the time of the Month 1, Month 3, and Month 5 interviews.

Nursing Problems	Interview Months		
	Month 1	Month 3	Month 5
Problems with breasts or feeding	55	29	16
Sore nipples	38	10	7
Infant chokes while breastfeeding	20	19	8
Cracked nipples	17	4	3
Breasts are too full	12	6	2
Breast infection	2	2	0
Problems with milk	36	27	16
Milk is not enough for the infant	34	25	15
Something is wrong with the milk	10	4	2
N ¹	198	163	143

Note:

1. Breastfeeding mothers who were interviewed at that month only.

In Month 1, almost two-fifths of the mothers (38%) report having sore nipples and more than one-third (34%) report not having enough milk for the infant. Problems with sore or cracked nipples affect relatively few mothers after Month 3. The percentage of mothers who report having sore nipples declines rapidly to 10 percent at Month 3 and 7 percent at Month 5. The prevalence of the maternal perception that her milk is insufficient also declines but not as quickly. As a result, by Month 3, reported milk insufficiency is the most common nursing problem (25%).

Nipple care may be an important issue during the first few weeks of breastfeeding. After this critical period, problems with breasts and, to a large extent, problems with feeding diminish. By Month 3, maternal perception of problems with the milk are just as prevalent as the problems with breasts/feeding.

There are relatively few women who feel that there is something wrong with their milk. This proportion is 10 percent in Month 1 and declines to 2 percent by Month 5. Experience of breast infections is also rare, with only 2 percent of the mothers reporting a breast infection. In addition to these problems, leaking of the breasts is reported by 86 percent of the mothers in Month 1, 62 percent in Month 3, and 45 percent in Month 5. Leaking of breastmilk appears to be a common inconvenience experienced by a majority of breastfeeding mothers.

In addition to the indicators of reported problems with breasts/feeding and with milk, a measure was developed that distinguished between the following four groups of breastfeeding mothers:

- (1) Mothers reporting no nursing problems
- (2) Mothers reporting problems with breasts and feeding but none with milk
- (3) Mothers reporting problems with milk but none with breasts and feeding
- (4) Mothers reporting problems with breasts/feeding and problems with milk.

Figure VII.1 shows the percentages of breastfeeding WIC mothers in each one of these groups at Months 1, 3, and 5. As can be seen in this figure, percentage of WIC mothers who report no nursing problems increases from 31 percent in Month 1 to 71 percent in Month 5. In Month 1, almost one-quarter of the mothers report having problems with breasts/feeding and problems with the milk. By Month 5 only 4 percent of the mothers report having both types of nursing problems.

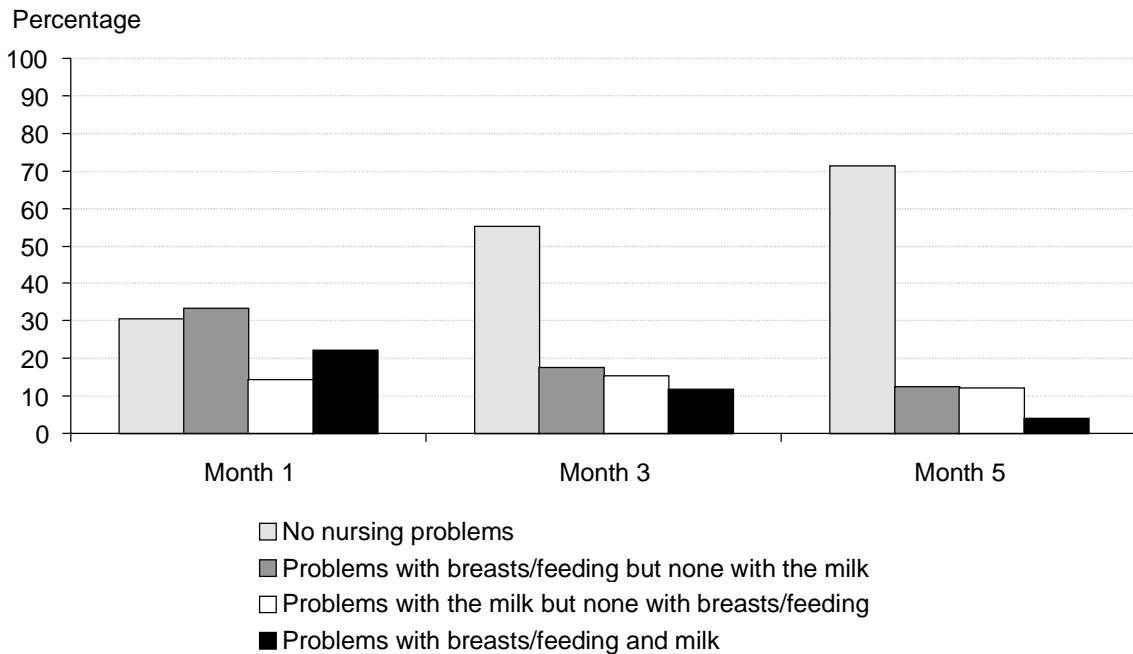


Figure VII.1. Percentage of breastfeeding WIC mothers who report experiencing nursing problems in Months 1, 3, and 5.

✓ There are no significant differences in the experience of nursing problems by socio-demographic characteristics.

The analysis of the experience of nursing problems by socio-demographic characteristics shows that the reported experience of nursing problems is not significantly associated with these characteristics.

Conclusions

There is a decline in the percentages of mothers reporting nursing problems over the first five months of infancy. This decline may be due to two reasons: (1) women who breastfeed longer durations may learn to manage nursing problems and (2) women experiencing nursing problems may cease breastfeeding at higher rates, leaving a group of women who continue breastfeeding who are less prone to experiencing problems. This latter possibility is explored further in Section VII.4.

During the first month, the most commonly reported problem that may interfere with breastfeeding is sore nipples. FCS suggests the following remedies for this problem: changing of the position of the infant while breastfeeding, more frequent feedings to avoid vigorous nursing, keeping the nipples dry, and use of nipple guards (FNS, 1993a). The most commonly reported problem at Months 3 and 5, and the second most commonly reported problem at Month 1, is insufficient milk. The proportion of mothers who report this problem is very similar to that reported by Hill and Aldag (1993), and the high prevalence of this problem underscores its importance as a focus of breastfeeding support activities.

VII.4. Analysis of Continuation and Cessation of Breastfeeding

Research Questions

In this section, descriptive and multivariate analyses of continuation and cessation of breastfeeding are presented. One of the main purposes of the WIC-IFPS is to identify attitudes/beliefs and practices of WIC participants associated with the continuation of breastfeeding (FNS, 1993b). Accordingly, four research questions are addressed here:

- (1) What is the duration of breastfeeding of WIC mothers?

- (2) What is the duration of breastfeeding among WIC mothers in major socio-demographic subgroups?
- (3) What are the unique contributions of socio-demographic characteristics of WIC mothers to the duration of breastfeeding?
- (4) What are some program factors that are associated with the duration of breastfeeding?

Error! Not a valid filename. **Main Findings**

- ✓ One-half of the WIC mothers who initiate breastfeeding cease breastfeeding their infants by 57 days of age.

- ✓ Substantial percentages of WIC mothers cease breastfeeding very shortly after birth. One-fifth of the mothers who initiate breastfeeding cease to do so within ten days after birth. By the time infants are one month of age, almost two in five WIC mothers cease breastfeeding.
- ✓ Younger mothers, African American mothers, less educated mothers and mothers who use child care are more likely to cease breastfeeding than other mothers.
- ✓ Reported problems with breastmilk are associated with 70 percent higher rates of breastfeeding cessation.
- ✓ Mothers who breastfed previous children are half as likely to cease breastfeeding than mothers who did not breastfeed their previous children.
- ✓ Breastfeeding at the first feeding predicts longer durations of breastfeeding.
- ✓ Positive attitudes and beliefs about breastfeeding are associated with lower rates of breastfeeding cessation.
- ✓ Concurrent feeding of breastmilk and infant formula is associated with a more than doubled rate of breastfeeding cessation.
- ✓ WIC mothers who know about the special WIC breastfeeding food package for women whose infants do not receive formula from WIC have significantly lower rates of breastfeeding cessation.
- ✓ The receipt of each additional WIC Program component that supports breastfeeding is associated with a 20 percent additional reduction in breastfeeding cessation rates.

See the Results section for more information on these findings.

Previous Studies

Although there are more studies of breastfeeding initiation than breastfeeding duration, the latter is a relatively well-studied infant feeding practice. Socio-demographic characteristics, health-related characteristics, social context of the mother, professional advice, hospital practices, feeding of other foods, breastfeeding attitudes and beliefs, and WIC Program components have all been found to be associated with breastfeeding duration.

Socio-demographic characteristics. The national Ross Laboratory Mothers' Study (RLMS) and the NMIHS data have been used to investigate the socio-demographic correlates of breastfeeding duration samples that have national coverage. African American race, lower education, and young maternal age were found to be associated with shorter durations of breastfeeding (Ryan et al., 1991b; Schwartz et al., 1995). Other studies with local samples obtained similar results, with African American race (Hill, 1991; Hill & Aldag, 1993) and younger maternal age (Bagwell et al., 1992) correlating with shorter durations of breastfeeding. In addition, maternal employment was found to be negatively associated with breastfeeding duration (Fomon, 1993: 409; Ryan et al., 1991b).

Health-related characteristics. Attributes pertaining to infant and maternal health are found to be associated with the duration of breastfeeding. Low birthweight was found to be associated with a shorter duration of breastfeeding in the analysis of the RLMS (Ryan et al., 1991b). Among the maternal health indicators, nursing problems have been studied most extensively as a predictor of breastfeeding cessation. Bagwell et al. (1992) found that, among women aged 20-29, insufficient milk is the most likely reason (over one-fifth) to cease breastfeeding. A study of the mothers participating in the Missouri WIC Program found that inadequate milk supply is cited as the primary reason (McClurg-Hitt & Olsen, 1994). In New York City, one-fourth of mothers said that they stopped breastfeeding because their milk "dried up" and another fourth because their breasts were sore (Bevan et al., 1984). Similar findings are shown in Hill and Aldag (1993) and Hawkins et al. (1987).

Social context of the mother. Few studies have examined the role of the social context of the mother in her decision to stop breastfeeding. The RLMS and NMIHS do not yield data on the social context. Two studies with local samples elicited information on this factor. Bagwell et al. (1992) categorized social context factors for ceasing breastfeeding under the "other reasons" category, and did not examine them in detail. Hill (1991) examined factors describing the social context of the mother but found that they did not significantly predict breastfeeding duration.

Sources of breastfeeding advice other than WIC. Many previous studies emphasize the importance of providing support and instruction to breastfeeding mothers to help them overcome any problems associated with breastfeeding, and to promote continued breastfeeding (American Academy of Pediatrics, 1993:1-2; FNS, 1993a; Freed et al.,

1991; Riordan & Auerbach, 1993; NAWD, 1990). Unfortunately, the mothers who experience nursing problems are sometimes advised by their physicians to supplement with formula or to stop breastfeeding (Freed, 1993; Michelman et al., 1990; Reames, 1985). Nevertheless, it has been shown that targeted professional breastfeeding support promotes longer durations of breastfeeding (Ryan et al., 1990; Saunders & Carroll, 1988).

Hospital practices. It is commonly believed that formula availability may suppress continued breastfeeding, because mothers who initiate supplementing breastfeeding with formula may experience a reduced milk supply. For example, it has been shown that aggressive formula marketing interferes with breastfeeding by rendering formula more accessible (Oski & McMillan, 1991). There is strong indication that formula availability may decrease breastfeeding (Bevan et al., 1984; Hill, 1991). Hospital gift packages containing formula gifts are suspected to inhibit continued breastfeeding (Bergevin et al., 1983; Dungy et al., 1992).

Breastfeeding attitudes/beliefs. Breastfeeding attitudes and beliefs are often recommended as targets for intervention, in order to promote breastfeeding initiation and continuation. The guidelines for breastfeeding promotion issued by the NAWD (1994) stress the need to monitor the attitudes/beliefs of WIC mothers as one component of an effective breastfeeding promotion program. A recent review article shows that women who breastfeed are more likely to be aware of the benefits of breastfeeding (particularly the health benefits for the infants) and are less likely to be concerned about such perceived barriers to breastfeeding as embarrassment, fear of discomfort, limitations on freedom and social life, and potential lack of the father's involvement in feeding (Losch et al., 1995). A few previous studies examined the association between breastfeeding attitudes/beliefs and duration of breastfeeding. Belief in the benefits of breastfeeding over formula feeding and knowledge about breastfeeding are found to be significantly and positively associated with breastfeeding duration (Hill, 1991; Fomon, 1993: 409; Leff et al., 1994).

Feeding of other foods. Many previous studies demonstrated a strong association between the breastfeeding cessation process and formula feeding. For example, Hill (1991) found that concurrent formula feeding alone was responsible for almost one-third of the variance in the duration of breastfeeding. There are physiological reasons for this association. Infants who receive formula feeds and breastfeeds at the same time may

suffer from nipple confusion (due to the difference between artificial nipples and the breast), may develop a weak suck, may refuse the breast, or may suckle less intensively on the breast, thereby reducing milk production (FNS, 1993a). In response to such research, NAWD (1994) suggests that breastfeeding women not be offered formula or samples unless they specifically request them. Furthermore, NAWD advises clinics to inform breastfeeding mothers of the possible negative consequences of formula supplementation.

The relations between perceived milk insufficiency, formula supplementation, and reduced duration of breastfeeding may be bi-directional. While formula supplementation may lead to reduced breastmilk and cessation of breastfeeding, mothers who decide to wean may initiate formula for the purpose of weaning (Hill, 1991; Hill & Aldag, 1993). One study that examined the association between the feeding of supplemental foods and duration of breastfeeding found a positive association (Hill, 1991).

WIC Program components. The WIC Breastfeeding Promotion Study and Demonstration (USDA, 1990) yields evidence that intensive breastfeeding promotion and support by WIC is associated with increased 6-week breastfeeding prevalence (four of seven sites) and increased 3-month prevalence (five of seven sites). A local study of WIC participants indicated that duration of breastfeeding was not associated with prenatal WIC participation, but women participating in WIC postnatally did breastfeed for longer periods of time (Arnotrading et al., 1992). In national studies, Schwartz et al. (1992) found that WIC breastfeeding education increased the incidence and duration of breastfeeding among WIC participants. In a later study, however, Schwartz et al. (1995) found that prenatal WIC breastfeeding education and advice increased breastfeeding initiation but did not affect breastfeeding duration. The evidence from these studies indicates that postnatal breastfeeding education and support are associated with the continuation of breastfeeding while prenatal participation in WIC breastfeeding programs may be more effective in breastfeeding initiation.

Statistical Methods

The WIC-IFPS included a series of probes that allowed the determination of the infant's age (in days) at the time of complete breastfeeding cessation. In addition, for all infants, mothers were asked when formula (see Section VI.6) and supplemental foods were initiated. Because of the detailed questionnaire and the study design consisting of

frequent interviews, the errors in measuring the duration of breastfeeding are likely to be small.

The life table method was used to analyze the timing of breastfeeding cessation. There are three reasons why the life table approach is appropriate:

- (1) Breastfeeding cessation occurs at a different time for each infant. Over the period of breastfeeding, characteristics of the mother that are predictive of breastfeeding cessation may change (e.g., household composition, formula supplementation, and maternal employment). The changes in these predictors must be accounted for when investigating their association with the duration of breastfeeding.
- (2) There are a number of mothers who were still breastfeeding at the time of the Month 12 interview. Data from these mothers must be included in the analysis because they are likely to be different in those characteristics that are predictive of breastfeeding duration. If they are excluded from the analysis, the remaining sample of women will no longer be representative of the national population of mothers who participated in WIC prenatally.
- (3) A small number of mothers were lost from the study before they ceased breastfeeding. Life table methods allow the use of the partial information that is available from these mothers.

The first step in applying the life table method was to obtain a series of age-specific rates of breastfeeding cessation. These rates were used to estimate the proportions (or percentages) of mothers who were still breastfeeding at each age of the infant. Furthermore, the median age of breastfeeding cessation was estimated. The median age of breastfeeding cessation is the age when one-half of the breastfed infants are weaned.

The life table methodology can be extended to estimate multivariate models of rates of breastfeeding cessation. Most of the recent efforts to model breastfeeding cessation (Adair et al., 1993; Guilkey et al., 1990; Schwartz et al., 1992) have relied on models similar to those used here. These models yield a series of coefficients that show the strength of the association between the rates of breastfeeding cessation and factors that are hypothesized to be predictors of those rates. A transformation of the estimated coefficients allows them to be interpreted as the estimated relative risk. For example, if the transformed coefficient of the predictor factor x is 2, it is said that the factor x is

predicted to double the rates of weaning or, conversely, is predicted to be negatively associated with the duration of breastfeeding.

In building multivariate models of formula supplementation, a protocol was followed, as before, that tested the predictive power of groups of variables. Those variables that were not significantly associated with the likelihood of breastfeeding cessation and those variables that were not of primary substantive interest were eliminated from the models of weaning.

Results

Descriptive Analysis. Table VII.2 shows the estimated median duration of breastfeeding by maternal socio-demographic characteristics.

- ✓ One-half of the WIC mothers who initiate breastfeeding cease breastfeeding their infants by 57 days of age.

The median duration of breastfeeding of the WIC mothers is estimated to be 57 days, meaning one-half of the WIC mothers stop breastfeeding their infants by 57 days of age. By 13 days of age, one-quarter of the infants are weaned. By 199 days (about 6.5 months), three-quarters of the infants are weaned.

Table VII.2. Median age of breastfeeding cessation, age when 25% and age when 75% of the infants are weaned from the breast.

Characteristics	Median Age ¹	Age When 25% of Infants Are Weaned from the Breast	Age When 75% of Infants Are Weaned from the Breast	N
Total	57	13	199	463
SOCIO-DEMOGRAPHIC CHARACTERISTICS				
Race and ethnicity				
White	52	13	151	227
African American	42	8	182	66
Hispanic	77	14	246	131
Other	128	58	364	39
Age				
14 - 19	19	6	68	89
20 - 25	61	14	191	202
26 or older	87	20	280	172
Birth order of the infant				
Firstborn	32	7	136	189
Secondborn	56	13	152	84
Thirdborn or younger	78	24	304	180
Immigrant status				
Born in the U.S.	50	12	180	326
Born elsewhere	96	22	304	125
Father of the infant lives with the mother				
Yes	52	13	199	226
No	63	13	196	237
Poverty level ²				
< 50%	53	12	152	150
50 - 100%	67	13	250	134
100% or more	49	14	199	62
Highest grade completed by the mother				
9 th grade or less	65	8	224	71
10 th or 11 th grades	25	12	77	81
12 th grade	48	10	196	184
More than high school	87	39	304	113

Notes:

1. Age when 50% of the mothers are still breastfeeding.
2. Poverty level measures the income of the respondent's family relative to the federal poverty level for a family of that size.

✓ Substantial percentages of WIC mothers cease breastfeeding very shortly after birth. One-fifth of the mothers who initiate breastfeeding cease to do so within ten days after birth. By the time infants are of one month of age, almost two in five WIC mothers cease breastfeeding.

The *Healthy People 2000* report (USDHHS, 1990) specifies the goal that 50 percent of all infants be breastfed until five to six months of age. At five months, or 150 days of

age, about 31 percent of WIC infants are breastfed among those who initiated breastfeeding. That is equivalent to about 16 percent of all WIC infants being breastfed at 150 days of age.

Figure VII.3 shows the percentages of the WIC mothers who are still breastfeeding at given ages of the infant, as well as the *Healthy People 2000* goal. Among the breastfeeding mothers, only 38 percent continue breastfeeding beyond 90 days. Since 56 percent of the mothers ever initiate breastfeeding, an estimated 21 percent of all WIC mothers breastfeed for 90 days or more. Furthermore, the percentages of breastfeeding mothers during the first 30 days indicate that 21 percent of the mothers who initiate breastfeeding cease within ten days. By 30 days of age, 38 percent of the WIC infants who initiated breastfeeding are weaned.

Table VII.2 also provides information about group differences in duration of breastfeeding. Race/ethnicity differences are strong and of expected directions. African American mothers have the shortest duration of breastfeeding, with nearly one-quarter ceasing breastfeeding by eight days postpartum and one-half doing so by 42 days. Hispanic mothers breastfeed longer durations than white and African American mothers, with one-half breastfeeding at least 77 days.

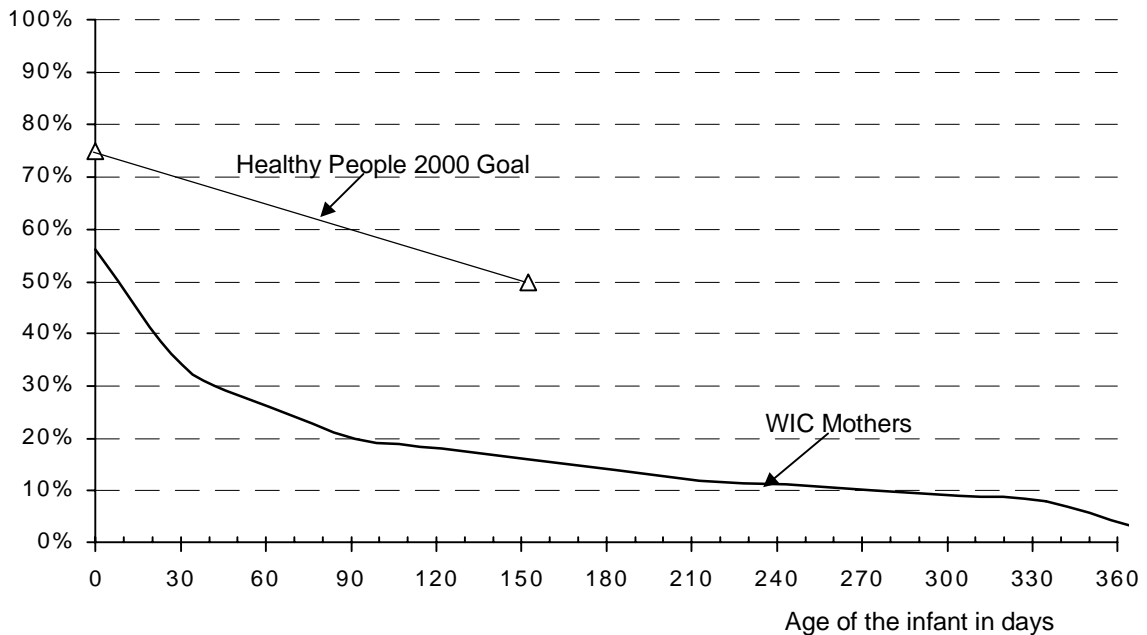


Figure VII.3. Percentage of all WIC mothers breastfeeding, by the age of the infant.

Maternal age is positively associated with breastfeeding duration, with youngest mothers having the shortest durations of breastfeeding and the oldest mothers having the longest durations. These differences are also displayed in Figure VII.4. One-half of teenage WIC mothers cease breastfeeding their infants by 19 days of age, as compared to 61 days by 20-to 25-year-old mothers, and 87 days by 26-year-old or older mothers.

Mothers who were born outside the United States have a median duration of

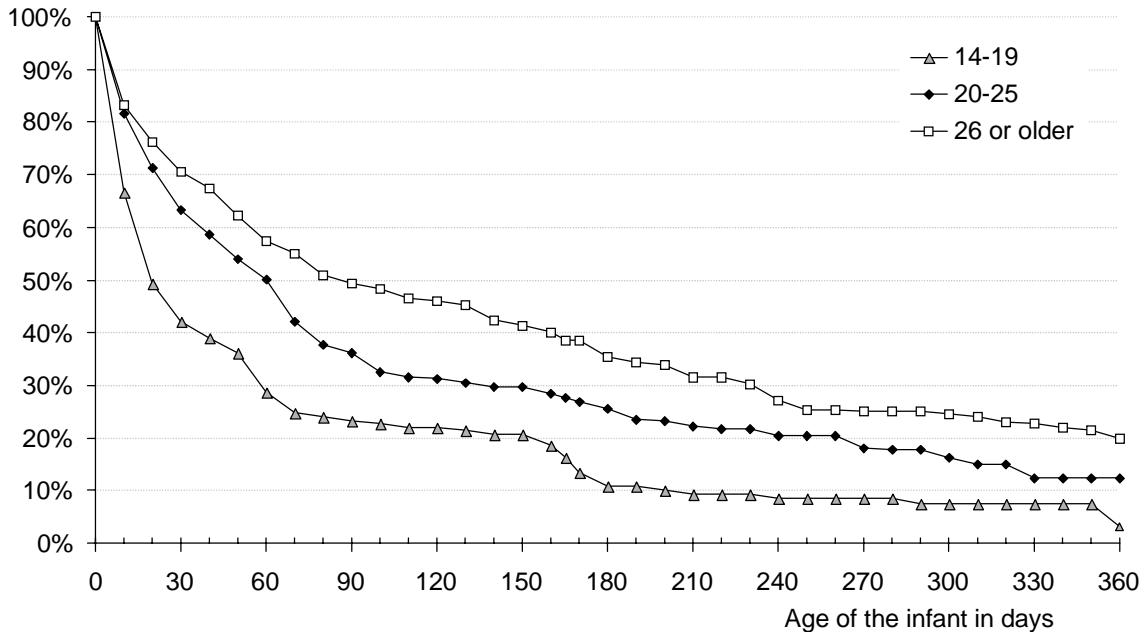


Figure VII.4. Percentage of WIC mothers still breastfeeding, by the age of the infant and age of the mother.

breastfeeding that is almost twice as long as that for the mothers who were born in the United States (96 days as compared to 50 days). The differences in the median duration of breastfeeding by the father's presence are small. The mothers who are in the lowest and highest income levels have shorter durations of breastfeeding than those in the middle category (i.e., between 50 and 100% of the poverty level). Level of education is positively associated with breastfeeding duration with the exception of the lowest educational level. Mothers with 9th-grade education or less have a longer duration of breastfeeding than all but the highest education level. This non-linear association between breastfeeding duration and education is likely because of the high proportion of immigrant mothers in the lowest education category.

Additional exploratory analysis of the percentage of mothers who are still breastfeeding at each age of infant was conducted to examine the differences by maternal reports of knowledge of the WIC special food package for breastfeeding women whose infants do not receive formula from WIC. Mothers who report knowing about the special food package for breastfeeding women breastfeed for longer durations. Figure VII.5 presents the percentages who are still breastfeeding at each age of the infant for the group of mothers who report that they know about the special food package and the group of mothers who report that they do not know about the special food package. At every duration, higher percentages of mothers who know about the special food package are still breastfeeding. For example, when the infant is two months old (60 days), 60 percent of the mothers who know about the special food package are still breastfeeding, as compared to 42 percent of the mothers who did not know about the special food package.

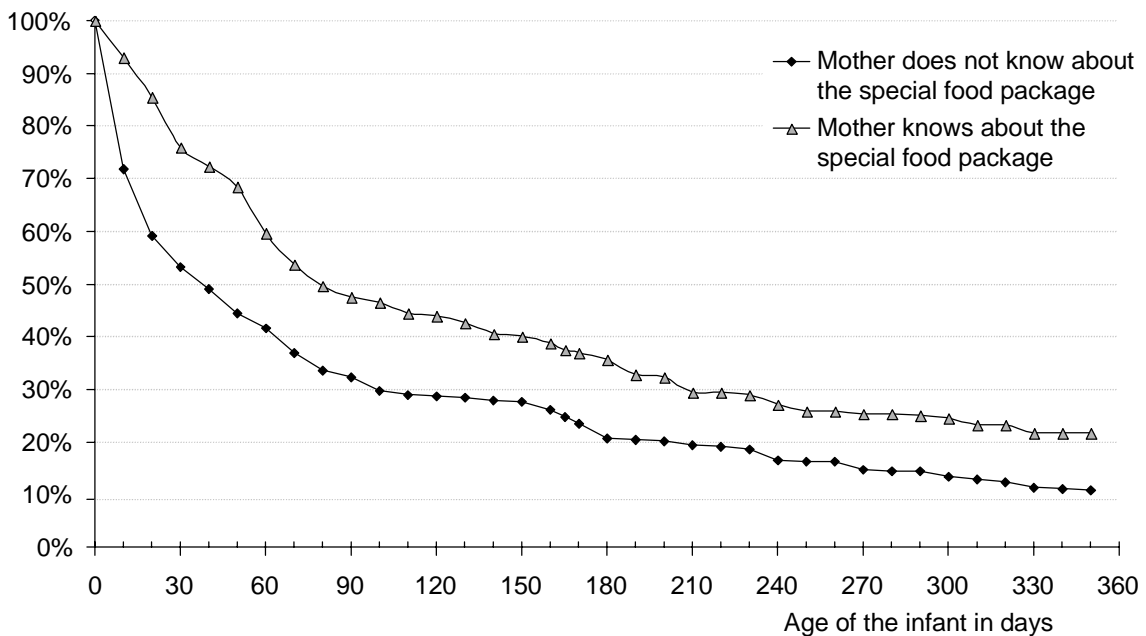


Figure VII.5. Percentage of WIC mothers still breastfeeding, by the age of the infant and whether the mother reports knowing about the special WIC food package for breastfeeding women who do not accept infant formula from WIC.

Multivariate Analysis. In order to delineate the unique contribution of various factors in predicting the rates of breastfeeding cessation, multivariate analyses of these rates were conducted. In investigating the predictors of breastfeeding cessation, the following

models were tested:**Error! Not a valid filename.**Model III includes the program factors in addition to the non-program factors considered in Model II. Among the program factors, three WIC Program components are considered: knowledge of the special WIC breastfeeding food package, receipt of information about breastfeeding from WIC, and receipt of advice to breastfeed from WIC. The association between these three WIC Program components and breastfeeding cessation can be estimated in different ways. Here, two alternative formulations of this association are presented. These alternative formulations are described in detail on page 173 and are presented as Model III-a and Model III-b in Table VII.3.

Table VII.3 displays the results of the multivariate models of the rates of breastfeeding cessation. Note that in the WIC-IFPS, attitudes and beliefs, receipt of information and advice on breastfeeding, and knowledge of the special WIC food

Table VII.3. Relative risks¹ estimated by the multivariate models of rates of breastfeeding cessation (N=486).

Predictors	Model I	Model II	Model III-a	Model III-b
SOCIO-DEMOGRAPHIC CHARACTERISTICS				
Maternal age	0.96**	0.96**	0.96**	0.96**
African American	1.27*	1.03	0.91	0.94
Hispanic	1.02	0.85	0.97	0.98
Maternal immigrant status - foreign born	0.77	0.82	0.63**	0.64**
Birth order of the infant - firstborn	1.18	0.66	0.74	0.75
Maternal household size	0.94	0.97	0.97	0.97
Maternal education	0.94*	0.97	0.96	0.96
Use of non-maternal child care	1.53**	1.48*	1.36	1.36
HEALTH-RELATED CHARACTERISTICS				
Reported problems with the breast or feeding		1.08	1.02	1.02
Reported problems with the breastmilk		1.70**	1.48**	1.49**
SOCIAL CONTEXT				
Receipt of advice to breastfeed from the grandmother		0.87	0.79	0.79
Mother breastfed previous children		0.45**	0.53**	0.52**
SOURCES OF NUTRITION ADVICE OTHER THAN WIC				
Receipt of advice to breastfeed from physician		0.88	0.93	0.96
Receipt of information about breastfeeding elsewhere		0.91	0.91	0.91
HOSPITAL PRACTICES				
Mother breastfed at the first feeding		0.68**	0.83	0.83
INFANT FEEDING ATTITUDES AND BELIEFS				
Perceived benefits of breastfeeding			0.99**	0.99**
Perceived barriers to breastfeeding			1.01*	1.01*
CONCURRENT INFANT FEEDING PRACTICES				
Current use of formula			2.38**	2.42**
WIC PROGRAM COMPONENTS				
Knowledge of the special WIC breastfeeding food package ²			0.73*	
Maternal report on receipt of information about breastfeeding from WIC ³			0.80	
Maternal report on receipt of advice to breastfeed from WIC. ⁴			0.90	
Maternal report on the number of WIC program components received				0.81**

Notes:

1. Relative risk greater than one implies that the characteristic considered is associated with higher likelihood of formula supplementation. Relative risk less than one implies that the characteristic considered is associated with lower likelihood of formula supplementation.
2. The answer to the question "Have you been told that there is a special WIC food package from breastfeeding women who do not accept infant formula from WIC?" is "yes."
3. The answer to any one of the three questions "Have you received information or advice from the WIC office about (1) benefits of breastfeeding?, (2) how to breastfeed?, or (3) mother's diet while breastfeeding?" is "yes."
4. The answer to the question "Have WIC program staff told you that you should breastfeed?" is "yes."

* p<.05,

** p<.01

package for breastfeeding women were measured at the Month 2 interview. This timing may be subsequent to breastfeeding cessation for many mothers, so the association of these variables with breastfeeding cessation rates must be interpreted with caution.

- ✓ Younger mothers, African American mothers, less educated mothers, and mothers who use child care are more likely to cease breastfeeding than other mothers.

Maternal age is a significant predictor of rates of breastfeeding cessation. Older mothers are more likely to continue breastfeeding than younger mothers at any age of the infant. Each additional year of age is correlated with a 4 percent decline in the rate of breastfeeding cessation (relative risk is 0.96). African American mothers are significantly more likely to discontinue breastfeeding by a factor of 27 percent.

As expected, maternal education is significantly and negatively associated with the rates of breastfeeding cessation. More educated mothers are likely to have lower rates of breastfeeding cessation than less educated mothers. Each additional year of education (controlling for other socio-demographic markers) is correlated with a reduction in the breastfeeding cessation rates by almost 6 percent (relative risk is 0.94). This indicates that a mother with a 2-year college degree is expected to have a rate of breastfeeding cessation that is three-quarters that of a mother who dropped out of school after completing the 9th grade.

Use of child care is associated with significantly higher rates of breastfeeding cessation. This relative risk is not only significant but it is very large. The rates of breastfeeding cessation are predicted to be over 50 percent higher (relative risk is 1.53) if a mother is using child care.

- ✓ Reported problems with breastmilk are associated with 70 percent higher rates of breastfeeding cessation.

Model II in Table VII.3 includes all non-program factors considered as predictors of breastfeeding cessation. Maternal reports of problems with breastmilk (perceived insufficiency or perception that something is wrong with the milk) during a month significantly predicts higher rates of breastfeeding cessation. A mother who experiences such problems is expected to have about 70 percent higher rates of breastfeeding cessation than a mother who does not experience such problems. Experience of

problems with breasts or feeding (e.g., sore nipples, infant choking while breastfeeding) does not significantly predict breastfeeding cessation rates. This finding indicates that such problems may inconvenience the mother but probably do not influence her decision to continue breastfeeding.

- ✓ Mothers who breastfed previous children are half as likely to cease breastfeeding than mothers who did not breastfeed their previous children.

Two social context measures, the receipt of advice from the infant's grandmother (the mother's mother) to breastfeed and breastfeeding of previous children, are included in Model II. Grandmother's advice is not significantly predictive of the rates of breastfeeding cessation.

- ✓ Breastfeeding at the first feeding predicts longer durations of breastfeeding.

Among the hospital practices, initiation of breastfeeding at the first feeding predicts about one-third reduced likelihood of breastfeeding cessation (relative risk is 0.68). Receipt of information about breastfeeding somewhere other than WIC and receipt of advice to breastfeed from the physician do not significantly predict the rates of breastfeeding cessation.

Note that in Model II, when reported problems with breastmilk, breastfeeding of previous children, and breastfeeding at the first feeding are controlled, African American race and maternal education are no longer significant predictors of breastfeeding cessation rates. It is known that there are no socio-demographic differences in the reports of problems with breastmilk (see Section VII.3). It is concluded that the differences in previous breastfeeding history and hospital practices account for the observed racial and educational differences in breastfeeding cessation rates. For example, given the same method of first feeding, African American and white WIC mothers are similarly likely to cease breastfeeding. However, if the method of first feeding is disregarded, African American mothers are more likely to cease breastfeeding because they are less likely to breastfeed at the first feeding (see Chapter V).

- ✓ Positive attitudes and beliefs about breastfeeding are associated with lower rates of breastfeeding cessation.

Model III-a in Table VII.3 includes the program factors as predictors of breastfeeding cessation. Perceived benefits of breastfeeding and perceived barriers to breastfeeding are significantly predictive of breastfeeding cessation rates. Mothers who believe in the benefits of breastfeeding have lower rates of breastfeeding cessation. Mothers who perceive barriers to breastfeeding have higher rates of breastfeeding cessation. Each point increase in the perceived benefits scale score predicts a one-percentage-point reduction in the rates of breastfeeding cessation. Similarly, each point increase in the perceived barriers scale score predicts a one-percentage-point increase in the rates of breastfeeding cessation.

- ✓ Concurrent feeding of breastmilk and infant formula is associated with a more than doubled rate of breastfeeding cessation.

Model III-a in Table VII.3 includes an indicator of concurrent feeding of formula. Concurrent feeding of formula increases the likelihood of breastfeeding cessation. This association is not only statistically significant, it is extremely strong. The rate of breastfeeding cessation for the WIC mothers who are formula feeding concurrently with breastfeeding is 2.4 times that for a predominantly breastfeeding mother, controlling for relevant non-program and program factors. The association of feeding of supplemental foods with rates of breastfeeding cessation was also tested, but was found to be insignificant (results not presented). Feeding of supplemental foods (cereals, fruits, vegetables, and meats) is not associated with continued breastfeeding.

It is important to note that breastfeeding cessation following the introduction of formula supplementation may be intentional or unintentional. In intentional cessation, mothers may initiate formula supplementation because they are planning on ceasing breastfeeding. In unintentional cessation, mothers may initiate formula supplementation for other reasons (e.g., convenience), but find that they can no longer continue breastfeeding because their milk production is no longer adequate.

Controlling for breastfeeding attitudes/beliefs and concurrent feeding of formula, the method of first feeding is no longer significantly predictive of the rates of breastfeeding cessation. In other words, the association between the method of first feeding and continued breastfeeding appears to be because of the association of this factor with breastfeeding attitudes/beliefs and use of formula. Furthermore, controlling for these factors, maternal immigrant status significantly predicts lower rates of breastfeeding

cessation by a factor of more than one-third (relative risk is 0.63). Based on analyses presented previously (see Chapters IV, V, and VI) it is known that foreign-born mothers are more likely to continue breastfeeding while supplementing with formula. In other words, controlling for formula use, foreign-born mothers are less likely to cease breastfeeding.

- ✓ WIC mothers who know about the special WIC breastfeeding food package for women whose infants do not receive formula from WIC have significantly lower rates of breastfeeding cessation.

Model III-a of Table VII.3 also includes the measures of WIC Program components. Knowledge of the WIC special breastfeeding food package is significantly associated with a 27 percent lower rate of breastfeeding cessation (relative risk is 0.73). Receipt of information from WIC about breastfeeding is not significantly associated with continuation of breastfeeding, nor is receipt of advice from WIC staff associated with continuation of breastfeeding. The estimates of the relative risks for the three WIC Program components listed in Table VII.3, Model III-a are all of similar direction and magnitude. Each program component is predicted to reduce the rates of breastfeeding cessation by a factor of 10-25 percent. This finding suggests that there may be a “dose-response” type association between the reported receipt of WIC Program components and breastfeeding cessation rates. In other words, mothers who report receiving all three program components may be the least likely to cease breastfeeding followed by the mothers who report receiving two of the three program components, and those who report receiving only one program component. Model III-b tests this hypothesis. It must be noted here that the WIC-IFPS does not support causal inferences regarding the effects of WIC Program components. An association is tested here that may not be due to causality.

About 12 percent of the WIC mothers report receiving none of the three WIC Program components considered here (i.e., knowledge of the special WIC breastfeeding food package, receipt of information about breastfeeding, and receipt of advice to breastfeed). Twenty-three percent report receiving one of the three program components, 47 percent report receiving two program components, and 19 percent report receiving all three program components. Figure VII.6 shows the observed differences in percentages still breastfeeding at every duration between the women who report receiving none, one, two, and three WIC Program components. This figure clearly suggests the presence of a dose-response association between the reported receipt of WIC Program components that are in support of breastfeeding and the continuation of breastfeeding.

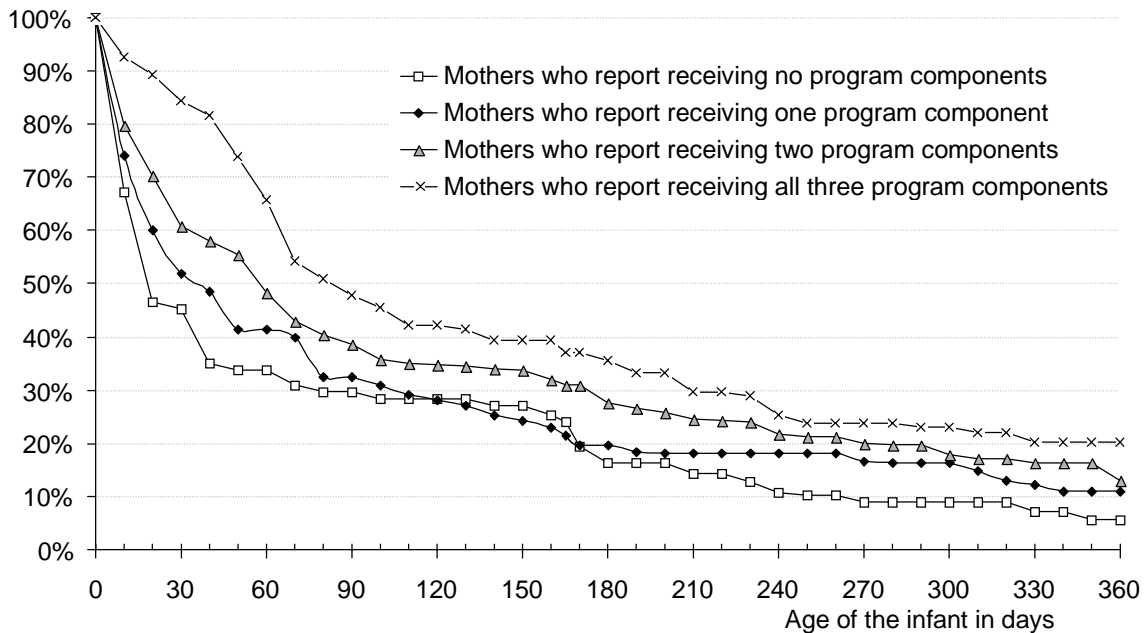


Figure VII.6. Percentage of WIC mothers still breastfeeding by the age of the infant and reported receipt of none, one, two, and three WIC Program components that support breastfeeding.

Note: The following program components were considered: knowledge of the special WIC breastfeeding food package, receipt of information about breastfeeding, and receipt of advice to breastfeed.

- ✓ The receipt of each additional WIC Program component that supports breastfeeding is associated with a 20 percent additional reduction in breastfeeding cessation rates.

Model III-b indicates that the simple count of number of WIC Program components reportedly received by the mothers is a highly significant ($p < .01$) predictor of breastfeeding cessation rates. The estimates indicate that the receipt of each additional program component predicts a 20 percent additional reduction in the breastfeeding cessation rates. In other words:

- Women who report receiving one program component are 20 percent less likely to cease breastfeeding than women who report receiving no WIC Program components.
- Women who report receiving two program components are 40 percent less likely to cease breastfeeding than women who report receiving no WIC Program components.
- Women who report receiving three program components are 60 percent less likely to cease breastfeeding than women who report receiving no WIC Program components.

Conclusions

WIC mothers breastfeed for short durations. The median duration of breastfeeding is just under two months, and substantial proportions of WIC mothers cease breastfeeding during the first two weeks of life.

Several subgroups of WIC mothers are identified as those who are highly likely to cease breastfeeding early. These are African American mothers, mothers with low level of education, and mothers who use non-maternal child-care arrangements. In this study, models are considered that account for many other characteristics that are associated with breastfeeding cessation. The association of race with breastfeeding cessation is no longer significant when previous breastfeeding experience and hospital practices (i.e., type of first feeding) are controlled.

Maternal perception of problems with breastmilk (i.e., inadequacy of breastmilk and something wrong with breastmilk) is predictive of higher likelihood of breastfeeding

cessation. This finding is supported by many previous studies that found milk insufficiency syndrome to be an important barrier to continued breastfeeding.

Previous breastfeeding experience of the mothers play an important role in predicting their current breastfeeding duration. In Chapters IV and V of this report it is shown that previous breastfeeding experience of the mothers also predicts their breastfeeding initiation and formula supplementation once they initiate breastfeeding. It is concluded that mothers who have not breastfed their older children are the least likely to adopt infant feeding practices that include breastfeeding. If they do, analyses presented in this chapter indicate that they are likely to stop breastfeeding early. This finding underscores the difficulty of changing the established patterns of infant feeding. As a result, first-time mothers emerge as a critical target group of mothers for promotion of healthy infant feeding practices. It is likely that once such practices are established, they will be adopted in raising future children as well.

Program factors examined in this study are strongly and significantly associated with the rates of breastfeeding cessation. First and foremost, concurrent formula feeding is associated with a strong—almost 2.5-fold—increase in the rates of breastfeeding cessation. The WIC-IFPS data do not support the hypothesis that concurrent formula feeding will ease the stress of breastfeeding and allow the mothers to breastfeed longer durations. High rates of breastfeeding cessation among concurrently formula feeding mothers may be due to several reasons:

- Mothers who start feeding formula may find that their milk supply has diminished because of decreased stimulation (FNS, 1993a). This may result in an unplanned hastening of the breastfeeding cessation process. In fact, NAWD (1994) advises the WIC clinics to inform the mothers about this possibility.
- Alternatively, mothers who start feeding formula may find it a more convenient method of feeding. Note that belief in barriers to breastfeeding (e.g., inconvenience) increases the rates of formula initiation (see Section IV.5). These mothers may want to further reduce breastfeeding in order to benefit from what they see as a more convenient method of feeding.
- Finally, the mothers who initiate formula may be initiating it with the intention of weaning their infants. In fact, FCS advises that the weaning process be

undertaken gradually (FNS, 1993a). The initiation of formula may be a part of the weaning process rather than its predictor.

Mothers who participate in WIC Program components that support breastfeeding, breastfeed for longer durations than the mothers who do not participate. Breastfeeding support provided by the three WIC Program components considered here appear to be promoting significantly longer durations of breastfeeding. The association of other breastfeeding education programs and physicians' advice to breastfeed with breastfeeding cessation was examined, but found to be insignificant. It appears that these factors significantly influence rates of initiation of breastfeeding (see Chapter IV), but the WIC Program provides the primary source of continued support and education to the mothers after the birth of the infant. Knowledge about the special WIC breastfeeding package for mothers whose infants do not receive formula from WIC promotes exclusive or predominant breastfeeding (see Section IV.5) as well as a longer duration of breastfeeding, when the effects of formula supplementation are controlled. Furthermore, the receipt of various WIC Program components are associated with longer durations of breastfeeding in a cumulative way. Women who receive multiple components of the WIC Program (i.e., receive information about breastfeeding, receive advice to breastfeed, and know about the special breastfeeding food package) are predicted to breastfeed for longer durations than women who receive fewer components of the WIC Program.

CHAPTER VIII

INITIATION OF SUPPLEMENTAL FOODS: THE TRANSITIONAL PHASE OF INFANT FEEDING

VIII.1. Overview

The transitional phase of infant feeding is characterized by a mix of nursing (breast and/or formula feeds) and other specially prepared foods for the infant. These foods are known as supplemental foods. The transitional phase constitutes the longest infant feeding phase. During the transitional phase mothers must make many important choices regarding what foods to feed and the timing of their introduction.

In this chapter, analyses are presented that describe the initiation of supplemental foods:

- In Section VIII.2, WIC Program components pertaining to the initiation of supplemental foods are discussed.
- Detailed analyses of initiation of specific types of supplemental foods are presented in Section VIII.3. This section also includes some exploratory analyses of the order of initiation of supplemental foods.
- In Section VIII.4, a brief analysis of initiation of supplemental drinks is presented.

There are two important health- and nutrition-related concerns regarding the feeding of the supplemental foods to WIC infants. First, early introduction of supplemental foods is an important health concern (see Section III.1). Second, the inappropriate ordering of the introduction of supplemental foods may be a health concern. These are the issues addressed in this chapter.

VIII.2. WIC Program Components that Pertain to Infant Feeding Issues in the Transitional Phase

There is consensus among nutrition and health professionals regarding the optimal timing of initiation of foods other than breastmilk or formula. It is commonly recommended that the timing of initiation of supplemental foods be determined based on the physical, psychological, and physiological maturity of the infant. An infant who can sit and independently support his or her head and neck and is able to express satiety is assumed to be ready to initiate supplemental foods alongside nursing (American Academy of Pediatrics, 1993: 25, 32-33; Bedinghaus & Doughten, 1994; Fomon, 1993: 457). Furthermore, FCS advises that infants are ready to start on supplemental foods when they can hold their heads steady and sit with support, draw in their lower lips when using the spoon, and keep food in their mouths to swallow rather than push it back out (FNS, 1993a). These developments usually occur around four to six months of age.

WIC has two program components that pertain to the initiation of supplemental foods: (1) food vouchers for the infant and (2) nutrition education and counselling for the mother. By regulation, WIC is not to issue supplemental food vouchers (i.e., cereal and juice) for infants under four months of age. However, WIC provides supplemental formula to mothers who request it for their infants. WIC Program does not necessarily provide formula to meet all of the needs of all exclusively formula-feeding infants. Since formula is an expensive food item, it is possible that the mothers who feel that the free formula available from WIC is not sufficient may look to other supplemental foods to provide adequate food to their infants. Indeed, a study of WIC clients (Bevan et al., 1984) found that if WIC formula was not available, the mothers gave cow's milk products to their infants. Mothers may also give formula thickened by cereal or other foods when formula is not available.

Nutrition education on the feeding of supplemental foods is likely to focus on when to feed, which foods to introduce, and how to feed those foods to the infant. The education on feeding of supplemental foods may include the risk of too early initiation of supplemental foods (choking, food allergies, and consumption of less formula or breastmilk, thus not receiving appropriate nutrients) and risks of postponing supplemental foods beyond six months of age (difficulties of accepting foods at later ages and depriving the older infant of needed nutrients) (FNS, 1993a). Nutrition

education on supplemental foods may also provide information on the recommended order of initiation of supplemental foods (iron-fortified cereals first; fruits, vegetables, and meats next, FNS, 1993a). Furthermore, FCS indicates that fruit juices may be introduced once an infant can drink from a cup—as a source of carbohydrates, vitamin C, and fluids—but they should be fed in moderation and never to substitute for breastmilk or formula (FNS, 1993a). Cow's milk is not recommended before 12 months of age (FNS, 1993a).²¹ Similarly, sweetened foods, caffeinated drinks, sodas, and honey are not recommended prior to one year of age (FNS, 1993a).

VIII.3. Choice of Supplemental Foods and Timing of Their Introduction

Research Questions

The WIC-IFPS elicited information on the initiation of eight different types of supplemental foods: cereals, fruits, vegetables, meats, starchy foods, dairy foods, high-protein foods, and sweet/snack foods. Detailed information about the time of initiation of the four major groups of supplemental foods (i.e., cereals, fruits, vegetables, and meats) was elicited. For the remaining groups of supplemental foods, only the first interview at which the mother reported feeding these foods is known.

This section addresses four questions:

- (1) When do WIC mothers initiate feeding different types of supplemental foods?
- (2) Is timing of initiation of supplemental foods associated with the socio-demographic characteristics of the mothers?
- (3) What are the non-program and program factors that are associated with a high likelihood of initiating cereals, fruits, and vegetables inappropriately early?
- (4) What is the order in which WIC mothers initiate cereals, fruits, vegetables and meats?

Figure VIII.1 displays the non-program and program factors considered as predictors of initiation of cereals, fruits, and vegetables prior to four months of age. The following non-program factors are considered:

²¹ Until 1996, however, FCS policy permitted whole cow's milk to be provided to infants on an individual participant basis when supported with a medical prescription for a documented nutritional need. According to a policy issued on June 21, 1995 which went into effect on January 1, 1996, cow's milk cannot be issued to WIC infants under 12 months of age.

- **Socio-demographic characteristics:** maternal age, race and ethnicity, immigrant status, birth order of the infant, maternal household size, father presence in the household, poverty level of the mother,²² maternal receipt of

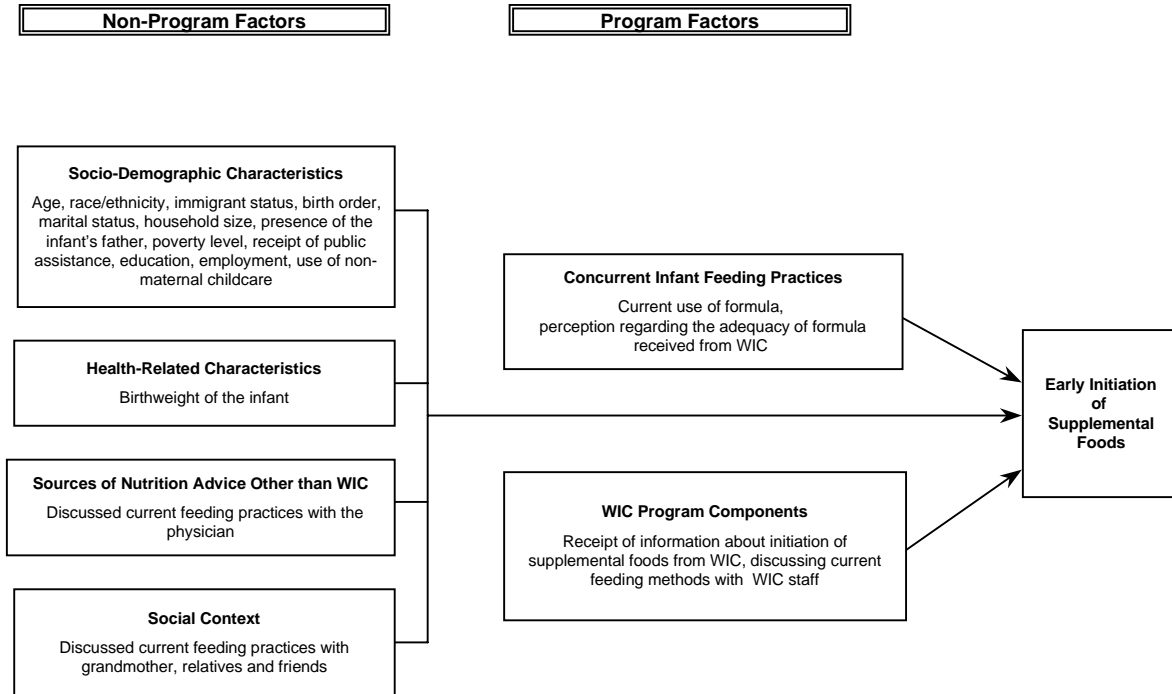


Figure VIII.1. A model of early initiation of supplemental foods and the measures of its predictors from the WIC-IFPS.

public assistance, education, maternal employment status, and use of non-maternal child care²³

- **Health-related characteristics:** birthweight of the infant
- **Social context:** mother discussed her current feeding practices with the grandmother, relatives, or friends²⁸
- **Sources of nutrition advice other than WIC:** mother discussed her current feeding practices with her physician²⁸

In addition, the following program factors are considered:

²² A variable was included that indicated if the mother reported her income.

²³ Maternal employment status and use of child care may vary each month. They were incorporated in the model as time-varying predictors.

- **Concurrent infant feeding practices:** whether the infant receives formula and whether the mother perceives that the formula provided by WIC is adequate²⁴
- **WIC Program components:** receipt of information about initiation of supplemental foods from WIC, and discussing current feeding practices with WIC staff²⁸

Main Findings

- ✓ Large proportions of WIC infants are given cereal, fruits, and vegetables prior to four months of age. Indeed, introducing cereal prior to four months of age is the norm rather than the exception among WIC mothers. More than one-quarter of WIC mothers introduce cereals prior to two months of age.
- ✓ Few WIC mothers introduce starchy foods other than cereals, dairy foods, and high-protein foods other than meats prior to four months of age. However, over one-fifth of WIC mothers introduce sweet/snack foods prior to four months of age.
- ✓ White and African American mothers are more likely to initiate cereal earlier than four months of age than Hispanic mothers. Mothers of Hispanic origin and immigrant mothers tend to postpone the initiation of cereals.
- ✓ Cereal is the first supplemental food introduced for four-fifths of the WIC infants. Fruits and vegetables are most often the second, and meats are most often introduced as the third or fourth group of supplemental foods.
- ✓ Race/ethnicity of the mother is significantly associated with the order of initiation of each of the four types of supplemental foods: cereals, fruits, vegetables, and meats. While cereal is the first supplemental food for nine out of ten white and African American infants, it is the first supplemental food for only two-thirds of Hispanic infants.
- ✓ Mothers who were born outside of the United States are significantly less likely to initiate cereals prior to four months of age, with the rate of premature initiation of cereals being only one-third of that for comparable mothers born in the United States.

²⁴ These variables were incorporated in the model as time-varying predictors.

- ✓ Use of non-maternal child care increases the likelihood of inappropriately early initiation of cereals.
- ✓ Concurrent feeding of formula is associated with a twofold increase in the likelihood of inappropriately early initiation of cereals.
- ✓ Receipt of information from WIC regarding the initiation of supplemental foods is associated with a significantly lower risk of inappropriately early introduction of cereals.
- ✓ Older mothers and mothers of African American origin are less likely to initiate fruits earlier than four months of age.
- ✓ Use of non-maternal child care increases the likelihood of inappropriately early initiation of fruits.
- ✓ Concurrent feeding of formula is associated with a threefold increase in the likelihood of inappropriately early initiation of fruits.
- ✓ Older mothers are less likely to initiate vegetables earlier than four months of age.
- ✓ Concurrent feeding of formula is associated with a 3.6-fold increase in the likelihood of inappropriately early initiation of vegetables.

See the Results section for more information on these findings.

Previous Studies

Very little is known about the pattern of supplementation of the nursing diet throughout the United States (IOM, 1991), except that data from the RLMS (1988 administration) and various marketing surveys have recently been presented in a textbook by Fomon (1993: 29-31). In the early 1970s, foods other than breastmilk and formula were given to most infants by the age of six weeks (Sarett et al., 1983). Since that time, there has been a trend toward later supplementation, at least through 1988 (the latest year for which information is available), but the majority of infants receive supplemental foods before the recommended age of four months. Fomon (1993) cites a personal communication from Martinez in providing the following information: In 1988, other foods were fed to one-third of infants age one to two months, half of those age two to three months, and almost three-fourths of those age three to four months. Among three to four month-old infants, 64 percent were receiving cereal, 39 percent fruits, 23

percent vegetables, 7 percent meats, 4 percent eggs, and 49 percent juice. It is concluded that, while introducing supplemental foods too early is a significant public health concern in the United States, introducing these foods too late is not likely to be a health concern that affects a substantial proportion of infants.

A single study was identified that investigated the pattern of introduction of supplemental foods in a local sample. Solem et al. (1992), in a study of inner-city infants, identified as significant nutrition problems the early introduction of supplemental foods, especially the introduction of cereal in a bottle (67%), and excessive use of sweet foods.

Statistical Methods

The WIC-IFPS elicited information about the date infants were first fed cereals, fruits, vegetables, and meats. In addition, at each interview the mothers reported whether their infants received starchy foods, dairy foods, high-protein foods other than meats, or sweet/snack foods. The approximate age at which the infant first received these latter groups of foods can be estimated. Starchy foods include biscuits, crackers, bread, noodles, rice, potatoes, grits, or tortillas. Dairy foods include yogurt, cheese, ice cream, and pudding. High-protein foods other than meats include beans (e.g., black beans, pinto beans, chick peas), peanut butter, and eggs. Sweet/snack foods include chips, pretzels, candy, cookies, jam, honey, and any other foods not included in previous categories.

Life tables of initiation of these eight categories of supplemental foods were constructed. As before, the reasons for the use of the life table methods include:

- (1) Characteristics of the mother and the infant that are predictive of choice of foods may change (e.g., household composition, maternal employment, child care use). Life table analyses allow the changes in these predictors to be accounted for when investigating their association with the initiation of supplemental foods.
- (2) A number of mothers had not initiated various types of supplemental foods by the time their infants were four months old. Data from these mothers must be included in the analysis because, if they are excluded, the age of initiation of supplemental foods will be underestimated and the sample will not be representative.
- (3) Life table methods allow the use of partial information available from the mothers who dropped out of the study prior to the initiation of various supplemental foods.

In applying the life table method, the first step was to obtain a series of age-specific rates of initiation of groups of supplemental foods. Next, these rates were used to estimate the percentages of mothers who have not yet introduced supplemental foods at each age. The median age of the infant at initiation of each type of supplemental food was estimated. The median age is defined as the age when one-half of the infants receive those foods.

The order of initiation of four major groups of supplemental foods (i.e., cereals, fruits, vegetables, and meats) was determined by ranking the dates of initiation of each type of food for each infant. The order could be determined for those infants whose mothers reported on the dates of initiation of each supplemental food. If two types of foods were reportedly initiated on the same date, both were assigned the same rank order. As a result, for each type of supplemental food, a distribution of the infants who initiated that type of food as the first, second, third, or fourth type was obtained. For each type of food, the percentage distributions of the rank orders of initiation were tabulated for all infants and also for infants classified by maternal race/ethnicity. The latter distribution was tested for the statistical significance of race/ethnic differences, using chi-square tests. These chi-square statistics were adjusted to account for the stratified and clustered sample design, using SUDAAN statistical software (Shah, Barnwell, Hunt, & LaVange, 1992).

Multivariate models of rates of initiation of supplemental foods were estimated, using the life table methodology. These models yielded a series of coefficients that show the strength of the association of non-program and program factors with the rates of initiation of specific supplemental foods. An important issue is that the predictors of inappropriately early introduction of supplemental foods are likely to be different from the predictors of introduction of these foods after the infant reaches the recommended developmental level (four to six months of age). The focus here is the inappropriately early introduction of supplemental foods. In the analyses presented here, the assumption was made that introduction of supplemental foods is inappropriate prior to four months (122 days) of age. Therefore, age-specific rates of introduction of supplemental foods were analyzed up to four months of age. It is possible that some infants indeed reach the recommended level of physical and motor maturity to receive supplemental foods before four months. Other infants may not reach that maturity until six months. The cutoff of four months of age is conservative and is unlikely to overestimate the appropriate age for the introduction of supplemental foods for a

substantial proportion of the infants. Subsequent to that age, the predictors of the process of initiation of supplemental foods were not analyzed.

The multivariate models yield coefficients for non-program and program predictors of early initiation of supplemental foods that can be transformed to the relative risks of early initiation of these foods. A relative risk greater than one indicates a factor that is associated with increased likelihood of inappropriately early introduction of supplemental foods. A relative risk less than one indicates a factor associated with lower likelihood of early introduction of supplemental foods.

In building multivariate models, a protocol was followed, as before, that tested the predictive power of groups of variables (see Appendix H). Factors that were not significantly associated with the likelihood of early initiation of supplemental foods and those that were not of primary substantive interest were eliminated from the final models.

Results

Descriptive analyses of initiation of supplemental foods. Figure VIII.2 provides the percentages of mothers who have not yet initiated cereals, fruits, vegetables, and meats at each age of the infant.

✓ Large proportions of WIC infants are given cereal, fruits, and vegetables prior to four months of age. Indeed, introducing cereal prior to four months of age is the norm rather than the exception among WIC mothers. More than one-quarter of

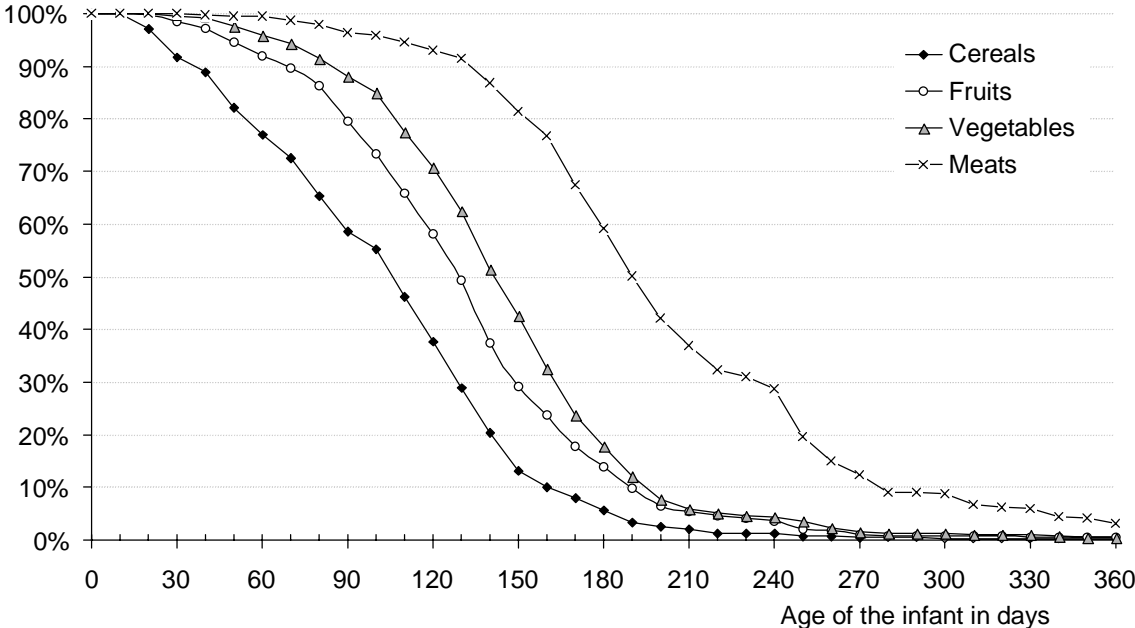


Figure VIII.2. Percentage of WIC mothers who have not yet initiated cereals, fruits, vegetables, and meats, at each age of the infant.

WIC mothers introduce cereals prior to two months of age.

Many mothers initiate the four basic groups of supplemental foods (i.e., cereals, fruits, vegetables, and meats) before four months of age. Cereal is the most common supplemental food initiated prior to four months of age. Among the WIC infants, 62

percent receive cereal prior to four months of age. More than one-quarter (27%) receive cereal prior to two months of age. Fruits are the next most common supplemental food initiated prior to four months, at 42 percent of the infants. Vegetables are the third most commonly initiated food prior to four months, with 29 percent of the infants receiving vegetables before they reach four months of age. A very small minority (7%) of infants receive meats prior to four months of age.

- ✓ Few WIC mothers introduce starchy foods other than cereals, dairy foods, and high-protein foods other than meats prior to four months of age. However, over one-fifth of WIC mothers introduce sweet/snack foods prior to four months of age.

Supplemental foods other than those in the four basic groups are not very likely to be introduced prior to four months of age, with the exception of sweet/snack foods (see Figure VIII.3). These food groups are defined on page 184. Only 6 percent of WIC mothers introduce starchy foods, 4 percent introduce dairy foods, and 3 percent introduce high-protein foods other than meats prior to four months of age. The early introduction of sweet/snack foods may be a more pertinent problem, with over one-fifth (21%) of WIC mothers feeding foods in this group prior to four months of age. It should be noted that the WIC-IFPS questionnaire asked about honey and jam in the same question as other sweet foods, and introduction of these items prior to four months may be more common than the introduction of other sweet foods such as cookies.

Table VIII.1 provides the median ages of initiation of eight categories of supplemental foods for all WIC infants and for WIC infants categorized by selected socio-demographic characteristics of the mothers. This table indicates that cereal is the supplemental food that is typically initiated earliest. By about 3.5 months of age

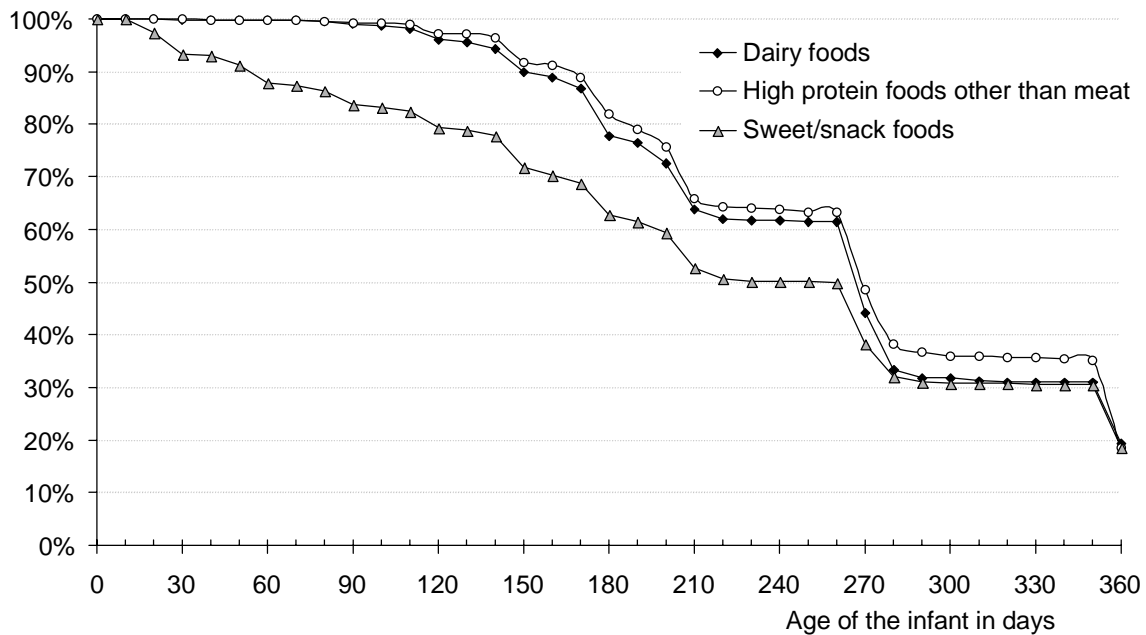


Figure VIII.3. Percentage of WIC mothers who have not yet initiated dairy foods, high-protein foods other than meats, and sweet/snack foods, at each age of the infant.

(106 days), one-half of the infants receive cereal. Fruits and vegetables follow, with median ages of initiation of about four months (129 days) and a little under five months (141 days, respectively). Meats and other starchy foods follow fruits and vegetables, with median ages about 6.5 months (190 and 198 days, respectively). Dairy foods, high-protein foods, and snack foods are initiated later, on average, with median ages of initiation well over 8 months (250 days).

✓ White and African American mothers are more likely to initiate cereal earlier than four months of age than Hispanic mothers. Mothers of Hispanic origin and immigrant mothers tend to postpone the initiation of cereals.

The racial/ethnic group differences in initiation of supplemental foods are substantial. White mothers initiate cereal, fruits, and vegetables somewhat earlier, on average, than the other racial/ethnic groups. African American mothers have a lower median age of initiation of cereal than Hispanic mothers and the mothers in the "other" category, although the same is not true for the initiation of fruits and vegetables. These

Table VIII.1. Median age of the infant (in days) when specific supplemental foods¹ are initiated by selected socio-demographic characteristics of the mother.

Socio-Demographic Characteristics	Median Age of Initiation							
	Cereals	Fruits	Vegetables	Meats	Starchy Foods	Dairy Foods	High Protein Foods Other Than Meats	Sweet/Snack Foods ²
Total ³	106	129	141	190	198	266	269	257
Race/ethnicity								
White	89	117	137	192	197	262	274	265
African American	101	140	148	184	200	268	268	209
Hispanic	129	132	144	190	197	271	208	197
Other	142	147	147	200	209	270	268	208
Age of the mother at birth of child								
14 - 19	101	120	137	190	186	266	271	209
20 - 25	106	128	139	188	199	264	269	262
26 or older	110	133	142	194	201	269	266	227
Immigrant status								
Born in the U.S.	92	128	139	189	198	264	270	260
Born elsewhere	136	135	148	199	199	274	208	202
Father of the infant lives with the mother								
Yes	103	127	137	194	197	262	271	261
No	107	131	143	186	199	269	267	213
Poverty level ⁴								
< 50%	113	135	147	189	200	267	269	260
50 - 100%	94	129	138	191	201	263	267	260
100% or more	102	116	127	178	198	262	265	209
N	745	803	835	856	827	835	844	829

Notes:

1. Definitions of the supplemental food groups are given on page 184.
2. Includes sweets (e.g. honey, candy, cookies), snack foods (e.g. crackers, chips) and any other supplemental foods not mentioned before.
3. Median ages estimated for all infants, regardless of maternal characteristics.
4. Poverty level measures the income of the respondent's family relative to the federal poverty level for a family of that size.

differences may, in part, be due to immigrant status differences between racial/ethnic groups, with almost 75 percent of Hispanic mothers being born outside of the United States.

Infants whose mothers were born outside the United States have higher median ages of initiation of cereal by more than one month. Fifty percent of the mothers born in the United States initiate cereal by 92 days of age, whereas the same proportion is reached 44 days later (at 136 days of age) among the foreign-born mothers. Indeed, the infants of the mothers born outside the United States are the only socio-demographic group who

have a median age of initiation of cereal that is above the recommended minimum of four months of age. Figure VIII.4 shows the differences in the proportions of infants who have not yet initiated cereal at each age, by maternal immigrant status. The median ages of initiation of other foods are not substantially different by the immigrant status of the mother, except for the median age of initiation of high-protein foods and snack foods. The mothers born outside the United States tend to initiate high-protein foods other than meats and snack foods about 60 days earlier than the mothers born in the United States.

There are small differences in median ages of initiation of starchy foods (other than

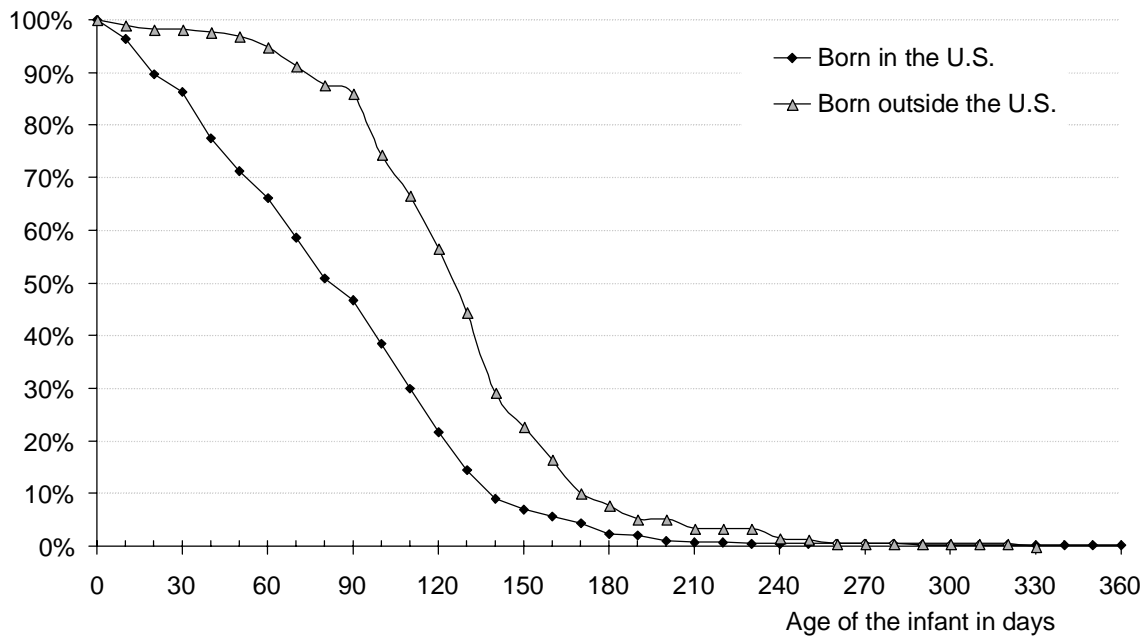


Figure VIII.4. Percentage of WIC mothers who have not yet initiated cereals at each age of the infant, by maternal immigrant status.

cereals) and dairy foods by race/ethnicity. Hispanic mothers initiate high-protein foods other than meats earlier, with median age of initiation (208 days), when their infants are almost two months younger than the infants of other racial and ethnic groups. The findings about high-protein foods other than meats likely pertain to beans, which constitute a preferred food group among Hispanic families.

Initiation of sweet/snack foods is postponed by white mothers more than any other racial and ethnic group. The median age of initiation of sweet/snack foods among the

white mothers is almost nine months (265 days), as compared to about seven months (209 days) for African American, and 6.5 months (197 days) for Hispanic, mothers. These differences may primarily be due to the use of honey, although WIC-IFPS data do not yield specific information about honey.

Maternal age differences in the median ages of initiation of supplemental foods are not large. Although teenage mothers introduce cereal and fruits somewhat earlier, these differences are not consistent across the groups of supplemental foods. Similarly, there are small differences in the timing of initiation of supplemental foods by the birth order of the infant (results not shown).

Mother's cohabitation with the father of the infant does not appear to be associated with the initiation of supplemental foods. The only large difference is observed for the initiation of sweet/snack foods. The mothers who do not live with their infant's father initiate sweet/snack foods earlier, with a median age of about seven months (213 days), as compared to almost nine months (261 days) for the mothers who live with the infant's father.

Economic well-being is associated with earlier initiation of four groups of supplemental foods. Mothers at or above the 100-percent poverty level (i.e., income relative to the federal poverty level) initiate fruits, vegetables, meats, and snack foods earlier than the mothers who have lower levels of income. These differences may be partly due to a higher proportion of immigrant mothers (who postpone supplemental feeding) in the lower-income category.

There are no large or consistent effects of educational level on the timing of initiation of different categories of supplemental foods (results not presented). The only exception is sweet/snack foods. Mothers who finished high school or who attended school beyond high school delay the introduction of sweet/snack foods by about two months, as compared to the mothers with less education. This may be due to some further knowledge of general nutritional principles among higher educated mothers; they may be aware that sweet foods, excessively salty foods, and fatty foods are inappropriate for infants.

Descriptive analyses of order of initiation of supplemental foods. An important issue that has not been investigated previously is whether mothers tend to feed supplemental foods to their infants in a progression, starting from baby cereal and moving to fruits, vegetables, meats, in that order. Figure VIII.5 provides an overview of the order of initiation of supplemental foods. Note that two or more types of supplemental foods may be introduced at the same time, resulting in more than one type of food being ranked as first, second, or third introduced food. For example, both cereals and fruits can be ranked as the first supplemental food type if the dates of initiation coincide.

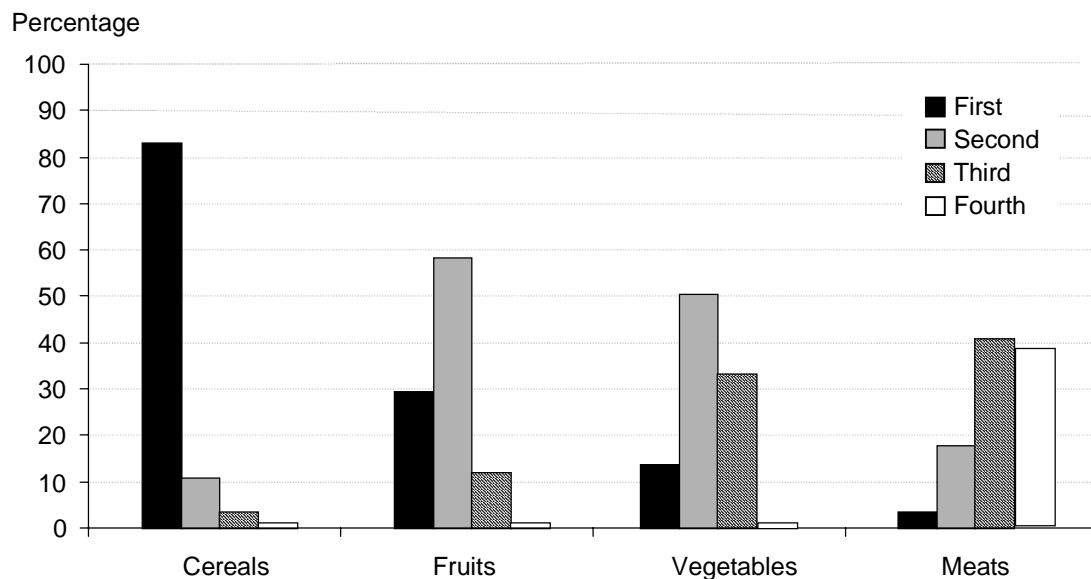


Figure VIII.5. Percentages of mothers initiating cereals, fruits, vegetables, and meats as the first, second, third, or fourth type of supplemental food.

✓ Cereal is the first supplemental food introduced for four-fifths of the WIC infants. Fruits and vegetables are most often the second, and meats are most often introduced as the third or fourth group of supplemental foods.

Cereal is the first supplemental food introduced to 83 percent of the WIC infants. Fruits and vegetables are most often the second type of supplemental food introduced, with 58 percent of the mothers introducing fruits second, and one-half of WIC mothers introducing vegetables as the second food type. One-third of WIC mothers introduce

vegetables as the third type of supplemental food. Meats are most often introduced as the third or fourth group of supplemental food, with about two-fifths each introducing meats as the third and fourth food types. Only 3 percent of the mothers introduce meats as the first supplemental food.

- ✓ Race/ethnicity of the mother is significantly associated with the order of initiation of each of the four types of supplemental foods: cereals, fruits, vegetables, and meats. While cereal is the first supplemental food for nine out of ten white and African American infants, it is the first supplemental food for only two-thirds of Hispanic infants.

Table VIII.2 shows the distribution of the rank order of initiation of cereal, fruits, vegetables, and meats by maternal race/ethnicity. Maternal race/ethnicity is significantly associated with the order of initiation of each type of food considered here. While cereal is the first food to be initiated by nine out of ten white and African American mothers, it is the first food for only two-thirds of Hispanic mothers and mothers of other ethnic origins. For about one-fifth of Hispanic mothers and mothers of "other" ethnic origins, cereal is the second type of supplemental food to be initiated. When immigrant status differences are examined, it is found that mothers born outside the United States are significantly less likely to initiate cereal as the first type of supplemental food than the mothers who were born in the United States (61% versus 90%).

Fruits constitute the first supplemental food introduced by a quarter of white mothers and one-half of Hispanic mothers. They constitute the first supplemental food introduced by less than one-fifth (16%) of the African American mothers and more than one-third of the mothers of other ethnic origins. For white, African American, and other mothers, however, fruits constitute the second type of supplemental food introduced. Hispanic mothers tend to introduce fruits as the first supplemental food. Vegetables are introduced as the first supplemental food by almost one-quarter of the Hispanic mothers and almost one-third of the mothers of other ethnic origins. Nevertheless, for most white, African American, and Hispanic mothers, vegetables are the second type of supplemental food introduced to the infant's diet, probably concurrently with the introduction of the fruits.

Table VIII.2. Percentage distribution of the order of initiation of cereals, fruits, vegetables, and meats, by race/ethnicity of the mother.

Race/Ethnicity	Order of initiation of the supplemental food				N ¹
	First	Second	Third	Fourth	
CEREAL					
White*	90	8	2	1	352
African American	94	6	1	0	159
Hispanic	65	22	10	3	147
Other	61	20	19	0	48
FRUITS					
White*	25	63	12	0	353
African American	16	67	17	1	155
Hispanic	50	39	8	2	147
Other	37	50	12	0	47
VEGETABLES					
White*	10	48	42	0	352
African American	14	56	27	3	154
Hispanic	24	52	24	2	146
Other	31	27	39	3	47
MEATS					
White*	0	12	38	50	352
African American	4	25	46	25	159
Hispanic	6	22	44	27	147
Other	12	17	25	47	48

Notes:

1. The number of cases reflects the number of WIC-IFPS mothers for whom the order of initiation of that supplemental food can be determined.

* Chi-square statistic testing race and ethnicity differences in the order of initiation is significant at $p < .05$.

Meat is the third or fourth type of supplemental food introduced by the mothers of all ethnic and racial groups. Almost one-half of the white and "other" mothers and one-quarter of the African American and Hispanic mothers initiate meats as the fourth type of supplemental food. A substantial proportion of African American and Hispanic mothers (approximately one-quarter) initiate meats as the second type of supplemental food.

Further analyses (results not presented) revealed that maternal age and birth order of the infant are not significantly associated with the order of initiation of supplemental foods. The significant associations between socio-demographic characteristics and order of initiation of supplemental foods are as follows: mothers who live with the fathers of their infants are significantly more likely to introduce meats as the fourth type of supplemental food than the mothers who live apart from their infant's father (47% versus 33%). As a mother's income level increases, she is more likely to initiate cereals as the first supplemental food (81% for mothers at 50% of the poverty level or below, and 90% for mothers at 100% of the poverty level or above). Mothers with higher levels of income

are also less likely to initiate meats as the first or second type of supplemental food. Maternal education is similarly associated with the initiation of cereal as the first supplemental food. Only 71 percent of the mothers with ninth grade education or lower initiate cereal as the first supplemental food, as compared to 89 percent of the mothers who have more than a high school education. These differences may partly be due to the association of race/ethnicity and immigrant status with maternal education.

Multivariate analyses of initiation of supplemental foods. Multivariate analyses of the age-specific rates of early initiation of cereals, fruits, and vegetables were conducted (see page 185). Early initiation of these supplemental foods is defined as their introduction prior to four months of age. Because of the low proportions of infants who received meats prior to four months of age (7%), the inappropriately early introduction of meats is not an issue for the WIC infants. The following multivariate models of early initiation rates of cereals, fruits, and vegetables were estimated:

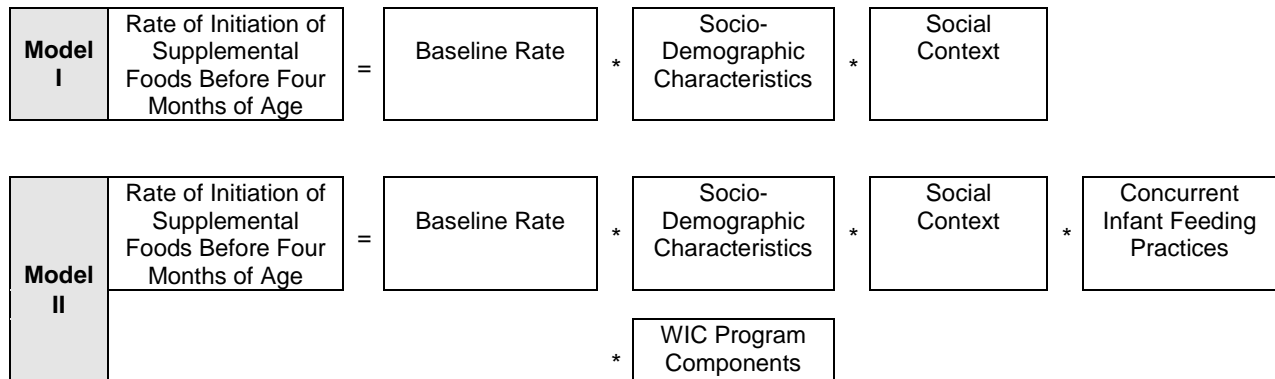


Table VIII.3 provides the relative risks for inappropriately early initiation of cereals. Model I includes socio-demographic characteristics. Factors describing the social context of the mother were not included in this model because none of these factors was significantly predictive of early cereal initiation rates.

Table VIII.3. Relative risk¹ of initiation of cereals prior to four months of age (N=745).

	Model I	Model II
SOCIO-DEMOGRAPHIC CHARACTERISTICS		
Age of the mother at birth of child	.99	.99
African American	1.00	.92
Hispanic	.98	.95
Maternal immigrant status - foreign born	.35**	.35**
Maternal household size	.95	.95
Income reported	.87	.88
Poverty level ²	1.34*	1.34*
Use of child care	1.69**	1.59**
CONCURRENT INFANT FEEDING PRACTICES		
Use of formula		2.09**
Perception that formula given by WIC is inadequate		1.10
WIC PROGRAM COMPONENTS		
Discussed current feeding methods with WIC staff ³		1.04
Receipt of information about initiation of supplemental foods from WIC ⁴		.81**

Notes:

1. Relative risk greater than one implies that the characteristic considered is associated with higher rates of early initiation of supplemental solids. Relative risk less than one implies that the characteristic considered is associated with lower rates of early initiation of supplemental solids.
2. Poverty level measures the income of the respondent's family relative to the federal poverty level for a family of that size.
3. The answer to the question "Have you discussed the methods you are currently using to feed your baby with WIC staff?" is "yes."
4. The answer to the question "Have you received information or advice from the WIC office about when to begin giving cereal or other foods?" is "yes."

* p<.05,

** p<.01

✓ Mothers who were born outside of the United States are significantly less likely to initiate cereals prior to four months of age, with the rate of premature initiation of cereals being only one-third of that for comparable mothers born in the United States.

Maternal age and race/ethnicity differences in the rates of early introduction of cereals are not significant, controlling for the other relevant characteristics. However,

maternal immigrant status is significantly associated with cereal initiation rates. Mothers who were born outside the United States are significantly less likely to initiate cereals prior to four months of age. Indeed, the estimated rate of initiation of cereals for foreign-born mothers is almost one-third of that for comparable mothers born in the United States (relative risk is 0.35). Among the respondents who reported their income level, the measure of economic well-being (poverty level) is positively associated with cereal initiation. Mothers who have higher levels of income are more likely to initiate cereal prior to four months than mothers who have lower levels of income. This finding is contrary to what was expected. It was expected that mothers may initiate cereals early because of the expense of formula feeding. This is not supported by the WIC-IFPS data.

- ✓ Use of non-maternal child care increases the likelihood of inappropriately early initiation of cereals.

Use of non-maternal child care is associated with early introduction of cereal. Infants who receive non-maternal care are 1.7 times more likely to receive cereal prior to four months of age.

- ✓ Concurrent feeding of formula is associated with a two-fold increase in the likelihood of inappropriately early initiation of cereals.

Model II in Table VIII.3 includes the program factors associated with early initiation of cereal. The inclusion of these measures does not alter the estimated effects of the socio-demographic factors included in Model I. Concurrent feeding of formula is strongly and positively associated with the rates of early initiation of cereal. An infant who is receiving formula is over twice as likely to receive cereal prior to four months of age as an infant who is not receiving formula. Mothers in the WIC-IFPS were asked about why they decided to feed the infant cereals. The most often quoted reasons are that the infant consumes too much formula, the infant is too hungry, and the infant sleeps better at night if fed cereal.

Model II also includes factors describing the WIC Program components. WIC-IFPS mothers who received formula from WIC reported whether they thought that the amount of formula from WIC was adequate or too little. Their perception that formula given by WIC is inadequate is not associated with early initiation of cereal.

- ✓ Receipt of information from WIC regarding the initiation of supplemental foods is associated with a significantly lower risk of inappropriately early introduction of cereals.

Consultation with WIC staff about the current methods of infant feeding is not significantly associated with cereal initiation, probably because relatively few mothers report consulting with WIC staff (see Section II.5). Receipt of information from WIC about initiation of supplemental foods is significantly and negatively associated with the rates of initiation of cereal prior to four months of age. The mothers who receive such information from WIC are expected to have lower rates of cereal initiation by almost one-fifth (relative risk is 0.81). Although this effect is not large as compared to the effects of formula use and child care use, it is significant.

- ✓ Older mothers and mothers of African American origin are less likely to initiate fruits earlier than four months of age.

Table VIII.4 provides the results of the models of rates of initiation of fruits prior to four months of age. Maternal age and maternal race differences in early introduction of fruits are significant. Older mothers are less likely to introduce fruits prior to four months. The rate of initiation of fruits for a 26-year-old mother is only 76 percent of the corresponding rate for a comparable 16-year-old mother. As seen in descriptive analyses, African American mothers are significantly less likely to initiate fruits than white mothers (or mothers of "other" origin). Maternal immigrant status is not significantly associated with the initiation of fruits, unlike the results for this factor found for the early introduction of cereal. Maternal household size is negatively associated with rates of early initiation of fruits.

Table VIII.4. Relative risk¹ of initiation of fruits prior to four months of age (N=803).

	Model I	Model II
SOCIO-DEMOGRAPHIC CHARACTERISTICS		
Age of the mother at birth of child	.97*	.98*
African American	.63**	.60**
Hispanic	.95	.97
Maternal immigrant status - foreign born	.78	.77
Maternal household size	.90**	.90**
Use of child care	1.37*	1.29*
SOCIAL CONTEXT		
Discussed current feeding methods with grandmother	1.16	1.16
CONCURRENT INFANT FEEDING PRACTICES		
Use of formula		2.93**
Perception that formula given by WIC is inadequate		.95
WIC PROGRAM COMPONENTS		
Discussed current feeding methods with WIC staff ²		.97
Receipt of information about initiation of supplemental foods from WIC ³		1.07

Notes:

1. Relative risk greater than one implies that the characteristic considered is associated with higher rates of early initiation of supplemental solids. Relative risk less than one implies that the characteristic considered is associated with lower rates of early initiation of supplemental solids.
2. The answer to the question "Have you discussed the methods you are currently using to feed your baby with WIC staff?" is "yes."
3. The answer to the question "Have you received information or advice from the WIC office about when to begin giving cereal or other foods?" is "yes."

* p<.05,

** p<.01

✓ Use of non-maternal child care increases the likelihood of inappropriately early initiation of fruits.

As with the initiation of cereal, use of non-maternal child care is associated with early introduction of fruits. Infants who receive non-maternal care are 1.4 times more likely than the infants who do not receive care from others to initiate fruits prior to four months of age.

- ✓ Concurrent feeding of formula is associated with a threefold increase in the likelihood of inappropriately early initiation of fruits.

An infant who is receiving formula is almost three times as likely to receive fruits prior to four months as an infant who is not receiving formula. It is possible that mothers who use a bottle to feed find it easy to feed mashed fruits. The maternal perception that formula given by WIC is inadequate is not predictive of early initiation of fruits.

Consulting with WIC staff about the current methods of feeding and receipt of information from WIC about introduction of supplemental foods are not significant predictors of early initiation of fruits. It is not clear why nutrition education programs are associated with lower likelihood of early cereal initiation but not early initiation of fruits.

- ✓ Older mothers are less likely to initiate vegetables earlier than four months of age.

Table VIII.5 provides the results of the models of initiation of vegetables prior to four months of age. Maternal age differences in early introduction of vegetables are significant and are larger than those for initiation of fruits. Older mothers are less likely to introduce vegetables prior to four months of age, with the rates of initiation of vegetables for a 26-year-old mother being only 62 percent of the corresponding rate for a 16-year-old mother. Neither race/ethnicity nor immigrant status are associated with significant differences in initiation of vegetables. Mothers who discuss infant feeding methods with their mothers (the infant's grandmother) are 1.3 times more likely to initiate vegetables prior to four months of age than the mothers who do not do so. It may be that the grandmothers are proponents of earlier infant feeding practices that encouraged diversification of diets in early infancy. These feeding practices are no longer supported by the American Academy of Pediatrics (1993: 25-30).

- ✓ Concurrent feeding of formula is associated with a 3.6-fold increase in the likelihood of inappropriately early initiation of vegetables.

Table VIII.5. Relative risk¹ of initiation of vegetables prior to four months of age (N=835).

	Model I	Model II
SOCIO-DEMOGRAPHIC CHARACTERISTICS		
Age of mother at birth of child	.95**	.96**
African American	.82	.78
Hispanic	1.01	1.02
Maternal immigrant status - foreign born	.85	.85
Maternal household size	.92	.92
Income reported	.96	.97
Poverty level ²	1.25	1.24
SOCIAL CONTEXT		
Discussed current feeding methods with grandmother	1.31*	1.31*
CONCURRENT INFANT FEEDING PRACTICES		
Perception that formula given by WIC is inadequate		.93
Use of formula		3.56**
WIC PROGRAM COMPONENTS AND INCENTIVES		
Discussed current feeding methods with WIC staff ³		.88
Receipt of information about initiation of supplemental foods from WIC ⁴		.91

Notes:

1. Poverty level measures the income of the respondent's family relative to the federal poverty level for a family of that size.
2. Relative risk greater than one implies that the characteristic considered is associated with higher rates of early initiation of supplemental solids. Relative risk less than one implies that the characteristic considered is associated with lower rates of early initiation of supplemental solids.
3. The answer to the question "Have you discussed the methods you are currently using to feed your baby with WIC staff?" is "yes."
4. The answer to the question "Have you received information or advice from the WIC office about when to begin giving cereal or other foods?" is "yes."

* p<.05,

** p<.01

Model II in Table VIII.5 shows that, as with the initiation of other supplemental foods, formula receipt is associated with higher likelihood of early initiation of vegetables. An infant who is receiving formula is 3.6 times as likely to receive vegetables inappropriately early as an infant who is predominantly breastfeeding. Model II also includes the measures of mother's participation in WIC Program components. These program components are not significantly associated with the rates of initiation of vegetables.

Conclusions

Early introduction of supplemental foods into the infant's diet is a significant nutrition problem for WIC infants. The estimated proportion of WIC mothers who introduce cereals prior to four months of age is three-fifths; this estimate is very close to that provided by a previous study of inner-city mothers in New York (Solem et al., 1992) and the estimate from the 1988 RLMS (Fomon, 1993). In addition to the early initiation of cereals, early initiation of fruits and vegetables affects substantial proportions of WIC infants. These infant feeding practices have several known health risks, including the risk of poor nutritional status because of lower consumption of breastmilk or formula, food allergies, and food intolerances (FNS, 1993a). Unfortunately, the WIC-IFPS reveals that, for a large proportion of WIC mothers, the reported reason for initiating cereal earlier than four months is to prevent the infant from consuming "too much" formula.

WIC mothers tend to initiate cereals as the first group of supplemental foods for their infants. Certain subgroups do not conform to this recommended pattern, however; among these groups are the less educated mothers, mothers born outside the United States, and Hispanic mothers, who tend to feed fruits or vegetables as the first supplemental food more often. There is a less clear ordering of the initiation of fruits, vegetables, and meats among the WIC mothers. The initiation of fruits and vegetables tends to occur concurrently. The initiation of meats often follows that of the fruits and vegetables, although substantial proportions of minority mothers (almost one-quarter of African American and Hispanic mothers) introduce meats as the second type of supplemental food.

Several markers have been identified that are indicative of a high likelihood of initiating supplemental foods too early. Young maternal age and the use of non-maternal child-care arrangements are predictive of initiating various supplemental foods too early. The findings, together with the findings of the earlier chapters of this report, indicate that infants receiving non-maternal care are likely to experience a variety of feeding patterns that are thought to be less than optimal, such as early initiation of formula supplementation of breastmilk, early cessation of breast-feeding, fewer breastfeeds a day, and early initiation of supplemental foods. It is possible that infants who receive care together with older children are exposed to supplemental foods prematurely, because of the feeding patterns of the older children.

Higher income is found to be *positively* associated with inappropriately early introduction of cereals. The most commonly cited reason for initiating cereal in the WIC-IFPS data is to prevent the infant from consuming "too much" formula. One would have expected that the most disadvantaged mothers would be more likely to initiate cereals because provision of more formula is a cost concern. However, the positive association between the income level and premature initiation of supplemental foods must be interpreted bearing in mind that all WIC mothers are, by definition, economically disadvantaged. Hence, the economic well-being measure distinguishes between extremely disadvantaged and less disadvantaged mothers.

Extremely disadvantaged mothers may receive formula assistance from a variety of sources in addition to WIC, which are not available to less disadvantaged mothers. For example, churches, charities, and food banks may provide supplementary formula to the extremely disadvantaged. Furthermore, in the WIC-IFPS sample, the mothers who are most disadvantaged are six times more likely to be receiving food stamps as more advantaged mothers. For the mothers receiving food stamps, the food stamp allowance of the household will increase after the birth of the infant, possibly allowing the mother to obtain more formula at no cost. In sum, the extremely disadvantaged mothers may have additional free formula available to them (from community sources and through food stamp participation) that may allow them to continue feeding formula without having to buy it and without feeling the need to supplement it prematurely with supplemental foods. As a consequence, mothers who are less disadvantaged may be most affected by the high cost of formula, leading them to introduce supplemental foods that cost less.

Formula-feeding infants are more likely to be given cereals, fruits, and vegetables inappropriately early than exclusively or predominantly breastfed infants. This is probably due to two reasons. First, these mothers can conveniently mix a cereal and feed it to their infants in a bottle, although FCS advises against this feeding practice (FNS, 1993a; see Chapter IX). It may be more difficult for predominantly breastfeeding mothers to feed cereal to their infants because it will involve acquiring a bottle or feeding with a spoon. Second, these mothers may perceive cereal as a means to make formula more nutritive ("to fill him up," "to let him sleep," and "he was starving," are often-reported phrases). If so, this misperception may need to be addressed.

The analyses presented here revealed a modest but statistically significant association between the WIC nutrition education program and postponement of initiation

of cereal until after four months of age. At the same time, inappropriately early introduction of cereal cannot be attributed to the maternal perception that formula provided by WIC is inadequate. Discussion of current feeding practices with WIC staff, however, is not associated with postponement of initiation of supplemental foods. It is not clear from WIC-IFPS data whether the mothers do not discuss the feeding of supplemental foods with WIC staff, whether they do not receive clear recommendations, or whether they are unable to apply the advice they receive from WIC.

The lack of association between receipt of information from WIC about feeding of supplemental foods and early initiation of fruits and vegetables raises the question of whether initiation of foods other than cereal is adequately addressed by WIC staff. Formula-feeding infants emerge as a group with a high likelihood of premature initiation of supplemental foods other than cereal. The needs of mothers of these infants for nutrition education and counselling about feeding of supplemental foods may be substantially higher than the needs of mothers who predominantly breastfeed.

VIII.4. Choice of Supplemental Drinks and Timing of Their Introduction

Research Questions

The WIC-IFPS elicited information on the initiation of three different types of supplemental drinks: fruit juices, sweet drinks, and milk (cow's milk and other milk). The first interview at which the mother reported feeding these drinks is known. The age of the infant at the time of initiation of these three groups of drinks was estimated based on this information.

This section addresses two questions.

- (1) When do WIC mothers initiate fruit juices, sweet drinks, and milk?
- (2) What are the differences between socio-demographic groups in the initiation of fruit juices and sweet drinks?

Main Findings

- ✓ Substantial proportions of WIC infants receive supplemental drinks such as sweet drinks and fruit juices prior to four months of age. About two-fifths receive fruit juices and one-third receive sweet drinks prior to four months of age.

- ✓ Early initiation of cow's milk or other milk is not a widespread problem among the WIC mothers.
- ✓ Hispanic infants receive sweet drinks very early in infancy.

See the Results section for more information on these findings.

Previous Studies

Initiation of supplemental drinks has not been an area of infant feeding that has received much attention. The FCS guidelines specify the following: Most of the infant's needs for fluids during the first year of life should come from breastmilk or formula. Fruit juices should be offered only when the infant can drink from a cup with assistance, usually between four and six months of age. If juices are initiated, they should be 100-percent fruit juice, rather than fruit-flavored drinks (FNS, 1993a). Sodas, punches, aides, etc., which are high in calories but have no nutritional value, should be avoided, as should caffeinated beverages. Cow's milk is also considered to be inappropriate during the first year of life.²⁵

A study of low-income families in Brazil found that tea, fruit juices, and soft drinks are introduced at very early ages in that population (Dorea & Furumoto, 1992). No studies of supplemental drinks in United States samples have been identified.

Statistical Methods

At the time of each interview, the mothers reported whether their infants received fruit juices, sweet drinks, cow's milk, or other milk. Sweet drinks include sugar water, fruit-flavored drinks such as Kool-Aid, sodas, tea, and coffee. The approximate ages at which the infant first received these drinks were estimated. Life tables of initiation of these three types of supplemental drinks were constructed. For further discussion of the life table methods, see Section VIII.3. A series of age-specific rates of initiation of supplemental drinks was obtained and, from these rates, the percentages of mothers who have not yet initiated each type of drink were estimated; the median age at which each type of drink was introduced was estimated. The median age is the age when one-half of the infants received a specific type of supplemental drink.

²⁵ This guideline was not in effect until January 1, 1996.

Results

Figure VIII.6 displays the percentages of mothers who have not yet initiated fruit juices, sweet drinks, and milk at each age of the infant.

- ✓ Substantial proportions of WIC infants receive supplemental drinks such as sweet drinks and fruit juices prior to four months of age. About two-fifths receive fruit juices and one-third receive sweet drinks prior to four months of age.

Substantial percentages of infants receive sweet drinks (i.e., sugar water, fruit-flavored drinks, sodas, tea, and coffee) during early infancy. About 14 percent receive sweet drinks by one month of age, and more than one-quarter receive sweet drinks by three months of age. By the fourth month, 31 percent of infants receive sweet drinks. Although the initiation of fruit juices occurs somewhat more gradually during the first three months, by the time the infants are four months of age, over two-fifths (43%) have received fruit juices.

- ✓ Early initiation of cow's milk or other milk is not a widespread problem among the WIC mothers.

Early initiation of cow's milk or other milk appears to be less of a problem for WIC infants. By six months of age, only 8 percent receive milk. During the second half of infancy, however, initiation of milk accelerates. By nine months of age, 22

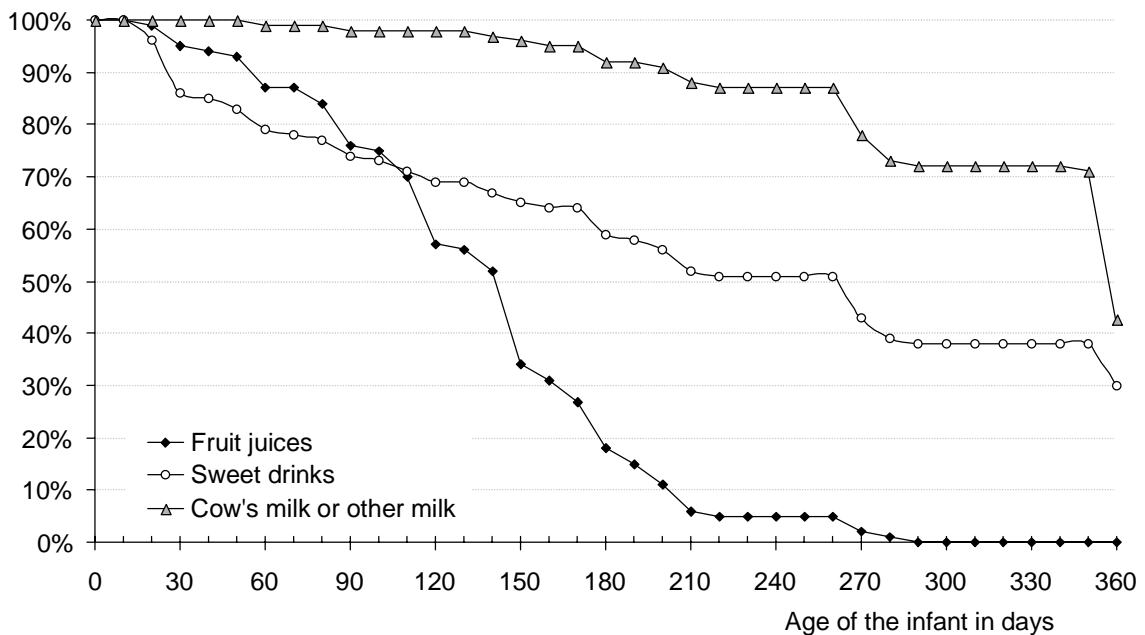


Figure VIII.6. Percentage of WIC mothers who have not yet initiated fruit juices, sweet drinks, and cow's milk or other milk at each age of the infant.

percent of the infants receive cow's milk or other milk. For the vast majority of WIC infants (71%), cow's milk is given between nine and twelve months of age.

Table VIII.6 provides the median ages of initiation of fruit juice and sweet drinks. This table does not include data for the timing of initiation of cow's milk. The median age at which cow's milk is initiated among the WIC infants is 356 days. Given the lack of variance in this feeding practice, and given that it conforms the recommended guidelines (which were adopted on January 1, 1996) quite closely, initiation of cow's milk will not be discussed further.

✓ Hispanic infants receive sweet drinks very early in infancy.

Table VIII.6 shows that the median age of initiation of fruit juice is about 4.5 months (141 days) and the median age of initiation of sweet drinks is about 8.5 months (261 days). These ages are well beyond the four-month benchmark. There are no racial or ethnic groups of infants who show an extremely early pattern of initiating these drinks,

Table VIII.6. Median age¹ of the infant at the time of initiation of fruit juices and sweet drinks, by selected socio-demographic characteristics of the mother.

Socio-Demographic Characteristics	Median Age at Initiation of Fruit Juice	Median Age at Initiation of Sweet Drinks ²
Total ³	141	261
Race and ethnicity		
White	140	241
African American	145	264
Hispanic	136	142
Other	142	364
Age		
14 - 19	120	206
20 - 25	142	260
26 or older	142	265
Birth order of the infant		
First born	117	209
Second born	143	265
Third born or younger	142	241
Immigrant status		
Born in the U.S.	141	263
Born elsewhere	140	142
N	747	806

Notes:

1. Age, in days, when 50% of the infants had received these drinks.
2. Sweet drinks include sugar water, fruit flavored drinks such as Kool-Aid, sodas, tea and coffee.
3. Median ages estimated for all infants, regardless of maternal characteristics.

except for Hispanic infants. One-half of the Hispanic infants receive sweet drinks prior to five months of age. Similarly, the median age of initiation of sweet drinks for the infants of foreign-born mothers is less than five months.

A further investigation of the distribution of the ages of initiation of sweet drinks reveals that about 40 percent of Hispanic infants receive sweet drinks by 1.5 months of age. Figure VIII.7 shows the age-specific percentages of infants who have not yet received sweet drinks by race/ethnicity of the mother. As seen from this figure, Hispanic infants are more likely to have received sweet drinks at every age, but these differences are especially pertinent during the first few months. Exploratory analyses of data revealed that these differences are mostly due to early initiation of manzanilla tea by Hispanic mothers. Many Hispanic mothers reported that they gave this tea to prevent or remedy colic.

Maternal level of education is positively associated with the median age of initiation of sweet drinks. Mothers with lower education have earlier median age of initiation of sweet drinks than mothers with higher education. This is probably because of the association between race/ethnicity, immigrant status, and educational level.

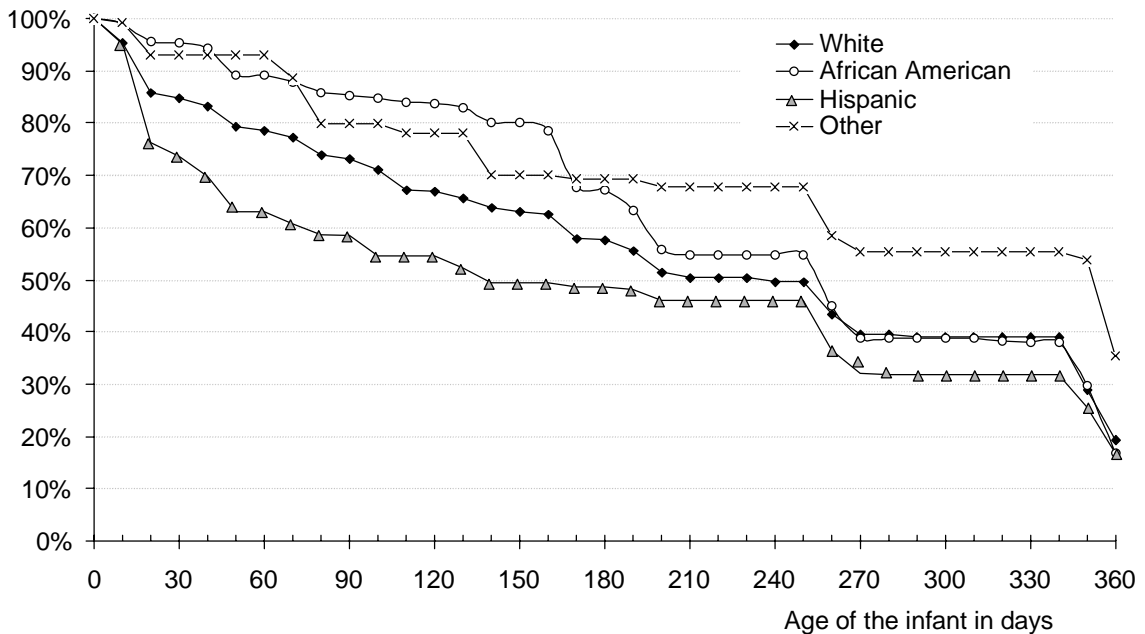


Figure VIII.7. Percentage of WIC mothers who have not yet initiated sweet drinks at each age of the infant, by race/ethnicity of the mother.

Younger mothers initiate fruit juices somewhat earlier than the older mothers. One half of teenage mothers initiate fruit juices prior to four months of age. Similarly, one-half of the firstborn infants receive fruit juices prior to four months. In response to open-ended questions, mothers reported relieving constipation, needing more to drink, and needing too much formula as common reasons for initiating fruit juice prior to four months of age.

Conclusions

Early initiation of fruit juices and sweet drinks appears to be a problem affecting two-fifths and one-third of the WIC infants, respectively. Important markers for early initiation of sweet drinks are Hispanic origin and being foreign born. Since 75 percent of Hispanic WIC mothers are foreign-born, these groups overlap to a large extent. Given the finding from a Brazilian study (Dorea & Furumoto, 1992) that early feeding of sweet drinks are pertinent among low income mothers, it is possible that this infant feeding practice is culturally rooted. Feeding of tea appears to account for much of the early initiation of sweet drinks among WIC mothers. Another area of concern is the early introduction of fruit juices to prevent the infant from drinking too much formula.

Throughout the United States, feeding of cow's milk to infants, particularly young infants, has become less common in recent years (Fomon, 1993). The percentage of five to six month-old infants who received cow's milk declined from 61 percent in 1971 to 16 percent in 1980 and 4 percent in 1991. It appears that this trend affected WIC mothers as well. In 1995, based on the WIC-IFPS data, 8 percent of WIC infants received milk by the end of six months of age.

CHAPTER IX

SUPPLEMENTAL FOOD FEEDING PRACTICES

IX.1. Overview

Use of appropriate methods of feeding of supplemental foods and supplemental drinks in infancy may contribute to the development of healthy eating habits in children. This chapter presents a description of the WIC mothers' practices for feeding supplemental foods and supplemental drinks. The following issues are addressed:

- Section IX.2 reviews the WIC Program components regarding the supplemental food feeding practices.
- Section IX.3 presents the analysis of the WIC-IFPS data on supplemental food feeding practices.

IX.2. WIC Program Components that Pertain to Supplemental Food Feeding Practices

The recommendations on progression of supplemental food types also include a progression of feeding implements (American Academy of Pediatrics, 1993a; FNS, 1993; Queen & Lang, 1993). Infant cereal, fruits, vegetables, and other supplemental foods should be fed by spoon (beginning at four to six months). Juices should be given by cup, not bottle; infants generally can drink from a cup with assistance at four to six months and can hold their own cup by ten to twelve months. They can begin eating "finger foods" by themselves at eight to ten months (FNS, 1993a).

WIC nutrition education and counselling programs may influence the practices regarding the feeding of supplemental foods by informing and advising mothers. FCS advises that, in general, no foods other than formula should be given by bottle (FNS, 1993a). There is concern that feeding of fruit juices (and other sweet drinks) by bottle increases the risk of tooth decay because of prolonged exposure of the teeth to a sweet liquid (American Academy of Pediatrics, 1993; Fomon, 1993; FNS, 1993a; Queen & Lang, 1993). Indeed, one of the objectives stated in *Healthy People 2000* is that at least 75 percent of parents and caregivers use feeding practices that prevent baby-bottle tooth

decay (USDHHS, 1991). The target for less educated parents is 65 percent. If this objective is translated to the statistics obtained from the WIC-IFPS, one would like to find that 65 to 75 percent of WIC mothers avoid giving fruit juices prior to the use of a cup.

An infant feeder, which allows soft foods to be pushed into the mouth of the infant, should not be used because it forces the infant to eat as opposed to providing him with an opportunity to turn away from the food. FCS advises against infant feeders and feeding of supplemental foods with a bottle that has a large nipple hole because these practices may cause the infant to choke, to consume food that may not be needed to meet nutritional requirements, and to learn eating supplemental foods incorrectly (FNS, 1993a). Generally, infants who are not able to eat from a spoon are not ready for supplemental foods (FNS, 1993a).

IX.3. Analysis of Supplemental Food Feeding Practices

Research Questions

This section addresses two questions:

- (1) What percentages of WIC infants use a cup (with and without assistance), a spoon, and an infant feeder throughout the first year of life? What percentages of WIC infants self-feed?
- (2) What is the prevalence of initiating supplemental foods prior to using a spoon, and initiating supplemental drinks prior to using a cup? Are there subgroups of WIC mothers who tend to adopt these practices?

Main Findings

- ✓ By Month 4, nearly three-fifths of the WIC infants receive some supplemental foods using a spoon and by Month 6, over 90 percent of the infants do so. White mothers are more likely to feed their infants using a spoon in early infancy than African American and Hispanic mothers.
- ✓ Nearly one-half of the WIC mothers use an infant feeder sometime during infancy. African American mothers are the most likely to use infant feeders and Hispanic mothers are the least likely to do so.
- ✓ By Month 9, nine out of ten WIC infants who eat supplemental foods pick up foods and put them in their mouth.

- ✓ Among the infants who receive supplemental drinks by Month 5, three-quarters have never used a cup, and among the infants who receive supplemental foods by Month 4, almost one-third have never used a spoon.

See the Results section for more information on these findings.

Previous Studies

Only one study was identified that investigated the method of feeding supplemental foods. This was a study of a low-income, mostly African American, inner-city sample (Solem et al., 1992). The authors report that 82 percent of the African American mothers and 79 percent of the Hispanic mothers feed cereal with a bottle. No studies of use of a cup, spoon, or infant feeder could be identified.

Statistical Methods

Since the WIC-IFPS questionnaire was designed for telephone administration, there were important time constraints on the length of the interview. In order to shorten the interview, not all questions were asked at every interview. Table IX.1 provides information about the interview months when questions about the method of feeding supplemental foods were asked.

First, the percentages of WIC infants using a spoon, an infant feeder, a cup, and a self-held cup, and percentage who were self-feeding were estimated based on the maternal reports about these feeding practices. These percentages were also broken down by selected maternal socio-demographic characteristics. Next, based upon the reported dates of initiation of supplemental foods and drinks, the percentages of mothers who initiated supplemental foods prior to using a spoon and the percentages of mothers who initiated supplemental drinks prior to using a cup were estimated. These percentages were also broken down by selected socio-demographic characteristics of the mother. Chi-square tests were conducted to test the significance of the differences between the subgroups. These were adjusted chi-square tests to account for the stratified and clustered sampling design of the WIC-IFPS. SUDAAN statistical software was used.

Table IX.1. WIC-IFPS interview months when questions on the methods of feeding supplemental foods were elicited.

Interview Month	Using a spoon ¹	Using an infant feeder	Using a cup with assistance	Using a self-held cup	Self feeding
Month 2	x	x			
Month 3					
Month 4	x	x			
Month 5			x		
Month 6	x	x	x		x
Month 7			x	x	
Month 9	x	x	x	x	x
Month 12		x	x	x	x

Note:

1. Asked only about the infants who were formula feeding at the time of the interview. The percentages of infants receiving formula at relevant months is as follows: Month 2, 89%; Month 4, 91%; Month 6, 92%; and Month 9, 91%.

Results

Table IX.2 shows the methods of feeding supplemental foods throughout the infancy, by the month of interview. The top panel of Table IX.2 shows the percentage of formula-feeding infants who were using a spoon prior to each interview.²⁶

- ✓ By Month 4, nearly three-fifths of the WIC infants receive supplemental foods using a spoon and by Month 6, over 90 percent of the infants do so. White mothers are more likely to feed their infants using a spoon in early infancy than African American and Hispanic mothers.

Nearly 20 percent of infants are fed some supplemental foods using a spoon by Month 2 (see Figure IX.1). By Month 4, this proportion triples to nearly 60 percent of the infants. By Month 6, over 90 percent of the infants receive supplemental foods using a spoon. These data indicate a high level of initiation of

²⁶ Infants who were fed both formula and breastmilk were also included.

Table IX.2. Methods of feeding supplemental foods at interview months when data were elicited.

Month of Interview	Percent	N
PERCENT FEEDING SUPPLEMENTAL FOODS USING A SPOON¹		
Month 2	18	614
Month 4	60	741
Month 6	94	775
Month 9	99	796
PERCENT FEEDING SUPPLEMENTAL FOODS USING AN INFANT FEEDER²		
Month 2	20	690
Month 4	35	817
Month 6	43	833
Month 9	47	840
Month 12	48	839
PERCENT DRINKING FROM A CUP WITH ASSISTANCE		
Month 5	23	819
Month 6	45	818
Month 7	68	832
Month 9	87	829
Month 12	93	832
PERCENT DRINKING FROM A SELF-HELD CUP		
Month 7	33	827
Month 9	70	825
Month 12	91	828
PERCENT SELF-FEEDING^{3,4}		
Month 6	43	758
Month 9	89	786
Month 12	98	796

Notes:

1. These data are available for formula-feeding infants only.
2. Includes all mothers who used an infant feeder any time prior to that interview.
3. Includes infants who were receiving supplemental foods only.
4. Defined by picking up foods and putting them in the mouth.

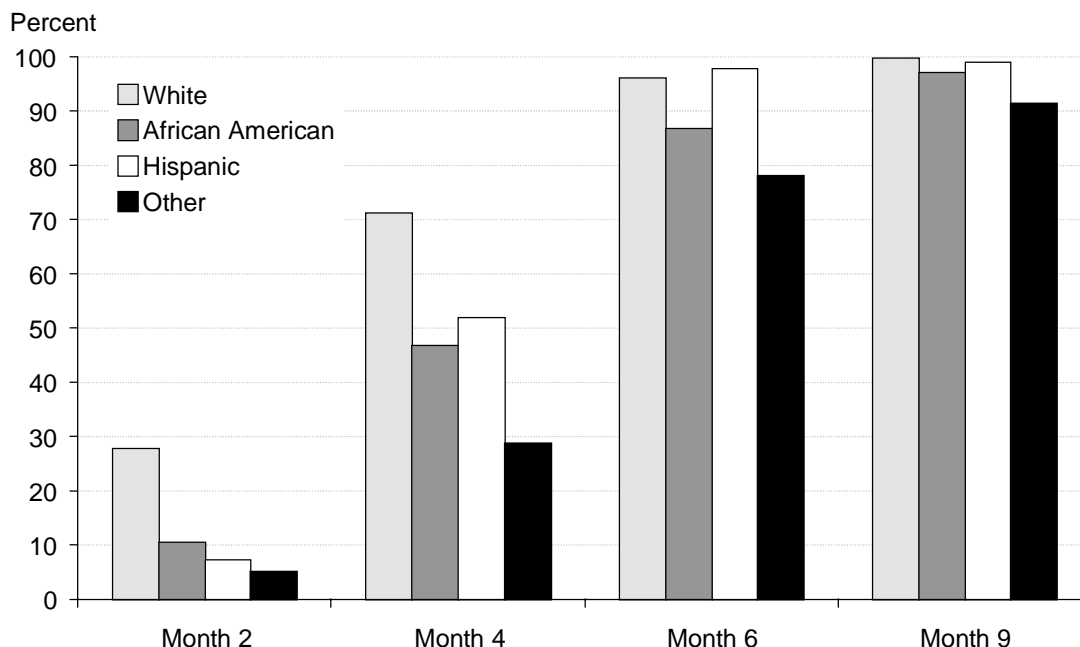


Figure IX.1. Percentage of WIC infants receiving supplemental foods using a spoon at interview months 2, 4, 6, and 9, by race and ethnicity of the mother.

use of a spoon by Month 6, although it is not known if the spoon constituted the primary method of feeding of supplemental foods.

There are some significant group differences in feeding of supplemental foods from a spoon among mothers of different race/ethnicity. White mothers are significantly more likely to feed their infants using a spoon (28% and 71% in Months 2 and 4, respectively) than African American mothers (10% and 47% in Months 2 and 4, respectively) and Hispanic mothers (7% and 52% in Months 2 and 4, respectively). However, as infants grow older (at Month 6 and Month 9), no significant differences remain, since a vast majority of mothers initiate the use of a spoon by that age.

✓ Nearly one-half of the WIC mothers use an infant feeder sometime during infancy. African American mothers are the most likely to use infant feeders and Hispanic mothers are the least likely to do so.

The second panel of Table IX.2 shows the percentage of mothers who used an infant feeder prior to each interview by race/ethnicity of the mother. By Month 2, nearly 20

percent of the mothers have used an infant feeder. This percentage gradually increases: by Month 12 nearly half of the mothers (48%) have used an infant feeder.

There are significant group differences in the use of an infant feeder by maternal race and ethnicity, throughout the infancy. Hispanic mothers are less likely to use an infant feeder than white mothers and African American mothers. Conversely, African American mothers are more likely to use an infant feeder than white mothers. Figure IX.2 displays these differences.

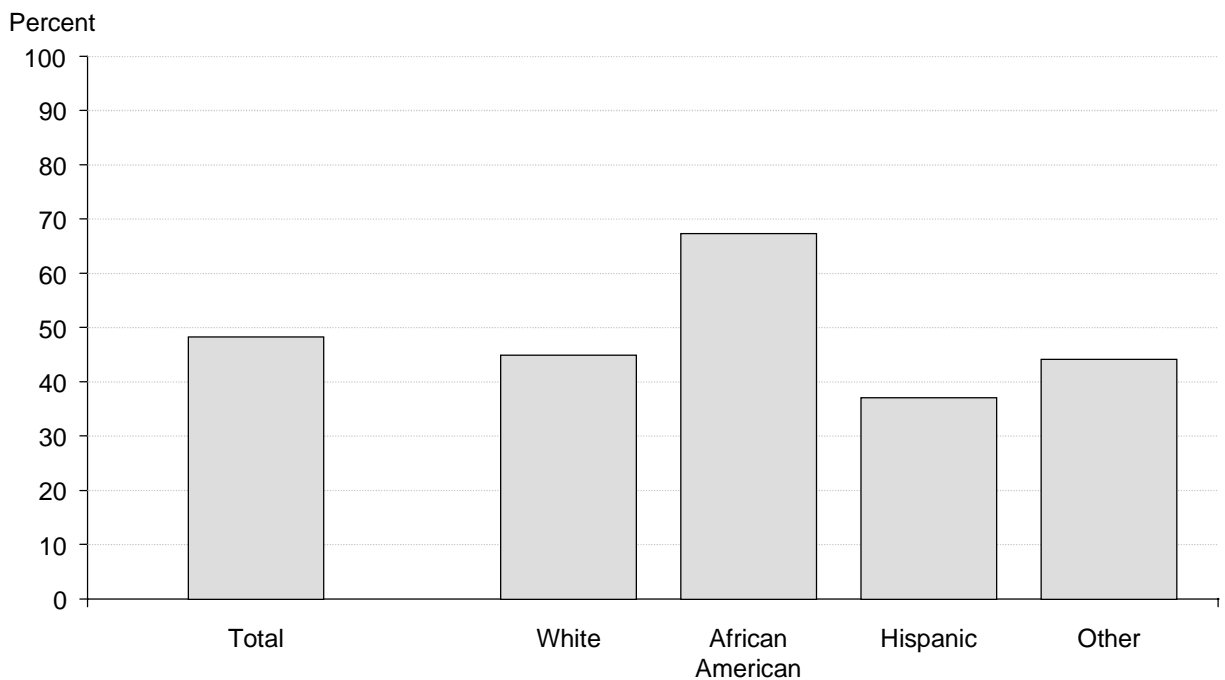


Figure IX.2. Percentage of WIC mothers who have used an infant feeder sometime during infancy, by race and ethnicity of the mother.

The third panel of Table IX.2 shows the percentages of infants, during the week before each interview, drinking from a cup that was held by someone. The proportions of infants using a cup to drink supplemental drinks increase rapidly between Month 5 and Month 9 interviews. Just under one-quarter of the infants use a cup by Month 5 and just under one-half (45%) do so by Month 6. By Month 12, nearly all infants (93%) use a cup

Table IX.3. Percentages of WIC mothers who adopt supplemental food feeding practices that are generally not recommended.

Supplemental Food Feeding Practice	Percent	N
Feeding supplemental drinks by Month 5 prior to using a cup ¹	77	508
Feeding supplemental foods by Month 4 prior to using a spoon ²	31	433
Feeding supplemental foods by Month 4 and have used an infant feeder sometime during the first 4 months ²	40	466

Notes:

1. Among the infants who received supplemental drinks by Month 5.
2. Among the infants who received supplemental foods by Month 4.

with someone else's assistance. There are no significant race/ethnicity differences in the use of a cup.

The fourth panel of Table IX.2 shows the percentage of infants using a cup that they hold themselves. There is a steady increase in the percentage of infants who can use a self-held cup. By Month 7, one-third of the infants use a self-held cup; by Month 9, 70 percent of them use a self-held cup, and by Month 12, more than 90 percent use a self-held cup. There are no significant race/ethnicity differences in the proportions of infants using a self-held cup.

✓ By Month 9, nine out of ten WIC infants who eat supplemental foods pick up foods and put them in their mouth.

The last panel of the Table IX.2 shows the percentage of self-feeding infants, among the infants who eat supplemental foods. By Month 6, more than two-fifths of the infants who eat supplemental foods start self-feeding. By Month 9, close to 90 percent of the infants who eat supplemental foods feed themselves. By Month 12, nearly every infant who eats supplemental foods is able to self-feed. There are no maternal race/ethnicity differences in the ability of infants to feed themselves.

✓ Among the infants who receive supplemental drinks by Month 5, three-quarters have never used a cup, and among the infants who receive supplemental foods by Month 4, almost one-third have never used a spoon.

Table IX.3 provides the percentage of infants who receive supplemental drinks by Month 5 who do not use a cup (with or without assistance). These are the percentages of infants who are known to have initiated supplemental drinks in a bottle.

Over three quarters of WIC mothers feed supplemental drinks to their infants prior to using a cup as compared to the target set by *Healthy People 2000* of one-quarter. There are no statistically significant group differences in feeding of supplemental drinks prior to the use of a cup by maternal race/ethnicity, age, immigrant status, living with the infant's father, poverty level, education, and birth order of the infant (results not presented).

Table IX.3 also shows the percentage of mothers who give supplemental foods by Month 4, prior to using a spoon, and the percentage of mothers who give supplemental foods by Month 4 and who use an infant feeder. Among the infants who receive supplemental foods by Month 4, 31 percent do not use a spoon. There are significant group differences by maternal race/ethnicity and whether the mother lives with the father of the infant. Figure IX.3 displays these differences. African American mothers are more likely to feed their infants supplemental foods prior to using a spoon in early infancy than white or Hispanic mothers. Half of African American mothers adopt this practice, as opposed to less than one-quarter of the white mothers and slightly over one-quarter of the Hispanic mothers. Mothers who live with the father of the infant are significantly less likely to feed their infants supplemental foods prior to using a spoon. It is estimated that one-quarter of the mothers who live with the infant's father adopt this practice, as opposed to more than one-third of the mothers who do not live with the father of the infant.

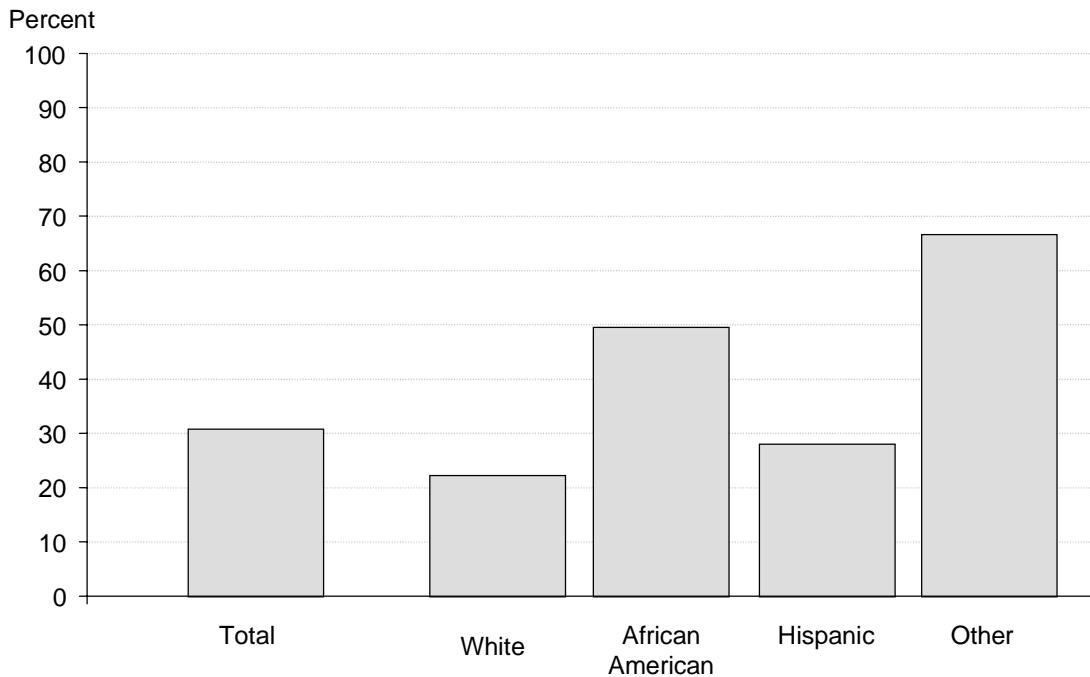


Figure IX.3. Percentages of WIC mothers who feed supplemental foods before Month 4, prior to using a spoon, by race and ethnicity of the mother.

Among the mothers who give supplemental foods by Month 4, more than one-third use an infant feeder. The only significant group difference is by maternal immigrant status. Among the mothers who give supplemental foods early (i.e., before Month 4), those who were born in the United States are more likely to use an infant feeder than those who were born elsewhere. Nearly one-half of these mothers who were born in the United States use an infant feeder to feed their infants, as opposed to only 12 percent of the mothers who were born elsewhere.

Conclusions

A majority of WIC mothers give supplemental foods using a spoon by the time their infant is about four months of age, and almost all initiate using a spoon by the time their infant is about six months of age. These data indicate that, developmentally, WIC infants are able to eat supplemental foods with a spoon between four and six months of age, as expected (FNS, 1993a). Almost all of the infants could hold a cup and feed themselves by the end of the first year, and nine out of ten infants could do so by nine months of age.

*A majority of the WIC mothers who start feeding infants supplemental drinks by Month 5 and supplemental foods by Month 4 not only adopt a pattern of initiation of supplemental foods earlier than generally recommended guidelines, but they also adopt methods of feeding that are considered to be inappropriate.*²⁷ Many mothers use an infant feeder or bottle when feeding supplemental foods and use a bottle when feeding supplemental drinks other than formula. Such feeding practices may have an adverse influence on the development of healthy eating habits for the infant as well as the infant's dental health (FNS, 1993a). These results suggest that feeding of supplemental drinks using a bottle is a common feeding practice across different socio-demographic groups, and feeding supplemental foods using a bottle is common enough to be a nutritional concern. In order to reach the objectives specified in *Healthy People 2000* (USDHHS, 1991), the percentage of WIC mothers initiating feeding of supplemental drinks in a bottle must be reduced by a factor of one-half to one-third.

²⁷ The FCS Guidelines were not published until November 1994 and probably not widely disseminated until 1995, well after the study period began.

CHAPTER X CONCLUSIONS

X.1. Overview

The Women, Infants, and Children Infant Feeding Practices Study (WIC-IFPS) is a unique longitudinal study of infant feeding in a cohort of economically disadvantaged mothers who received services from the WIC Program of the USDA's Food and Consumer Services (FCS). The WIC-IFPS is nationally representative of WIC mothers who participated in WIC during pregnancy. This study yields data on a group of 874 mothers and their infants, observed over a period of one year. Data collection took place between August 1994 and December 1995.

The purpose of the WIC-IFPS is to describe the infant feeding practices of a national sample of WIC mothers in order to understand the feeding choices and some of the factors that are associated with these choices. WIC-IFPS was not designed to evaluate the WIC Program's effect on infant feeding practices. A study to evaluate the WIC Program would have been very different; for example, there would have been a non-WIC comparison group, and information on WIC Program participation would not have been based solely on mother's recall.

In this chapter, an overview of the findings from the analyses of the WIC-IFPS data is presented. First, a summary of infant feeding practices is provided, along with a timeline illustrating these practices. After this summary, conclusions are presented that focus on the following areas:

- breastfeeding initiation (Section X.3)
- breastfeeding duration (Section X.4)
- formula feeding (Section X.5)
- introduction of supplemental foods (Section X.6).

Each section begins with a statement of the applicable infant feeding guidelines for WIC participants, followed by a summary of main findings. The guidelines for feeding of infants were set forth in *Infant Nutrition and Feeding—A Reference Handbook for*

Nutrition and Health Counselors in the WIC and CSF Programs (FNS, 1993a).²⁸ Brief commentary follows each summary of findings.

X.2. A Summary of Infant Feeding Practices of WIC Mothers

One of the distinguishing characteristics of the WIC-IFPS is that it is nationally representative of all WIC mother-infant pairs who participated in the WIC Program prenatally. The findings from the analyses of the WIC-IFPS data can be used to profile the feeding practices of WIC mothers. Table X.1 presents the percentages of WIC infants who receive each of the 13 different groups of foods at each month of age.

Five important conclusions can be drawn from an examination of this table:

- (1) *Small percentages of WIC mothers breastfeed throughout early infancy.* By one month of age, only one-third of the infants receive any breastmilk. By three months of age, only one out of five infants receives any breastmilk.
- (2) *Large percentages of WIC mothers feed infant formula even during the first few months of infancy.* More than four out of five mothers feed formula to their infants by one month of age. This implies that few infants are receiving breastmilk exclusively, or almost exclusively, in early infancy.
- (3) *WIC mothers introduce supplemental foods and drinks early in infancy.* For example, almost one-quarter of the infants receive cereal by two months of age. One-fifth of the infants receive fruits by three months of age. For a substantial proportion of WIC infants, the nursing phase of infant feeding (i.e., when the diet consists of breastmilk and/or formula only) is substantially shorter than the recommended four to six months.
- (4) *By the end of the first year of life, the transitional phase²⁹ of infant feeding is completed for almost all WIC infants.* By 12 months of age, almost all infants receive cereal, fruits, vegetables, meats, and starchy foods (e.g., rice, pasta, bread). More than 90 percent receive dairy foods and high-protein foods other than meats (e.g., beans, eggs, peanut butter).

²⁸ This document was not published until November 1994, and probably not widely disseminated until 1995, well after the study period began. However, some of the breastfeeding guidelines were also included in the 1990 National Association of WIC Directors (NAWD) *Guidelines for Breastfeeding Promotion in the WIC Program* (NAWD, 1990) as well as its 1994 revision (NAWD, 1994).

²⁹ The transitional phase is when the diet is being transformed from a nursing diet to a modified adult diet.

Table X.1. Percentages of WIC infants who receive each of the 13 groups of foods at each age.¹

Foods Fed ²	Age of the Infant in Months											
	1	2	3	4	5	6	7	8	9	10	11	12
Breastmilk	34	26	20	18	16	14	12	11	10	9	8	3
Formula	84	91	92	92	91	90	88	87	85	81	70	19
Fruit juice ³	5	13	25	44	68	84	95	95	99	100	100	100
Milk ³	0	1	2	2	4	8	13	13	27	28	28	84
Sweet drinks ³	14	22	27	32	36	42	29	50	61	62	62	88
Cereal ³	9	24	42	64	89	95	98	99	100	100	100	100
Fruits ³	2	8	21	44	73	87	95	97	99	99	100	100
Vegetables ³	1	4	12	31	61	85	95	96	99	99	99	100
Meats ³	0	1	4	8	20	45	66	76	91	93	95	99
Starchy foods ³	0	0	2	6	19	44	67	68	88	91	91	99
Dairy foods ³	0	0	1	4	10	23	38	39	65	69	69	93
High protein foods ³	0	0	1	3	9	20	36	37	60	64	65	93
Sweet foods ³	7	13	17	21	29	38	50	50	68	70	70	93

Notes:

1. The ages are actual ages and are not dependent upon the timing of the interview.
2. The food groups are defined in the text.
3. Infants who have received these supplemental foods prior to the corresponding age are assumed to be receiving those foods at any subsequent age.

(5) *Some feeding practices of the WIC mothers towards the end of the first year of life are outside of recommended dietary guidelines.* For example, almost 90 percent receive sweet drinks (e.g., fruit-flavored drinks, sodas, coffee, and tea), and over 90 percent receive sweet/snack foods (e.g., cookies, cakes, jams, honey, chips) by 12 months of age. FSC advises that sweet drinks and sweet/snack foods not be fed to infants under 12 months of age (FNS, 1993a).

Figure X.1 provides a timeline that describes the feeding practices of WIC mothers during the first two months of life. These two months constitute the nursing phase for a majority of WIC infants. A majority of the WIC infants are fed formula at the first feeding after birth. Nevertheless, a majority of WIC mothers initiate breastfeeding sometime during the first week after birth. During the period immediately following birth, most infants sleep away from their mothers, in the nursery, at least for one night. During the hospital stay, a majority of the mothers experience nursing problems. By the time of

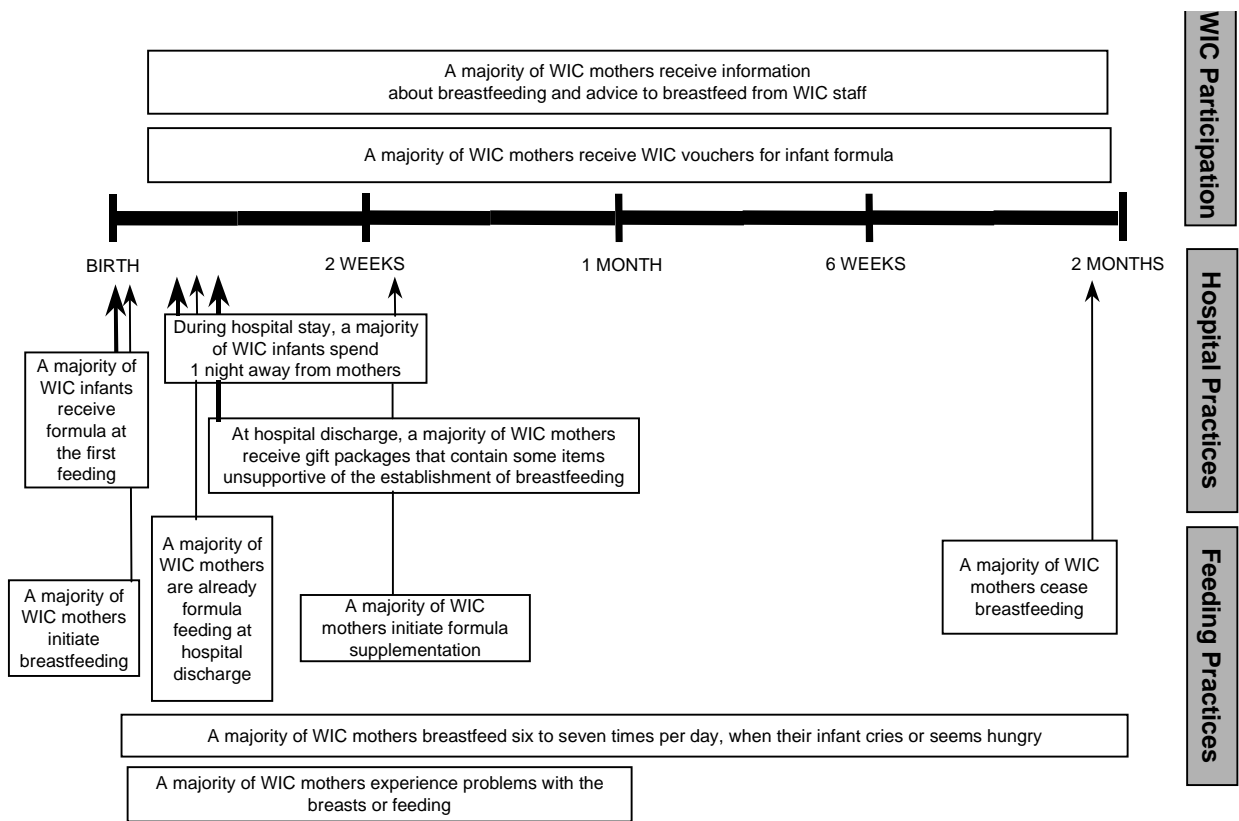


Figure X.1. Timeline describing WIC Program participation, feeding practices, and hospital practices for WIC mothers from birth through two months of age.

hospital discharge, more than one-half of WIC mothers are exclusively formula feeding their infants, and almost all WIC mothers receive a gift package from the hospital that includes an item that is unsupportive of the establishment of breastfeeding.

During the first two weeks after hospital discharge, a majority of breastfeeding WIC mothers initiate formula supplementation. Nevertheless, they breastfeed about six to seven times per day, when the infant cries or seems hungry. Just before the end of the first two months of life, a majority of breastfeeding WIC mothers cease breastfeeding.

Figure X.2 provides a timeline that describes the infant feeding practices of the WIC mothers in the transitional phase. A majority of WIC mothers initiate feeding infant cereal by the time their infants are about 3½ months of age. By the time the infants are a little over four months of age, a majority of WIC mothers have introduced fruits, vegetables, and fruit juices, in close succession. Most WIC mothers have not used a cup for their infants by the time they introduce supplemental drinks. By four months of age, a majority of WIC mothers use a spoon to feed some supplemental foods.

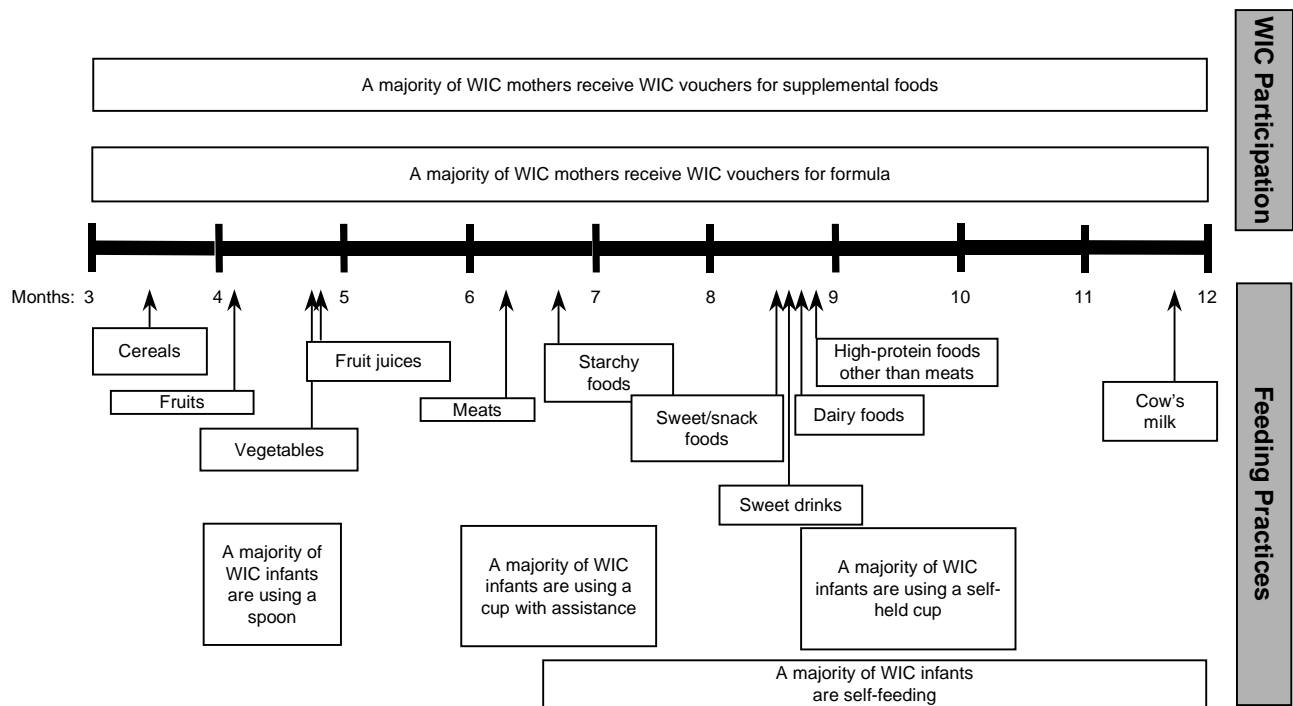


Figure X.2. Timeline describing WIC Program participation and feeding practices for WIC infants from three to twelve months of age.

By the time infants are seven months of age, a majority of WIC mothers introduce meats and starchy foods such as rice and pasta, offer supplemental drinks using a cup, and offer finger foods to allow the infants to feed themselves. By the time infants are nine months of age, a majority of WIC mothers introduce

dairy foods (cheese, yogurt, etc.), high-protein foods other than meat, sweet/snack foods, and sweet drinks, and allow their infants to use a cup to drink by themselves. A majority of WIC infants do not receive cow's milk until just before their one-year birthday.

X.3. Breastfeeding Initiation

FCS Guideline

- Breastfeeding should be encouraged.

Commentary

✓ More than one-half of WIC mothers initiate breastfeeding.

The *Healthy People 2000* objective regarding breastfeeding initiation is to “increase to at least 75 percent the proportion of mothers who breastfeed their babies in the early postpartum period” (USDHHS, 1990). The year 2000 target for low-income women is the same as the national target, despite the fact that the 1988 baseline figure for this subgroup (32%) is lower than for the nation as a whole (54%). The definition of breastfeeding used by *Healthy People 2000* is breastfeeding status at the time of hospital discharge. Using this definition, 45 percent of WIC mothers initiate breastfeeding. WIC adopts a more comprehensive definition of breastfeeding: any breastfeeding of the infant at any time during the first few weeks postpartum is taken as an indication of breastfeeding initiation. Using this definition, 56 percent of WIC mothers initiate breastfeeding.

The WIC Program has always encouraged breastfeeding as the best method of infant feeding (Tognetti et al., 1991), and efforts since 1988 have strengthened that support (Macro International and Urban Institute, 1995). The 1993 report from the U.S. General Accounting Office (GAO) concluded that “State WIC Programs have substantially increased their breastfeeding promotional efforts since the 1989 reauthorization of the WIC Program” (GAO, 1993). This conclusion is based on surveys of all state WIC directors and on intensive data collection from three local sites in each of four states. The report also noted that “nationally, USDA has taken many steps to promote breastfeeding—some of them before the 1989 act that required specific actions...” Breastfeeding is also strongly recommended by the American Academy of Pediatrics (1993) and the American Public Health Association (1991). The many benefits of

breastfeeding are summarized by the *Innocenti Declaration: On the Protection, Promotion and Support of Breastfeeding*, issued by an international group of experts assembled by the World Health Organization (WHO) and UNICEF (WHO/UNICEF, 1991).

A previous study of comparison of trends in breastfeeding initiation rates indicates that breastfeeding initiation among WIC participants declined from 39 percent in 1984 to 34 percent in 1990, but increased to 44 percent in 1994.³⁰ The fact that the 44 percent figure from the RLMS is less than that found in the WIC-IFPS is probably due to the differences in timing of the data collection, sample coverage and data collection methods.

- ✓ Hispanic mothers are most likely to initiate breastfeeding (four-fifths), followed by white mothers (half) and African American mothers (one-third).

Other characteristics of WIC mothers who are less likely to breastfeed include the following: under age 20; born in the United States; does not live with the father of the infant; has lower education; and has older children. These associations with socio-demographic characteristics are similar to those reported in other studies with national coverage (Ryan et al., 1991a, b; GAO, 1993).

Longer maternal hospital stay, probably associated with postnatal maternal health, is associated with lower rates of breastfeeding. In addition, infants are more likely to be breastfed if the mother reports receiving advice to breastfeed from her mother or other relatives, and if the mother breastfed previous children. Net of other factors, receipt of advice to breastfeed from a physician and receipt of information about breastfeeding from sources other than WIC are predictive of higher rates of breastfeeding.

These findings support the recent NAWD guidelines regarding prenatal breastfeeding encouragement: incorporation of positive peer influence; including the participants family and friends in breastfeeding education and support sessions; and encouraging the mother to communicate her decision to breastfeed to appropriate hospital staff (NAWD, 1994). WIC staff are also encouraged to coordinate prenatal breastfeeding education

³⁰ This information is from the Ross Laboratory Mother's Survey (RLMS, 1990 and 1994). The RLMS has been criticized because its sampling frame and its reliance on a mailed survey contribute to its not being nationally representative. The sample is obtained from lists that are estimated to include about 75 percent of births in the United States. Only half of the women selected for the survey actually responded (GAO, 1993). In particular, less-educated and low-income women are under-represented (Fomon, 1993; Hendershot, 1984).

activities with primary care providers, and to know the practices of their community hospitals and primary health care providers that pertain to breastfeeding.

- ✓ Among the mothers who do not receive breastfeeding advice from their physicians, receiving information from WIC about breastfeeding is associated with a higher likelihood of breastfeeding initiation. Knowledge of the special WIC breastfeeding food package for women whose infants do not receive formula from WIC is also associated with higher likelihood of initiating breastfeeding.

Most mothers recall having received information from WIC on the benefits of breastfeeding, about how to breastfeed, and about maternal diet during breastfeeding. Half report that the WIC staff told them to breastfeed. In response to a question about what type of infant feeding WIC recommends, one-third said “breastfeeding only” and most of the others said “both breastfeeding and bottle feeding.” In open-ended responses to the question about why the mother thinks this is what WIC recommends, most women indicate that they know the WIC Program promotes breastfeeding as the best method, but that the program also supports whichever method the mother chooses.

There is substantial overlap between receipt of information and advice on breastfeeding from WIC, and receipt of similar information or advice from the physician. However, WIC breastfeeding information appears to reach a much larger group of WIC mothers than physicians’ breastfeeding advice. Among the mothers who do not receive breastfeeding advice from their physicians, receipt of information about breastfeeding from WIC predicts more than a 50 percent increase in the likelihood of breastfeeding initiation. These findings indicate the importance of support and encouragement for the mother’s decision to breastfeed, a finding that is common to many studies (Bedinghaus and Doughten, 1994).

Maternal knowledge of the special WIC breastfeeding food package appears to be successful in encouraging the mothers to breastfeed. Unfortunately, fewer than one-third of mothers recall receiving information about the special WIC food package for breastfeeding women (although, of course, more women may have been told about the package but simply did not remember it).

The causal association of the WIC Program with breastfeeding rates is the subject of considerable debate. A national impact evaluation of the WIC Program on breastfeeding initiation has never been conducted, and therefore, inferences regarding the effects of the

WIC Program on breastfeeding rates are often speculative. The GAO report documented considerable variation among local sites in terms of who received breastfeeding education. In some sites, breastfeeding education was focused on women who either said they intended to breastfeed or were undecided, while in other sites all pregnant WIC participants received similar breastfeeding education (GAO, 1993). However, the WIC Breastfeeding Promotion Study and Demonstration (USDA, 1990), conducted at seven local WIC agencies throughout the country, documented increased breastfeeding incidence in response to various breastfeeding interventions (at all sites except the site that had the highest baseline incidence; Sanders et al., 1990).

The relationship of WIC participation with breastfeeding initiation has also been examined using data from the 1988 National Maternal and Infant Health Survey (NMIHS) (Schwartz et al., 1992, 1995). This study is nationally representative of all live births occurring in 1988, and as such, was too early to assess the effects of the intensified breastfeeding support activities of the WIC Program. Adjusting for the differences in the characteristics of the mothers who participate in the WIC Program and those who do not, women who reported receiving breastfeeding advice from WIC had a higher probability of breastfeeding (44%) than either non-participants (35%) or WIC participants who did not report such advice (26%). One of the main limitations of this study is that the data on receipt of breastfeeding advice could be biased such that mothers who breastfed may be more likely to recall this advice.

It is highly unlikely that the WIC Program alone can change the infant feeding preferences of the mothers. The GAO (1993) report notes that “negative influences on, or barriers to, breastfeeding extend beyond WIC’s ability to affect them,” and concludes that further increases in breastfeeding rates will require greater support from breastfeeding throughout the health care system, in the community, and in workplaces. Indeed, findings of the WIC-IFPS about WIC mothers’ hospital experiences support this statement. The GAO report includes a comprehensive list of recommendations made by state WIC directors for changes in regulations pertaining to both WIC and other federal programs that could help to increase breastfeeding rates.

✓ WIC mothers experience several hospital practices that are unsupportive of the establishment of breastfeeding. Less than three in ten WIC mothers give their infants breastmilk at the first feeding. Almost three-quarters of WIC infants sleep away from their mothers at least for one night during their hospital stay. Almost all WIC mothers receive a gift package from the hospital that contain items that are unsupportive to the establishment of breastfeeding. About one-third of the mothers who experience nursing problems in the hospital receive no help from the hospital staff.

About 60 percent of infants receive formula at the first feeding and 10 percent receive either sugar water or plain water. These results suggest that encouragement of breastfeeding in the neonatal period by the hospital staff may help increase breastfeeding at the first feeding. African American WIC mothers may constitute a target group, as they have the lowest rate of breastfeeding at the first feeding: about one in ten African American mothers breastfeed at the first feeding. Fewer than one-fifth of the mothers who initiate breastfeeding do so during the first hour of birth, and only about half breastfeed during the first three hours; one-fourth do not breastfeed until 13 or more hours after birth. Other hospital practices unsupportive of breastfeeding include rooming arrangements; the lack of breastfeeding support services for some WIC mothers; and the dispensing of formula, sugar water, bottle, and pacifier in gift packages.

There is nothing in the WIC reference handbook (FNS, 1993a) about the timing of the first breastfeed. NAWD guidelines specify that the infant be put to the breast within the first hour after birth (NAWD, 1990). Furthermore, NAWD suggests working with health care providers to promote hospital practices that are conducive to breastfeeding. The GAO (1993) report indicates that a vast majority of WIC state agencies have community task forces that help promote breastfeeding in collaboration with health care providers.

One of the recommendations made by state WIC directors in the GAO report (1993) is to require hospitals receiving federal funds (Medicare/Medicaid) to adopt the WHO/UNICEF “Baby Friendly” policies. The Baby Friendly Hospital Initiative encourages hospitals throughout the world to adopt the “Ten Steps to Successful Breastfeeding” (WHO/UNICEF, 1989), which include (1) helping mothers initiate breastfeeding within a half hour of birth and (2) giving newborn infants no food or drink other than breastmilk unless medically indicated (Karra et al., 1993).

X.4. Breastfeeding Duration

FCS Guidelines

- Breastmilk alone provides sufficient nutrition for infants for the first four to six months of life.
- Frequent breastfeeding (eight to twelve times per day, depending on the age of the infant) is important for stimulation of breastmilk supply.
- Breastfeeding should occur whenever the infant appears to be hungry, rather than following a set schedule.

Commentary

✓ One-fourth of the WIC mothers who initiate breastfeeding stop by the end of the second week, and one-half stop by the end of the second month.

The breastfeeding continuation goal in the *Healthy People 2000* report is that at least 50 percent of all infants are to be breastfed until five to six months of age (USDHHS, 1990). The corresponding percentage for WIC infants is 16 percent breastfeeding at five months of age. As with breastfeeding initiation, low-income women had a lower 1988 baseline continuation rate (9%) than the national average (21%), but the year 2000 continuation target is the same for all women. FCS also stresses continuation of breastfeeding (FNS, 1993a), and the American Academy of Pediatrics recommends breastfeeding for the first six to twelve months (American Academy of Pediatrics, 1993). The international *Innocenti Declaration* notes that the benefits of breastfeeding increase with increasing duration of breastfeeding (WHO/UNICEF, 1991).

Maternal socio-demographic factors associated with early cessation of breastfeeding are young age, lower education, and using non-maternal child care.

✓ Mothers who believe that they do not have sufficient milk, or that there is something wrong with their milk, are more likely to stop breastfeeding; other nursing problems are not significantly associated with breastfeeding cessation.

Breastfeeding mothers report various problems with nursing, which generally decrease over time. In the first month, about one-third of mothers think they do not have

enough milk and one-tenth think that something is wrong with it. Perception of not having enough breastmilk is one of the most commonly reported nursing problems.

Infant feeding guidelines of the FCS include a section on “how to know if your baby is drinking enough milk” (FNS, 1993a). Breastfeeding mothers are advised to monitor infant weight gain, frequency of breastfeeding episodes, the infant’s swallowing, number of wet and soiled diapers, and the color of the infant’s urine. When mothers of the WIC-IFPS were asked what they do about their perception of insufficient milk, very few said that they breastfeed more frequently or that they monitor infant growth or wet diapers; most said that they give formula.

There are many practical suggestions that can be offered to mothers who perceive problems with their breastmilk, as described in various WIC documents (FNS, 1993a; NAWD, 1990) and elsewhere (American Academy of Pediatrics, 1993; Freed et al., 1991; Riordan and Auerbach, 1993). Most importantly, mothers may be advised to breastfeed more frequently if it appears that the infant is truly not getting sufficient breastmilk.

✓ Mothers who believe that breastfeeding is beneficial are less likely to cease breastfeeding, while those who express more concern about barriers to breastfeeding are more likely to do so.

Responses to most questions about attitudes and beliefs concerning breastfeeding in the WIC-IFPS are significantly different for mothers who breastfeed the infant compared to those who do not. Non-breastfeeding mothers are significantly less likely to express positive attitudes on most issues, and are also generally more likely to say that they are “not sure” about various statements about consequences of breastfeeding. Responses to many of the questions about attitudes and beliefs also vary considerably by racial/ethnic background. In particular, African American mothers are most concerned about barriers to breastfeeding, while Hispanic mothers are most aware of the benefits of breastfeeding. While beliefs/attitudes may be predictive of breastfeeding practices, it is not known if a change in beliefs/attitudes will lead to a change in the rates of breastfeeding cessation. Nevertheless, the NAWD guidelines recommend the inclusion of questions about breastfeeding attitudes in the annual participant survey, in order to design more effective breastfeeding promotion programs (NAWD, 1994).

- ✓ Breastfeeding mothers who are concurrently feeding infant formula are almost 2.5 times as likely to stop breastfeeding, compared to those who are not receiving any formula.

Feeding infant formula to a breastfeeding infant can increase the rate of breastfeeding cessation in several ways (Riordan & Auerbach, 1993). Physiologically, because formula reduces the infant's need for breastmilk, breastfeeding frequency is reduced; fewer breastfeeds result in reduced breastmilk production. Although formula may be given with the idea of *adding* to the infant's diet, in fact it is difficult to give formula without instead *replacing* breastmilk, particularly in the early months of life (Greiner, 1996). Infants may also be confused by the differing suckling actions required for breast- and bottle feeding, and may prefer bottle feeding because it requires less effort. Mothers also may find that formula feeding is more convenient, or they may begin formula feeding with the intention of stopping breastfeeding.

- ✓ Mothers who know about the special WIC breastfeeding package have significantly longer breastfeeding duration. Among the three WIC Program components that support breastfeeding (i.e., the knowledge of the special breastfeeding food package, receipt of information about breastfeeding from WIC, and receipt of advice to breastfeed from WIC staff), receipt of each additional program component is associated with a further increase in breastfeeding duration.

Mothers who know about the special WIC breastfeeding package for mothers who do not accept formula from WIC, tend to breastfeed for longer durations. The WIC-IFPS provides information about two other WIC Program components that support breastfeeding: receipt of information about breastfeeding from WIC and receipt of advice to breastfeed from WIC staff. WIC Program components have a cumulative effect on the rates of breastfeeding cessation. WIC mothers receiving several of the WIC Program components that support breastfeeding, breastfeed longer durations than those receiving fewer program components. In other words, there appears to be a "dose-response" to WIC Program components that support breastfeeding, suggesting the need for a multiplicity of program activities that encourage and support breastfeeding. The recent guidelines of NAWD stress the importance of including questions in the annual participant survey regarding infant feeding decisions and the WIC Program's

breastfeeding support activities, in order to design more effective breastfeeding promotion programs (NAWD, 1994).

In the WIC Breastfeeding Promotion Study and Demonstration (USDA, 1990), the interventions were associated with increased six-week breastfeeding prevalence at four of the seven sites and increased three-month prevalence at five sites (Sanders et al., 1990). The recent analysis of the relationship between WIC participation and breastfeeding using NMIHS data, found that, contrary to the results for breastfeeding initiation, there were no differences according to WIC participation or receipt of breastfeeding advice, either in average breastfeeding duration or in the probabilities of breastfeeding at three or six months (Schwartz et al., 1995). None of these studies investigated the “dose-response” type association documented here.

- ✓ Breastfeeding infants are nursed about six times per day, decreasing from an average of almost seven in Month 1 to just under six by Month 5. Most are breastfed when they appear hungry, rather than on a fixed schedule.

While the number of daily breastfeeds declines somewhat as the infants get older, breastmilk is a major component of the diet for those infants who continue to breastfeed. Although several socio-demographic and other non-program factors are predictive of frequency of breastfeeds, these effects are indirect, through the effects of formula supplementation. Formula supplementation is the strongest and most direct predictor of frequency of breastfeeds, and it, in turn, is associated with non-program and program factors. The role of formula supplementation in predicting the frequency of breastfeeds indicates that WIC mothers may be substituting breastfeeds with formula feeds (supplemental formula use) rather than providing formula in addition to the breastfeed at each feeding (complementary formula use). Physician’s advice to breastfeed is positively associated with the frequency of breastfeeds, indicating that this infant feeding practice is amenable to specific professional guidance and advice.

Frequent breastfeeding is critical for stimulation of breastmilk production, particularly in the early weeks (Queen & Lang, 1993; Riordan & Auerbach, 1993). One of the FCS breastfeeding counseling guidelines is, “Nurse your baby often during the day and night to allow your body to make enough milk for your baby (the more you nurse, the more milk your body makes)” (FNS, 1993a). Supplemental formula feeding, especially if the

reason for supplementation is the perceived inadequacy of milk, is likely to be counterproductive.

✓ One-third of breastfeeding mothers express milk during the first two months.

Many of the breastfeeding mothers in this study report that they express milk from their breasts (one-third in the first and second month, and one-fourth in the third month). Breastmilk expression is somewhat more common among mothers of first-born infants, those who were born in the United States, and those who live with the infant's father.

The WIC reference handbook on infant feeding provides very general instructions regarding expression of breastmilk by hand, with manual and electric breast pumps (FNS, 1993a). Most of the WIC mothers who express milk do so with a manual pump.

X.5. Formula Feeding

FCS Guidelines

- Breastmilk alone provides sufficient nutrition for infants for the first four to six months of life.
- Formula should not be diluted with extra water in order to “stretch” it.

Commentary

✓ One-half of breastfeeding WIC infants are given formula during the first two weeks of life.

One-fourth of breastfeeding infants receive formula by the age of five days and one-half by sixteen days. The NAWD guidelines indicate that mothers be informed that formula supplementation can be expected to reduce breastmilk supply. These guidelines specify that WIC staff encourage and support breastfeeding, rather than offering additional formula (NAWD, 1994). NAWD also specifies that formula vouchers not be issued for exclusively breastfed infants or when a breastfeeding mother does not specifically request them (NAWD, 1994).

It is particularly important that foods other than breastmilk not be given during the first few weeks, when breastfeeding is being established (American Academy of Pediatrics, 1993; Riordan & Auerbach, 1993). These other foods would have a negative

impact on breastmilk production; they could also cause “nipple confusion” (i.e., the infant could have difficulty with proper suckling at the breast after feeding from an artificial nipple).

- ✓ Breastfeeding mothers who report problems with their milk are more likely to begin giving formula.

While it is not surprising that mothers who experience nursing problems respond by beginning to feed formula, this suggests that they do not know how to resolve these problems. In open-ended responses, many of the WIC mothers report that their reason for giving formula in addition to breastfeeding is that they do not have sufficient breastmilk. This answer corresponds to the response given to the question of what they do when they feel they do not have sufficient breastmilk. As noted previously, changes in breastfeeding patterns (notably, more frequent feedings) can minimize these problems, whereas supplementing with formula makes some of these problems worse and may lead to breastfeeding cessation.

- ✓ Breastfeeding mothers who report knowledge of the special WIC breastfeeding food package are less likely to begin giving formula.

Although reported knowledge of the special WIC breastfeeding food package is significantly associated with reduced formula use, receipt of advice to breastfeed from WIC or receipt of information about breastfeeding from WIC are not associated with formula supplementation. These results suggest that the special WIC breastfeeding food package may be an incentive for delaying of formula supplementation in addition to being an incentive for breastfeeding initiation and longer durations of breastfeeding.

- ✓ Less than ten percent of mothers report that they mix formula with extra water to make it last longer.

The percentage of WIC mothers overdiluting formula tends to increase with infant birthweight, suggesting that larger infants require more formula. FCS specifically advises that extra water should not be added to the bottle (FNS, 1993a). FCS advises that if a caregiver complains that he/she is receiving an insufficient amount of infant formula, WIC staff can offer powdered infant formula, which yields a greater quantity

than other forms of formula. Just over half of WIC mothers recall receiving information on how to formula feed and how to prepare formula.

X.6. Introduction of Supplemental Foods

FCS Guidelines

- Breastmilk alone is sufficient for the first four to six months.
- Infant cereal should be the first supplemental food introduced, at the age of four to six months. Fruits, vegetables, meats, and other protein-rich foods should follow, at six to eight months.
- The following foods should not be fed before the age of twelve months: cow's milk, sweetened foods and beverages, and caffeinated beverages.
- Fruit juices should be given by cup, not in a bottle. Supplemental foods (other than finger foods) should be fed with a spoon, not using an infant feeder or a bottle with enlarged nipple.

Commentary

✓ Receipt of cereal prior to four months of age is the norm rather than the exception among WIC infants. Infants who are formula fed are twice as likely to receive cereal inappropriately early as infants who are breastfed.

WIC infants receive supplemental foods much earlier than recommended. FCS advises that breastmilk and/or formula are the only foods that infants need until four to six months of age (FNS, 1993a; American Academy of Pediatrics, 1992). The order of introduction of supplemental foods by food type follows the guidelines set forth by FCS and other sources of nutrition guidance (FNS, 1993a; American Academy of Pediatrics, 1993; Fomon, 1993; Queen & Lang, 1993); however, each food type is introduced earlier than recommended. This finding suggests that the WIC mothers may be able to delay the whole process by delaying the introduction of the first supplemental food, usually the infant cereal.

Cultural differences among subgroups of mothers affect the timing of cereal introduction, as reflected by differences by immigrant status. Mothers who are born in the United States initiate infant cereal earlier than foreign-born mothers.

The analyses of the initiation of cereals, fruits, and vegetables suggest that formula-fed WIC infants constitute a group that is highly likely to receive these foods inappropriately early. This may be due to several reasons. First, the mothers who feed formula may view the bottle as an easy means to feed other foods to their infants. Second, formula-feeding mothers may add cereal to the bottle to promote longer sleep. Many mothers who initiate cereal report, in open-ended questions, that they do so to get the infant to sleep through the night or because the infant seemed to be wanting “too much” formula. Third, mothers may initiate cereal to avoid the expense of formula. This latter hypothesis is not supported by the WIC-IFPS data, in that mothers with higher levels of income are actually more likely to initiate cereal early.

- ✓ Mothers who receive information from WIC about feeding supplemental foods are less likely to initiate cereal inappropriately early.

Over half of WIC mothers report receiving information from the WIC Program about when to begin cereal and other foods. Receipt of information from WIC Program staff about when to start other foods is associated with a delay in the introduction of cereal.

- ✓ Two-fifths of WIC infants receive fruits and three in ten receive vegetables prior to four months of age. Formula-fed infants are three times as likely to receive these supplemental foods inappropriately early.

Young mothers are more likely to start feeding fruits and vegetables inappropriately early. Similar to the findings with the initiation of cereals, formula-fed infants emerge as a group who are three times as likely to be given fruits and three-and-a-half times as likely to be given vegetables inappropriately early as breastfed infants. The practice of giving a variety of supplemental foods to formula-fed infants may follow a premature introduction of infant cereal. Receipt of information from WIC about the initiation of supplemental foods is not predictive of a delay in introducing fruits and vegetables.

- ✓ Half of the WIC infants begin receiving fruit juice by age 4¹/₂ months. By 8¹/₂ months, half receive sweet drinks, such as sugar water, flavored drinks (e.g., Kool-Aid), sodas, tea, and coffee. One-fourth drink cow’s milk by nine months.

These results indicate that a substantial proportion of WIC mothers do not observe FCS’s guidelines, which specify that sodas, punches, etc.—which are high in calories but

have no nutritional value—should be avoided, as should caffeinated beverages and cow’s milk.³¹ It is advised that breastmilk or formula be the predominant liquid throughout the first year (American Academy of Pediatrics, 1993; FNS, 1993a); other liquids may be offered, but should be limited to ensure that the infant consumes sufficient quantities of other nutritious foods. When asked why they began feeding juice, many mothers report that the infant was constipated.

✓ Most WIC infants who receive supplemental drinks receive them from a bottle.

Three-fourths of infants under five months of age who receive non-formula liquids do not use a cup. Presumably most of these infants drink their supplemental drinks from a bottle. It is advised that juices not be introduced until the infant is able to drink from a cup. In addition, there is concern that feeding of fruit juices (and other sweet drinks) from a bottle increases the risk of tooth decay because of prolonged exposure of the teeth to a sweet liquid (American Academy of Pediatrics, 1993; Fomon, 1993; FNS, 1993a; Queen & Lang, 1993). *Healthy People 2000* specifies that infant feeding practices that prevent tooth decay be adopted by 65-75 percent of parents. The WIC-IFPS data indicate that this percentage currently is about 25 percent among the WIC mothers.

✓ Foods or liquids other than water are added to the formula in the bottle for almost one-fourth of WIC infants by three months of age. An infant feeder is used for one-fifth of infants by two months, one-third by four months, and almost one-half by nine months.

The addition of foods or liquids other than water to the formula is more common among African American mothers, teenage mothers, and those who were born in the United States. It is not known in the WIC-IFPS what additional substance was mixed with the formula. There is concern that this practice may cause over-feeding (because of the increased caloric concentration of the formula). It may also interfere with breastfeeding for those infants who remain on a mixed feeding regimen (American Academy of Pediatrics, 1993; Queen & Lang, 1993).

Both WIC and NAWD guidelines specify that supplemental foods be fed by spoon (beginning at four to six months), and not by a bottle or an infant feeder, because the

³¹ WIC’s policy on cow’s milk was issued on June 21, 1995 and went into effect on January 1, 1996, at the end of the data collection period of the WIC-IFPS. Prior to January 1, 1996, cow’s milk could be issued to infants under 12

infant may choke, and because infants who are not ready to eat with a spoon are not yet ready to eat supplemental foods (FNS, 1993a; NAWD, 1990).

months of age.

GLOSSARY

additive scales	Measures obtained by summing a number of other measures
breastfeeding practices	Exclusive or predominant breastfeeding (no formula, no supplemental foods), breastfeeding with formula supplementation (no supplemental foods), or complementary breastfeeding (with formula and supplemental foods)
CAI	Computer-assisted interviewing
CAPI	Computer-assisted personal interviewing
CATI	Computer-assisted telephone interviewing
chi-square statistics	A statistical quantity that summarizes the deviations between observed and expected frequencies in tabulated data; can be used to determine whether observed results are the result of chance or whether they indicate an underlying difference in two groups
clustered sampling design	A sample selected by picking groups of individuals or units rather than picking those individuals or units themselves
complementary breastfeeding	Feeding breastmilk and supplemental foods with or without formula
construct validity	The degree to which a measure quantifies the concept or the idea it targets
contraindicated	Reported that the presence of a condition prohibited a particular individual to be treated in the usual manner
dental caries	Tooth decay
descriptive analysis	Statistical analyses conducted for the purpose of describing the characteristics or behaviors of a group of individuals in terms of percentages, averages, or other summary measures
exponentiated	Expressed in terms of a designated power of e (the base of natural logarithms)
F-test	A statistical quantity that summarizes the differences between average quantities, and provides an assessment if the averages are different because of sampling errors; can be used to determine whether observed differences are the result of chance or whether they indicate an underlying difference in two groups

factor loading	A coefficient obtained from factor analysis that quantifies the relative weight of a given variable (item) in a factor
gastrointestinal system	Digestive system
high renal solute load	Requiring a high intensity of functioning by the kidney in order for the byproducts of food(s) to be excreted
in utero	Inside the uterus
infant feeder	A hard plastic receptacle with a spout at one end and a plunger at the other end that allows a caregiver to push textured food into an infant's mouth
internal reliability	A measure of the cohesiveness of the items that are assumed to be indicative of a single underlying concept; a means of quantifying whether the items <i>do</i> represent a single underlying concept
let-down-reflex	The action stemming from the hormonal process that causes the breastmilk to be pushed toward the nipple, leading to milk ejection
logistic regression model	A mathematical model predicting the logarithm of odds of occurrence of an outcome on the basis of a linear function of some observable conditions or characteristics
longitudinal	Concerned with the development of persons or groups over time
maturational	Having to do with the process of natural growth or development
multivariate analysis	Statistical method that can consider the relations between more than two characteristics or behaviors
musculo-skeletal system	All of the muscles, bones, joints, and related structures that function in the movement of the parts and organs of the body
NAWD	National Association of WIC Directors
nervous system	Network of structures that activates, coordinates, and controls all of the functions of the body
NMIHS	National Maternal and Infant Health Survey
non-parametric	Not relying upon an assumption about the distributional properties of a variable
nursing diet	An infant diet that consists of breastmilk only, breastmilk and formula, or formula only
parsimonious	The simplest assumption in the formulation of a model

partial breastfeeding	Feeding breastmilk and any other food to supplement it
postnatal	Occurring after the birth of a child
postpartum	Occurring in the period shortly after childbirth
prenatal	Occurring before the birth of a child
protocol	A standard procedure
psychometric	Pertaining to the development of psychological assessments and tests
relative risk	The ratio of frequency of a characteristic in one group relative to the frequency of the same characteristic in another group
renal	Of or relating to the kidneys
RLMS	Ross Laboratory Mothers Survey
satiety	The condition of being full or gratified
social context	Related to the circumstances that arise because of an individual's place in the society, community, or the family
socio-demographic	Related to social, economic, or demographic attributes
statistical significance	The likelihood that a hypothesis will be rejected although it is true
stratified	Separate or classified into groups or levels
WHO	World Health Organization
WIC	The Department of Agriculture's Special Supplemental Nutrition Program for Women, Infants, and Children
WIC-IFPS	The WIC Infant Feeding Practices Study
USDA	The United States Department of Agriculture
USDHHS	The United States Department of Health and Human Services

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