

WIC Infant and Toddler Feeding Practices Study – 2: Infant Year Report

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WIC ITFPS-2 Infant Year Report Executive Summary

Key Findings:

- **WIC mothers are breastfeeding at much higher rates than they were 20+ years ago**, with 83 percent now initiating breastfeeding as compared to 56 percent 20+ years ago, 62 percent breastfeeding at 1-month postpartum as compared to 33 percent 20+ years ago, and 18 percent still breastfeeding at 12 months as compared to 7 percent 20+ years ago.
- **Study mothers report receiving extensive support from WIC for breastfeeding.** This includes education from WIC, individual support calls, and guidance when encountering breastfeeding problems.
- **Introduction of complementary foods prior to 4 months, which was a substantial problem 20+ years ago, is no longer a major issue among WIC mothers.** Few mothers (20 percent) are introducing complementary foods before 4 months, as compared to at least 62 percent of mothers 20+ years ago.
- **Mothers report having made positive changes in how they feed themselves and their families due to WIC.** The most commonly reported changes include knowing how to choose more healthy foods, and eating more fruits and vegetables.

Overview of Study Goals and Methods

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) was established to safeguard the health of low-income pregnant women and infants who are at nutritional risk. The program was established by Congress as a pilot in 1972 under Public Law 92-433, Section 17 of the Child Nutrition Act of 1966, and made permanent in 1974.¹ The program, administered by the Food and Nutrition Services (FNS) of the U.S. Department of Agriculture (USDA), provides supplemental foods, nutrition education, including breastfeeding promotion and support, and health care referrals for low-income pregnant, non-breastfeeding and breastfeeding postpartum women and their infants and children up to age 5.

This report describes infant feeding practices for WIC infants as a part of the longitudinal WIC Infant and Toddler Feeding Practices Study (WIC ITFPS-2). By capturing data on WIC caregivers² and their children over the first 5 years of the child's life, the study will inform a series of research questions regarding feeding practices, the effect of WIC services on those practices, and the health and nutrition outcomes of children on WIC. Additionally, the study will update past analyses to assess changes in behaviors and trends that may have occurred over the past 20+ years—that is

¹ <http://www.fns.usda.gov/wic/about-wic-wics-mission>.

² Over 98 percent of respondents are biological mothers. Throughout the report the terms “mother” and “caregiver” are used interchangeably.

since WIC Infant Feeding Practices Study–1 (WIC IFPS-1), the last major study of the diets of infants and toddlers who were WIC participants.

WIC ITFPS-2 incorporates a core longitudinal sample (with up to 17 caregiver interviews occurring over the course of 60 months) and a supplemental sample with less frequent interviews to ensure cross-sectional precision in estimates at key points in time. Study mothers were recruited in person as they enrolled in WIC during the summer or fall of 2013 (either prenatally or before their infant was 2.5 months old). They were recruited from 80 WIC sites across 27 states and territories nationwide. Interviews are conducted by telephone in English or Spanish. In addition, the study team periodically obtains data on the mother and child from WIC administrative records. The study also collected data from WIC site staff using a web survey, and from State and local agencies staff using a mix of in-person and telephone interviews. This report on early feeding practices uses data from the prenatal interview and the 1-, 3-, 5-, 7-, 9-, 11-, and 13-month interviews, as well as from WIC administrative data, WIC staff surveys, and WIC key informant interviews.

The data in this report are based on the 3,777 caregivers who completed at least a 1- or 3-month interview, although analyses sometimes utilize a subset the data to address subgroups of interest. The data are weighted to represent the national population of infants enrolled in WIC for the first time during our 20-week recruitment period.³ Study findings represent the characteristics, views, behaviors, and experiences of this population.

Breastfeeding Practices

Defining Breastfeeding

Breastfeeding status at each interview is determined based on the caregiver indicating that the infant is currently being fed breastmilk, formula, both, or later in infancy, being fed neither. For this study, infants are considered breastfed if they are receiving any breastmilk. Differentiating this status further, infants are ***exclusively breastfed*** if they are receiving breastmilk and not formula, although they may also be fed complementary foods or beverages. Infants are ***combination fed*** if they are receiving both breastmilk and formula, and again they may also be fed complementary foods or beverages. Within the group of women who are breastfeeding, either exclusively or in combination,

³ Eligible mothers were either pregnant, or their infants were less than 3 months old. Mothers were at least 16 years old at the time of enrollment, and spoke either English or Spanish.

analyses examine *duration of breastfeeding*, or the number of days, weeks, or months during which the infant is fed breastmilk, and an associated concept, *cessation of breastfeeding*, or the infant age at which all breastfeeding stops.

Prenatal Beliefs and Intention to Breastfeed

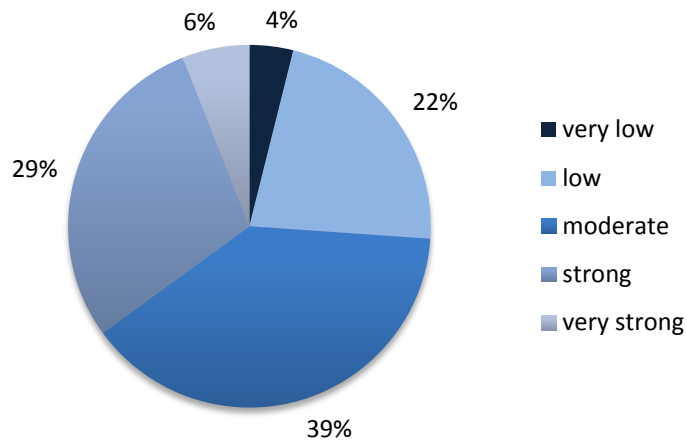
Study women who had not yet given birth had very positive views of breastfeeding. They agreed with many positive aspects of breastfeeding, with statements that breastfeeding helps the baby be healthy, helps protect the baby from diseases, and brings the mother and baby closer together getting the greatest endorsements (see Table 1).

They also did not perceive many traditional barriers to be impediments to breastfeeding, but a few issues still remain challenging. Less than 20 percent of prenatal women agree that breastfeeding ties a mother down or takes too much time, whereas more than 50 percent of women agree with the statements that breastfeeding means no one else can feed your baby and that with bottle feeding the mother knows the baby is getting enough to eat.

Table 1. Percentage of prenatal women agreeing with statements about benefits of and barriers to breastfeeding

Maternal attitudes and beliefs	Percent agreeing with statement
Benefits of Breastfeeding	
Breastfeeding brings a mother closer to her baby.	87.9
Breastfeeding helps protect the baby from diseases.	81.2
Breastfed babies are healthier than formula-fed babies.	79.7
Breastfeeding helps women lose weight.	74.5
Breastmilk alone gives a new baby all he/she needs to eat.	71.3
Breastfeeding is easier than formula feeding.	55.3
Breastfeeding reduces the risk of a child becoming overweight.	50.0
Barriers to Breastfeeding	
Breastfeeding takes too much time.	14.7
Breastfeeding ties you down.	17.3
Breastmilk leaking onto your clothes is something that I worry about.	27.4
Breastfeeding in public is not something that I want to do.	36.9
Breastfeeding is painful.	43.6
Breastfeeding means no one else can feed your baby.	50.8
With bottle feeding, the mother knows that the baby is getting enough to eat.	67.0
Unweighted n	2,649
Weighted n	395,398

Figure 1. Percentage of prenatal women by strength of intention to breastfeed exclusively



Prenatal women were also asked to complete the Infant Feeding Intentions (IFI) scale (Nommsen-Rivers & Dewey, 2009⁴), a measure that examines the strength of a respondent's intention to breastfeed her child exclusively over the first 6 months. The average IFI score for study women indicated moderately strong intentions to breastfeed exclusively, and 35 percent of the women had strong or very strong

intentions to breastfeed exclusively. Figure 1 shows the distribution of breastfeeding intentions.

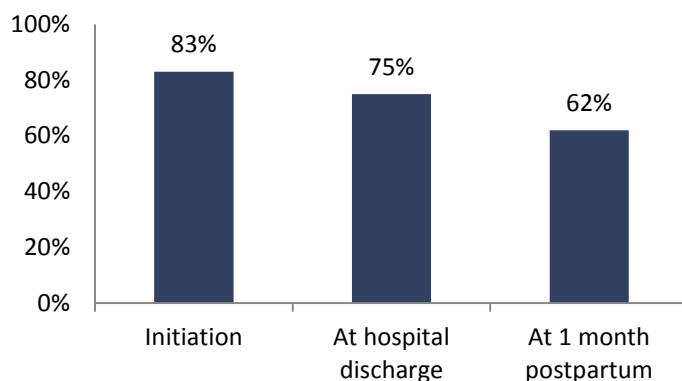
In multivariate analyses, which yield information on those factors that exert unique influence on outcomes of interest, the significant predictors of stronger prenatal intention to breastfeed included: perceiving more benefits and fewer barriers to breastfeeding; being pregnant with a first child; higher education attainment; having breastfed another child; living with the father of the baby; and, speaking with more than one person about plans to feed the infant.

Initiation and Establishment of Breastfeeding

Breastfeeding initiation rates were high among study mothers (see Figure 2).

Eighty-three percent of the mothers initiated breastfeeding. By the time of hospital discharge the rate had declined slightly, with 75 percent of study mothers feeding breastmilk, and 40 percent of study mothers feeding breastmilk exclusively. At 1-month postpartum, 62 percent of study mothers reported

Figure 2. Breastfeeding rates over the first month postpartum



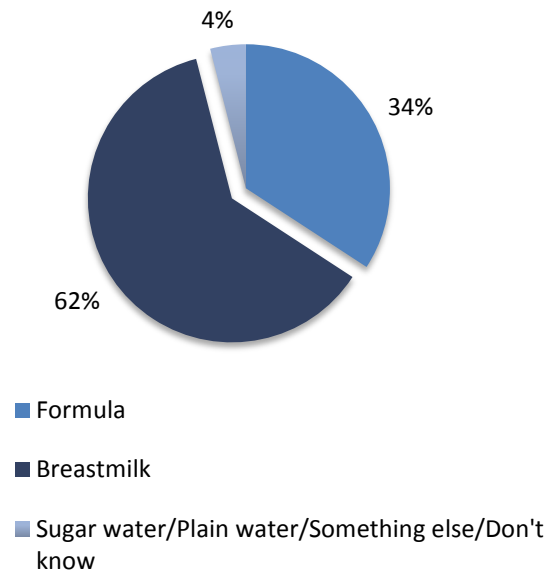
⁴ Nommsen-Rivers, L., and Dewey, K. (2009). Development and validation of the infant feeding intentions scale. *Maternal & Child Health Journal*, 13, 334-342. doi: 10.1007/s10995-008-0356-y.

breastfeeding, and 31 percent of study mothers reported exclusive breastfeeding. Multivariate analyses revealed that women most likely to initiate breastfeeding were: Hispanic; born outside the United States; had some breastfeeding history; received support from family, medical professionals, and WIC; had fewer than three children; and did not smoke during pregnancy.

Overall, hospitals were supportive of breastfeeding. For 62 percent of study mothers, breastmilk was the first feeding for their infants (see Figure 3), although this percentage was lower than the 83 percent who did initiate breastfeeding. Eighty-eight percent of mothers reported rooming-in with their newborns. Additionally, of those who reported breastfeeding problems in the hospital, 88 percent said they got help from hospital staff to alleviate the problem.

Fifty-five percent of women reported receiving gift baskets at discharge. Gift baskets often contain formula, coupons for formula, pacifiers, and new (empty) bottles. Women who were breastfeeding exclusively were less likely to receive these gift baskets. But among those who received a gift basket, having formula in the basket may have affected breastfeeding behaviors. A significantly greater percentage of women were exclusively formula feeding at 1 month if formula was in their gift pack (13 percent) than if formula was not (8 percent).

Figure 3. Among study mothers delivering in hospitals, the percentage of study infants by first feeding



Formula Supplementation

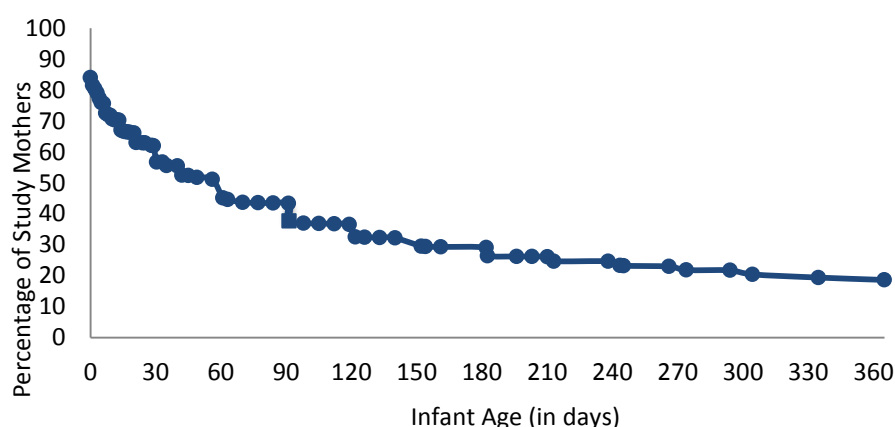
By 14 days postpartum, half of breastfeeding study mothers had begun regular supplementation with infant formula. At each interview through 7 months, the most commonly endorsed reasons for supplementation among mothers who were breastfeeding were that breastmilk alone did not satisfy the baby, and that the mother did not have enough breastmilk, suggesting that mothers perceived their breastmilk to be insufficient for their infants. Few mothers (3 percent) report adding either more or less water than recommended when mixing powdered infant formula. Multivariate analyses

show women at higher risk for earlier formula supplementation if they were: African American; Hispanic; born outside the United States; younger; had longer hospital stays; had less than a high school education; and employed at 7 months.

Duration of Breastfeeding

Although formula supplementation began for most breastfeeding mothers within the first month, feeding breastmilk either alone or in combination with formula continued for a large percentage of study mothers. Looking longitudinally at those mothers who completed all the postnatal interviews through 13 months, by 3 months (90 days) 43 percent are still breastfeeding, by 5 months (150 days) about 30 percent are still breastfeeding, and by 12 months (360 days) about 19 percent are still breastfeeding (see Figure 4).

Figure 4. Percentage of breastfeeding study mothers by infant age (in days)^a



^a Note that these percentages are for the longitudinal cohort and may differ slightly from the cross-sectional statistics at each age.

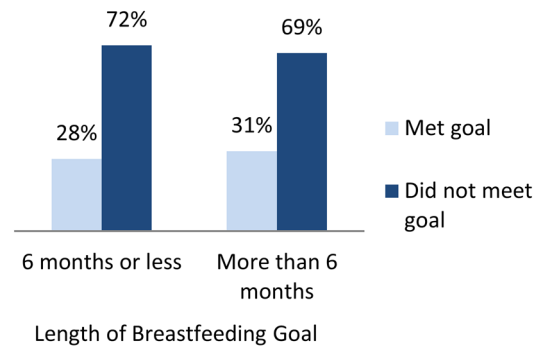
Focusing cross-sectionally on exclusive breastfeeding at each interview through 13 months, analyses show that at 3 months (90 days) 20 percent of mothers report breastfeeding exclusively, at 5 months (150 days) 16 percent report breastfeeding exclusively, and at 13 months (390 days) 14 percent report breastfeeding exclusively.

Despite the relatively high rate of breastfeeding over time, most breastfeeding study mothers are not achieving the personal duration goals they identified at the 1-month interview. Regardless of the length of the personal goal, findings are very consistent: Less than a third of women achieved their personal goals (see Figure 5). The small group of women with personal goals of 13 months or longer

were ultimately most successful, with 51 percent still breastfeeding at the time of the 13-month interview.

Several background characteristics are related to one's likelihood of stopping breastfeeding earlier. Analyses show that women are at higher risk for earlier breastfeeding cessation if they were: born in the United States; younger; unmarried; lowest income; providing formula; not encouraged to breastfeed by their infant's doctor; or did not receive a breast pump from WIC.⁵ Women who leave WIC at some point during these first 13 months were at lower risk for earlier cessation. This may include women who are breastfeeding successfully and therefore do not feel they need the ongoing support of WIC.

Figure 5. Percentage of breastfeeding mothers who met their personal breastfeeding goals, by length of goal



Reasons for Breastfeeding Cessation

The most common reasons for breastfeeding cessation remained fairly stable over time, although difficulties with sucking and latching on were prevalent in the early weeks, and infant loss of interest became more common after 2 months. Women perceived their breastmilk as not sufficient for their infants, a finding parallel to the reasons for formula supplementation (see Table 2).

⁵ The model was based on data collected between the 1- and 13-month interviews from women who indicated they had breastfed their infant. The women were asked the source of the breast pump with response options including: WIC loaned it to you or paid for it, you bought it or rented it, you borrowed from a friend or relative, it was a gift, or you use one provided by a hospital, your place of work, or someplace else. The receipt of a breast pump from WIC showed an impact on breastfeeding cessation as compared to either receiving a breast pump from somewhere else or not receiving one at all. Women were not asked if they requested a breast pump from WIC and did not receive it.

Table 2. Frequency of the top three most common reasons mothers stop breastfeeding

Reason Stopped Breastfeeding	Percentage of Breastfeeding Mothers Who Stopped Breastfeeding			
	Within the first 2 weeks	Within the first 8 weeks	During 2 nd or 3 rd months	During 4 th to 6 th months
Baby had trouble sucking or latching on ^a	53.3%	46.7%	NA	NA
Didn't have enough milk	46.0	53.0	56.4	55.9
Breastmilk alone did not satisfy baby	40.1	45.5	56.6	49.7
Baby lost interest in nursing	Not top three	Not top three	34.7	46.7
Unweighted n	319	625	256	176
Weighted n	74,513	144,721	64,309	44,667

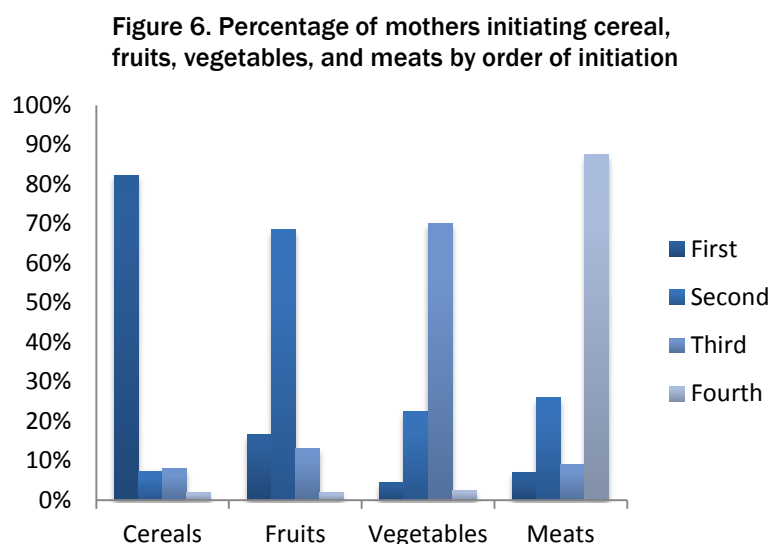
^a This item only appeared as a reason through the 3-month interview, so women who reported breastfeeding cessation after the time of that interview did not hear this as a reason for cessation.

NA denotes not applicable.

Introduction of Complementary Foods

Order of Introduction of Foods

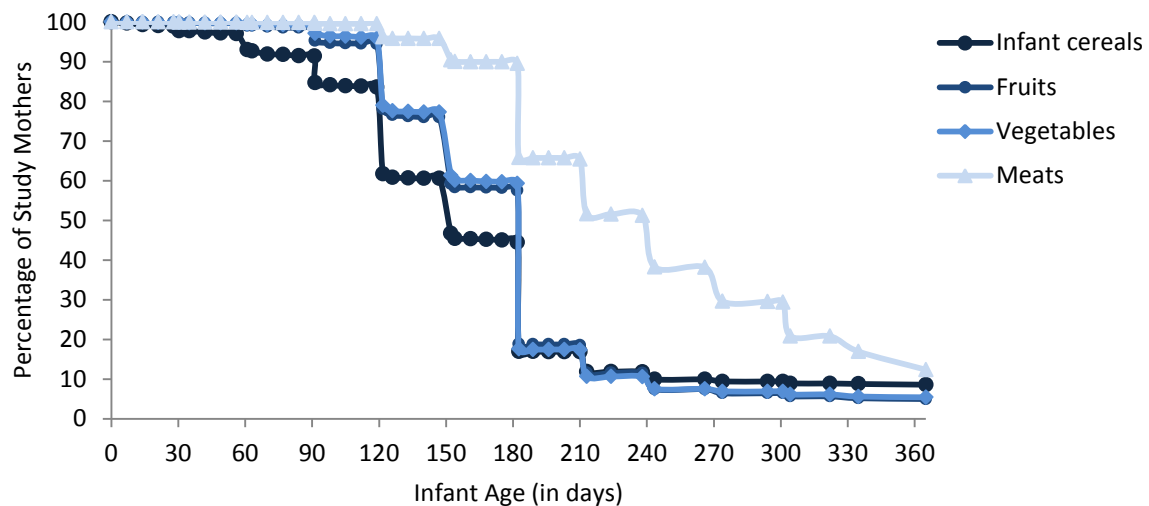
Foods that complement breastmilk or formula are recommended for introduction when the infant is developmentally ready, which typically happens between 4 and 6 months. Prior to this time, infants should receive only breastmilk or formula. Study mothers reported at each interview if they had introduced these and other foods, and the timing of introduction. Most mothers initiate infant cereals first, fruits second, vegetables third, and meats fourth (see Figure 6).



Timing of Introduction of Foods

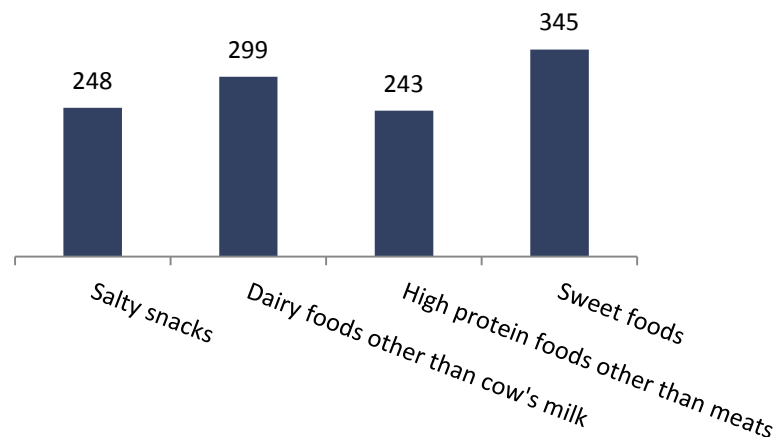
Data on the timing of initiation of these foods demonstrates that only 20 percent of mothers introduced any of these foods prior to 4 months of age (122 days) (see Figure 7).

Figure 7. Percentage of study mothers who have not yet initiated cereal, fruits, vegetables, and meats by infant age



Median timing of introduction of foods, that is, the point at which 50 percent of mothers have introduced that food, was also tracked. Baby cereals are the first complementary foods introduced, with the median age of introduction at about 4.5 months. Less than 1 percent of mothers reported adding food items such as cereal to bottles of formula or breastmilk at 1 month. The median age for introduction of fruits and vegetables is about 6 months, and the median age for introduction of meats is around 8 months.

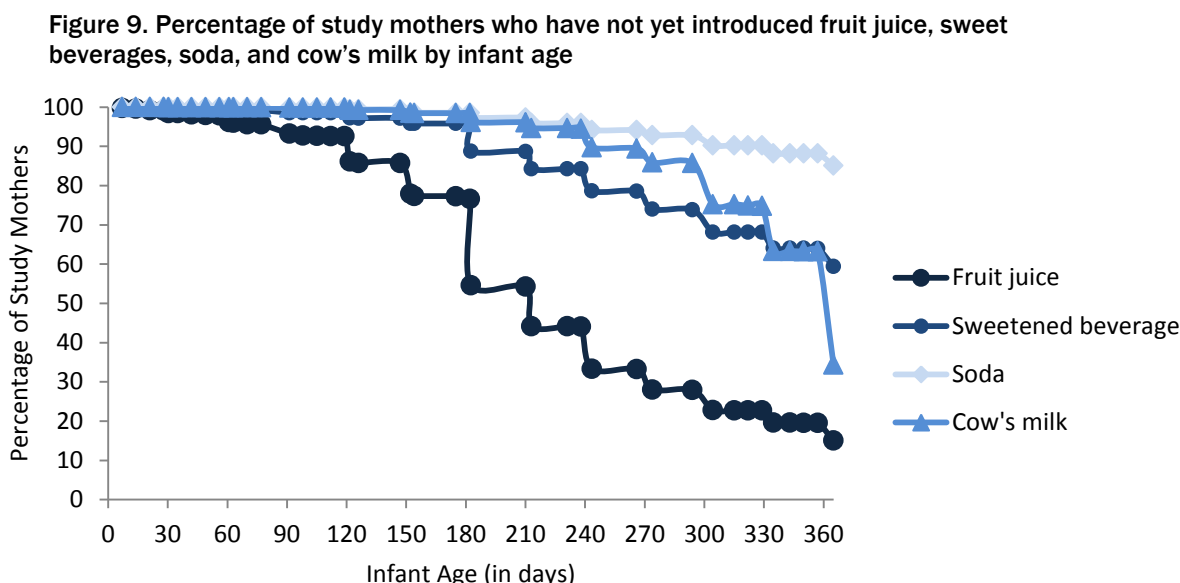
Figure 8. Median age (in days) when study mothers have introduced other specific complementary foods



Analyses also explore median timing of introduction of an expanded set of foods, including dairy foods other than cow's milk; high-protein foods other than meats; salty snacks such as chips, pretzels and salted crackers; and sweet foods such as cakes, candy, and cookies (see Figure 8). The median timing for introduction of high protein foods other than meats, which include beans, eggs, and peanut butter, and the introduction of salty snacks, falls shortly after the introduction of meats at about 8 months (243 and 248 days, respectively). The median introduction of dairy foods other than cow's milk (e.g., cheese, yogurt, goat's milk) is at about 10 months (299 days). Finally, the

median introduction time for sweet foods is when the child is approximately 11 months old (345 days).

Mothers also were asked about the timing of the introduction of beverages, including 100 percent fruit juice, sweetened beverages excluding soda,⁶ soda, and cow's milk (see Figure 9). One hundred percent fruit juice is introduced earliest, with nearly 10 percent of mothers having introduced it by 4 months (122 days), and 50 percent by 6 months (183 days), the earliest recommended age. Eleven percent of mothers have introduced sweetened beverages by 6 months (183 days), and 41 percent have introduced them by 13 months (396 days). Soda is less common, with only about 16 percent of mothers introducing it by the end of the first year. For the vast majority of infants, cow's milk is introduced at 1 year (365 days), which is consistent with guidance. It is not until 8 months of age (243 days) that 10 percent of infants have consumed cow's milk.



WIC Support for Infant Feeding

Study mothers reported receiving extensive support from WIC for breastfeeding initiation and continuation. At the time of the prenatal interview, 72 percent of women reported that they had already received breastfeeding information from WIC. Not getting breastfeeding information

⁶ As examples, the instrument listed Kool-Aid, Hi-C, Fruit Punch, sweetened juice, sweetened or flavored water, Gatorade, or sweet tea.

seemed to be linked to site characteristics, as sites in States with more stringent education and credential requirements for staff that provide nutrition education have higher rates of prenatal women reporting receiving breastfeeding education than do sites located in States with lesser requirements (83 percent of prenatal women versus 71 percent of prenatal women, respectively). Prenatal women also reported turning to WIC for advice about infant feeding, with a higher percentage of women (68 percent) having spoken with WIC staff than with their own mothers (62 percent) or with their doctors (51 percent).

After the birth of the infant, mothers who initiated breastfeeding reported that they received support from WIC, and results show that this support was related to ongoing breastfeeding. Postpartum women who received support calls from WIC staff were significantly more likely than those who did not receive calls to be breastfeeding exclusively at 1 month. Women who were combination feeding at 1 month, however, were significantly more likely to turn to WIC for support for breastfeeding problems than were exclusively breastfeeding women. At 3 months, among study mothers aware of the enhanced food package for fully breastfeeding mothers, 61 percent identified the food package as an important factor in their breastfeeding decision.

WIC also provides education on infant feeding practices beyond breastfeeding, and most study mothers report feeding practices in line with their WIC education. Only 11 percent of women are adding anything to their bottles of formula or breastmilk at 3 months, and only 3 percent are mixing powdered infant formula using either more or less water than recommended at 3 months. Just 20 percent of mothers are introducing complementary foods prior to 4 months. Nonetheless, many women are introducing 100 percent fruit juice by 6 months, and sweet foods, salty snacks, and sweetened beverages by 1 year.

Finally, at 3 months and again at 13 months, approximately 60 percent of mothers report having made a positive change in how they feed their families or themselves as a result of something they learned at WIC, with most changes involving increases in healthy eating (see Table 3).

Table 3. Top eight most important changes WIC recipients made because of something they learned at WIC, 3- and 13-month interviews

Most important change made ^a	Percent of study mothers who made changes	
	At 3 months	At 13 months
Know how to choose more healthy foods for myself/my family	32.6%	34.2%
Eat more fruits and vegetables	32.0	26.7
Other (not specified)	18.1	19.9
Offer the right amount of foods (portion)	5.3	9.7
Drink/buy fewer sugar sweetened beverages	3.9	4.1
Breastfeeding/breastfed	2.7	1.6
Eat more whole grains	1.9	1.2
Drink more reduced fat/low-fat/non-fat milk	1.7	1.8
Unweighted n ^b	1,668	1,714
Weighted n	265,795	271,329

^a Respondents were asked to choose only one response.

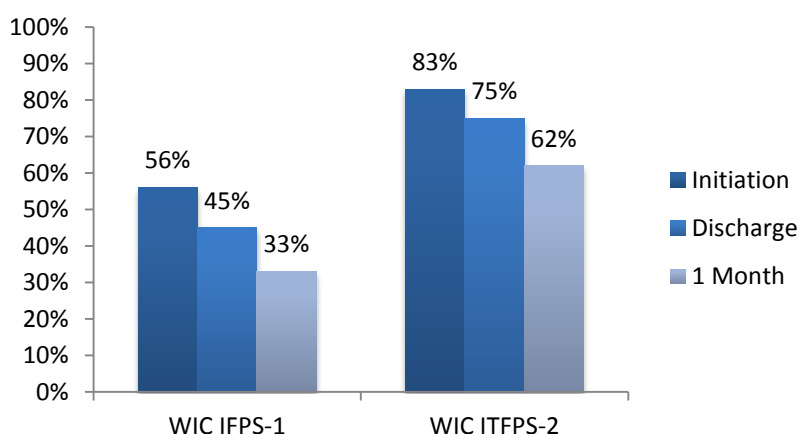
^b Unweighted n may differ slightly due to item nonresponse.

Comparisons with WIC IFPS-1

One of the major goals of WIC ITFPS-2 is to compare findings to those from WIC IFPS-1, the last major study of feeding practices for WIC infants, to examine changes in those feeding practices over the past 20+ years. Results show that today's WIC mothers are showing improvement over their predecessors on every major indicator of positive feeding practices.

Attitudes toward breastfeeding have improved since WIC IFPS-1, with prenatal WIC ITFPS-2 mothers endorsing more benefits of breastfeeding, and fewer barriers to breastfeeding, than their counterparts. Breastfeeding rates have increased for initiation, hospital discharge, and 1-month postpartum (see Figure 10).

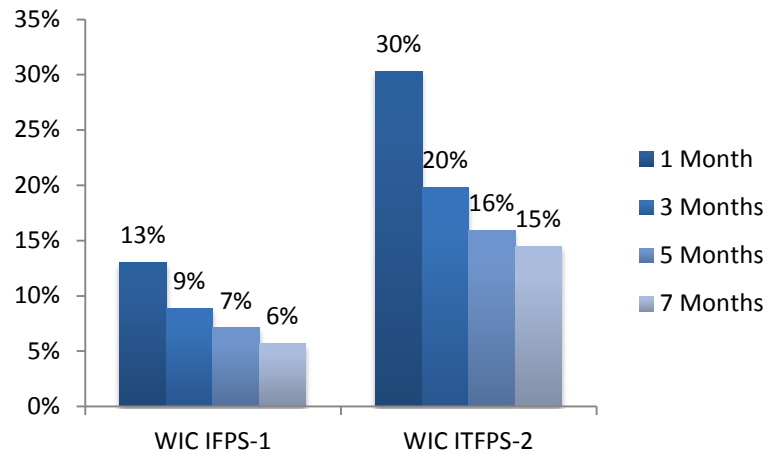
Figure 10. Breastfeeding rates for WIC ITFPS-2 and WIC IFPS-1 at initiation, hospital discharge, and 1-month postpartum



Exclusive breastfeeding rates also have improved over time, with consistently greater percentages of WIC ITFPS-2 study mothers continuing to breastfeed exclusively over time (see Figure 11).

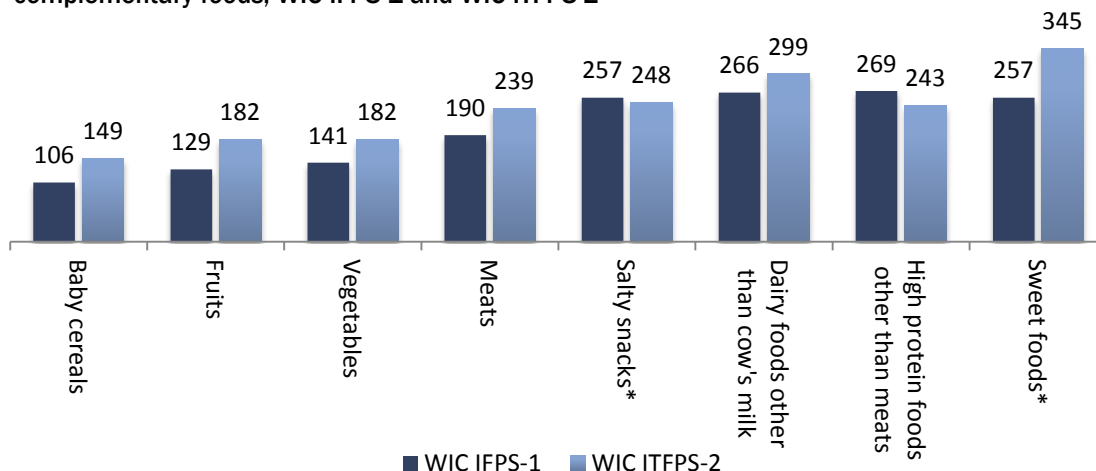
Women are reporting breastfeeding for longer now than they did at the time of WIC IFPS-1. Previous median duration of breastfeeding, either exclusive or in combination with formula feeding, was 57 days, whereas current estimates of median duration are more than a month longer (91 days). Looking at long-term breastfeeding, only 7 percent of WIC IFPS-1 women were still doing any breastfeeding at 1 year, whereas for WIC ITFPS-2, 18 percent were still breastfeeding at 1 year.

Figure 11. Exclusive breastfeeding rates at interview months 1-7 for WIC IFPS-1 and WIC ITFPS-2



These patterns of improvement extend to the introduction of complementary foods as well. In WIC IFPS-1, introduction of complementary foods began very early, with 27 percent of study infants being introduced to cereal prior to 2 months, and 62 percent being introduced to cereal prior to 4 months. For many other complementary foods the median time of introduction for WIC IFPS-1 was a month or more earlier than for WIC ITFPS-2 (see Figure 12).

Figure 12. Median age (in days) when study mothers have introduced specific complementary foods, WIC IFPS-1 and WIC ITFPS-2



* WIC IFPS-1 collapsed sweet foods and salty snacks into one category.

In WIC IFPS-1, salty snacks and sweet foods were reported as a single category, so the comparison between the two studies is not ideal. Nonetheless, it does appear that there has been a substantial shift toward delaying the introduction of sweet foods, but the timing of introduction of salty snacks may not have improved. Other than salty snacks, the only foods that are now introduced earlier are high-protein foods other than meats.

Summary, Limitations, and Next Steps

Summary of Findings

Overall, the findings from the infant year of WIC ITFPS-2 demonstrate that WIC mothers have changed in their attitudes and feeding practices over the past 20+ years, since WIC IFPS-1. These findings also suggest that the WIC program is meeting its goal of promoting healthy feeding practices for low-income women and their infants. The changes observed include:

- **More positive attitudes toward breastfeeding** since WIC IFPS-1, with prenatal WIC ITFPS-2 mothers endorsing more benefits of breastfeeding, and fewer barriers to breastfeeding, than their counterparts.
- **Higher breastfeeding rates** for initiation, hospital discharge, and 1-month postpartum.
- **Longer breastfeeding duration**, with women reporting both breastfeeding longer, and breastfeeding exclusively longer, than they did at the time of WIC IFPS-1.
- **Later introduction of complementary foods.** Introduction of complementary foods prior to 4 months, which was a substantial problem in WIC IFPS-1, is no longer a major issue with only a small percentage of WIC ITFPS-2 mothers introducing complementary foods before 4 months.

Interpreting Study Findings

As with all research studies, design decisions and study-specific goals for WIC ITFPS-2 result in limitations to the conclusions that the study team can draw, both now and in future analyses. There are several issues in the design and implementation of WIC ITFPS-2 that should be considered when interpreting results.

First, as an observational study, WIC ITFPS-2 is well-suited to studying the influences of an ongoing public program. Because of this observational study design, however, the study team can only infer causality between program predictors and outcomes, rather than establishing it with certainty.

Second, sample eligibility and weighting should be considered in interpreting the data. Women who were eligible for the study met specific enrollment criteria described earlier in this document. Additionally, the weighted sample represents the infants from this population who enrolled in WIC during our 20-week enrollment period. Consequently, findings may not apply fully to WIC mothers with very different characteristics, nor can the sample be interpreted as representing a full year of WIC enrollments.

Third, a goal of WIC ITFPS-2 is to examine how the feeding choices and practices of WIC mothers have changed since WIC IFPS-1, 20+ years ago. There are, however, some differences between the two studies. WIC ITFPS-2 mothers are older at the time of the birth of the target child, and a higher percentage identify as Hispanic or Latino, than WIC IFPS-1 mothers. The differences correspond to national shifts over time in the demographics of the U.S. population, and in women having children at later ages. Also, limits in the data available from WIC IFPS-1 analyses prevented making statistical comparisons between the two studies. Consequently, comparisons focus on the magnitude of changes over time, rather than statistical significance of the differences.

Finally, the scope of the study must be considered. Much of the data for WIC ITFPS-2 came from interviews with the caregivers themselves. These data are therefore filtered through the perceptions and memories of those caregivers. The study data also do not cover all potential influences on feeding practices and health. Factors beyond those explored in this study may influence, and continue to influence, eating and health.

Next Steps

This infant year report is the first in what will be a series of reports from the ongoing WIC ITFPS-2. Subsequent reports from the study will cover the through ages 2, 3, 4, and 5, examining nutrition, health outcomes, and family feeding practices of WIC children. The data from the study, which the Food and Nutrition Service will make available, also will provide scientific researchers and the public with a landmark platform of data from which to pursue further analyses on nutrition and health in children of low-income families.

1.1 Background

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) was established to safeguard the health of low-income pregnant women and infants who are at nutritional risk. The program was established by Congress as a pilot in 1972 under Public Law 92-433, Section 17 to the Child Nutrition Act of 1966, and made permanent in 1974.⁷ The program provides nutrition assistance to pregnant, postpartum, and breastfeeding women and their infants and children up to age 5. Participants must meet the income guidelines and have a household income at or below 185 percent of the Federal Poverty Level (\$44,123 for a family of four in 2014) or be eligible based on participation in certain other means-tested benefit programs. The Food and Nutrition Services (FNS) of the U.S. Department of Agriculture (USDA) administers WIC, which is a Federal grant program, to State Agencies (SAs) (or tribal or territory agencies). The SAs are responsible for program operations within their jurisdictions, and they provide services directly through government agencies, e.g., health departments or through contracts with local WIC-sponsoring agencies that provide services to WIC participants at local service sites or clinics.

The WIC Infant and Toddler Feeding Practices Study (WIC ITFPS-2) is a longitudinal study designed to measure the feeding practices employed by caregivers and the nutrition outcomes of children who participate in WIC. By capturing data on caregivers and their children over the first 5 years of the child's life, the study will inform a series of research questions regarding feeding practices, the effect of WIC services on those practices, and the health and nutrition outcomes of children on WIC. Additionally, the study will update past analyses to assess changes in behaviors and trends that may have occurred over the past 20 years—that is, since the last major study of the diets of infants and toddlers who were WIC participants.

The study is heavily predicated on the designs used for the 1997 Food and Consumer Service's⁸ WIC Infant Feeding Practices Study (WIC IFPS-1) (Baydar et al., 1997) and the Food and Drug Administration's Infant Feeding Practices Study II (FDA IFPS-II) (Fein et al., 2008), which are the

⁷ <http://www.fns.usda.gov/wic/about-wic-wics-mission>.

⁸ In 1998, the Food and Consumer Service was renamed as the Food and Nutrition Service.

two best known longitudinal infant feeding practices studies over the past 20 years. Building on the past longitudinal work maximizes the comparability between current study data and past work, which facilitates assessing changes over time. The study also uses aspects of the Gerber/Nestle Feeding Infants and Toddlers Studies (FITS) conducted in 2002 and 2008 to address nutrition and feeding practices of toddlers (Briefel et al., 2010; Ponza et al., 2004; Ziegler et al., 2006). Additionally, in revising the instrument, developers leveraged many of the approaches previously used, such as rotating question modules, to ensure study efficiency.

The seven primary objectives for the WIC ITFPS-2 include:

- Update results of data collected in the 1997 WIC IFPS-1.
- Compare new findings with other major studies (WIC IFPS-1, FDA IFPS-II, and the FITS 2002 and 2008).
- Assess effectiveness of different education and breastfeeding promotion approaches in achieving recommended feeding patterns and behaviors.
- Assess conditions of overfeeding, overconsumption, underfeeding, and inappropriate feeding.
- Identify nutrition education influences.
- Assess impact of WIC food packages on outcomes.
- Determine change in maternal feeding practices and behaviors over time as infants and toddlers transition into or out of WIC.

The study was designed to meet the seven objectives as well as answer 60 research questions specified by FNS. These questions are listed in Appendix A.

1.2 Study Design

This observational study follows a hybrid design, incorporating a core longitudinal sample (the “core” sample) and a supplemental cross-sectional sample (the “supplemental” sample) to ensure precision in estimates at key points in time. The core longitudinal sample of women and their infants was enrolled in the study as they enrolled in WIC (either prenatally or before their infant is 2.5 months old if they did not enroll prenatally). The babies will be followed until they are

60 months old, with up to 17 maternal (or primary caregiver⁹) interviews occurring prenatally, and at 1, 3, 5, 7, 9, 11, 13, 15, 18, 24, 30, 36, 42, 48, 54, and 60 months. The supplemental cross-sectional sample was also recruited as the women and their infants enrolled in WIC. This sample will be interviewed at 10 key time periods (1 or 3, 7, 13, 24, 30, 36, 42, 48, 54, and 60 months). To become eligible for the longitudinal interviews, participants must complete a baseline module of demographic characteristics that is administered at the prenatal, 1-month, or 3-month interviews. This report on early feeding practices uses data from the prenatal interview and the 1-, 3-, 5-, 7-, 9-, 11-, and 13-month interviews.

Observational studies are well suited to social programs such as WIC for which random assignment is not feasible. The direct observation of individuals in their natural setting will capture the multiple effects of participation in WIC. However, as an observational study, it should be noted that it is impossible to definitively attribute causality. We hypothesize relationships and the analyses infer causality based on the correlations between variables; but causality cannot be unequivocally established.

1.3 Sample Selection

The goal of the WIC ITFPS-2 is to collect data from a representative sample of participants who were enrolled in WIC prior to 3 months of age. This includes both those enrolled while the mother was pregnant and those who were first enrolled as infants. To obtain a representative sample of WIC participants, first a sample of WIC sites was selected, and then a sample of participants enrolling in WIC at each of the selected WIC sites was selected. A summary of the sampling plan is given below and further details of these procedures are provided in Appendix B1.

1.3.1 Sampling WIC Sites

The WIC sites were selected using a stratified two-stage sampling approach. Because no national list of service sites exists, a summary file at the level of the unit reported by each State Agency (SA) in the census of April 2010 (the WIC Program and Participant Characteristics 2010, or PC2010) was used as the sampling frame. This census resulted in a file with one record for each participant being

⁹ Over 98 percent of respondents are biological mothers. Throughout the report the terms “mother” and “caregiver” are used interchangeably.

served by WIC in that month. Because SAs had flexibility for how they reported service location identifiers for PC2010, the IDs provided in the records varied; some provided the service site ID in addition to a local agency code, while others included only a local agency code. As a result, two stages of selection were used to sample sites. The first stage involved the sampling of “PC2010 tabulation units”—the units for which IDs were provided in the PC2010 data. The second stage involved the sampling of sites for situations in which the sampled tabulation unit was a local agency.

The sample was stratified to improve the precision of survey estimates. To achieve this goal, the strata were formed in such a way that the units within the strata were more similar to each other (in terms of characteristics related to key survey outcomes) than units in general (i.e., strata should be internally *homogeneous*). Five characteristics of the first-stage sampling unit or its SA were used to group the sites into a total of 40 strata for selection. The first three of these five characteristics are actually features of the WIC State Agency Plan and were included because they may be associated with key survey outcomes related to breastfeeding and nutrition. The characteristics included:

- **Peer Counseling Program.** Whether the SA has a breastfeeding peer counseling program in place.¹⁰
- **Trained Paraprofessionals.** Whether SA policy allows for trained paraprofessionals to provide nutrition education (versus requiring that staff members that provide nutrition education have professional training or credentials).
- **Policy to Provide Formula.** Whether SA policy permits providing one can of formula for breastfeeding infants during the first 30 days of life.
- **Percent of Women Who Used the Fully Breastfeeding Package.** The PC2010 data were used to measure food-package selection by first-stage sampling unit, and this rate was computed by taking the ratio of the number of postpartum women who received the fully breastfeeding package during April 2010 to the total number of postpartum women receiving any food package that same month.
- **Average of Children’s and Mothers’ High Weight for Height Rates.** The PC2010 data were used to estimate the percent of children and the percent of mothers who are “high weight for height”¹¹ at the first-stage sampling unit level, and these percentages

¹⁰ It turned out that there was no variation in this characteristic; all states reported offering a breastfeeding peer counseling program.

¹¹ For children (12 months or older), “high weight for height” is determined based on nutrition risk code 110 (see <http://www.fns.usda.gov/sites/default/files/WICPC2010.pdf>). For children 24 months and older, it is defined as higher than the 95th percentile of body mass index (BMI) for age. For children 12 to 24 months, it is defined as at risk of being overweight by virtue of having a mother or father who is obese (BMI of 30 or greater). For mothers, the criterion is a pregravid BMI of 25 or higher.

were averaged together to get a measure of risk of being overweight for all participants at the first-stage sampling unit level.

Within each stratum, two sites were sampled with probabilities proportional to size, where the measure of size was the expected number of eligible enrollees. Thus, a total of 80 WIC sites were sampled.

1.3.2 Sampling WIC Enrollees

We sampled new WIC participants who enrolled at the sampled sites during a pre-specified time period deemed the “recruitment window.” Specifically, we included in the sample all new women enrolling in WIC for the first time for either their current pregnancy or their newborn at the site during the “recruitment window.”¹² The recruitment window was a consecutive string of days during the study recruitment period in which all new WIC enrollees in that site were screened for eligibility and recruited into the WIC ITFPS-2. The length of the recruitment window for each site was pre-determined based on the estimated amount of time needed to yield 98 eligible new WIC enrollees per site (the target sample size for each site).¹³ The start date for the recruitment window was randomly assigned to each site. Because the flow of new WIC enrollees into the 80 sites varied substantially, the window length was much shorter in sites with a “high flow” of new enrollees compared to sites with a “low-flow.” The study participants must have enrolled in WIC at the site during the recruitment period, although the study screening and enrollment could occur at a later date.

Core and Supplemental Samples. Two samples were selected at each service site: a core longitudinal and supplemental cross-sectional sample. The core sample was originally designed to be an equal probability sample of all new enrollees. The supplemental sample was designed to focus on subpopulations with specific characteristics such as African American mothers and infants enrolled postnatally with no prenatal WIC exposure. During the study recruitment period, changes were made to the approach for assigning cases to the core and supplemental samples, as well as to subsampling cases for the supplemental sample, which are discussed in more detail in Appendix B1.

¹² Women who had enrolled in WIC for previous pregnancies and/or enrolled other children in WIC were eligible for the study. Women below the age of 16, those who did not speak English or Spanish, and those enrolling a child over 2.5 months of age were not eligible for the study.

¹³ Estimated amount of time needed to yield 98 new WIC enrollees was based on July 2012 enrollment figures from the sites.

For some interviews, both the core and supplemental sample (combined) are interviewed; for other interviews, only the core sample is interviewed.

Multiple Births. For those study mothers who had multiple births such as twins, a single infant was sampled at the first postnatal interview.

1.4 Data Sources

During the 6-year data collection period that began in July 2013,¹⁴ the study will be collecting data from numerous sources. The main source is a series of followup telephone interviews with the mother. Other key information such as child's weight and length is being obtained periodically from WIC administrative records or health care providers; and contextual information about the WIC sites and State policies was obtained from clinic and WIC program staff.¹⁵ The data sources include:

- Screening and enrollment interviews with recruited WIC enrollees;
- Telephone followup interviews with study participants conducted prenatally and when their babies are 1, 3, 5, 7, 9, 11, 13, 15, 18, 24, 30, 36, 42, 48, 54, and 60 months of age;
- WIC administrative records or health care providers for height and weight measures when the babies are born and at 6, 12, 24, 36, 48, and 60 months of age;
- WIC administrative records for WIC food packages provided to mothers and babies;
- Site visits to participating WIC sites and key informant interviews that profile local policies and practices; and
- A WIC site staff survey that collects information on local WIC programs and the training and experience of the staff.

Table 1-1 presents an overview of the information being obtained from each data source. Key content areas include background characteristics, knowledge, and lifestyle; feeding practices and experiences; childrearing practices; and weight and length outcomes.

¹⁴ Westat will collect data over a 6-year period, but the length of time a mother will be a participant is dependent on when she was recruited. Mothers recruited when they were 1-month pregnant will be participants for 5.8 years, whereas mothers enrolled when their baby was 2.5 months old will be in the study for about 4.8 years.

¹⁵ Information about the WIC sites will be used as covariates in exploring the variation in feeding practices. Only site-level data on modes of nutrition education delivery are available for this study; no data are available on the mode of nutrition education received by individual study participants.

Table 1-1. Data sources by topics covered

Domain	Screening/ enrollment	WIC participant survey interview																		WIC Admin. data	Staff survey/key informant interviews
		Baseline ^a	Prenatal	1 month	3 months	5 months	7 months	9 months	11 months	13 months	15 months	18 months	24 months	30 months	36 months	42 months	48 months	54 months	60 months		
Socio-demographic and background characteristics	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
WIC site characteristics and policies																					✓
WIC program awareness and utilization			✓		✓		✓			✓			✓			✓		✓			
Maternal health and lifestyle	✓	✓		✓	✓		✓			✓			✓	✓		✓		✓			
Feeding experience, knowledge, attitudes, beliefs, information, advice		✓	✓	✓	✓	✓	✓			✓	✓		✓	✓		✓		✓			
Hospital feeding related practices				✓																	
Current feeding practices				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓			
24-Hour dietary recall				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓		✓		
Child health behavior/rearing practices				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		
Food access and preferences														✓		✓		✓			
Child developmental milestones																✓		✓			
Child weight and length														✓	✓		✓		✓	✓	
WIC food package type																				✓	
Contact updates			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
New caregiver characteristics				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		

^a Baseline module questions are asked at the first interview (could be prenatal, 1 month, or 3 months).

* These questions are asked anytime someone permanently replaces the primary caregiver.

1.5 Data Collection Procedures

The study is using multiple modes of data collection to obtain the necessary information to support the study objectives. Study mothers were recruited in-person at WIC sites, and are administered regular followup interviews by telephone. In addition, we periodically submit requests to SAs for data on the mother and child from WIC administrative records. We also collected data from WIC site staff using a web survey, and from State and local agencies staff using a mix of in-person and telephone interviews.

1.5.1 Recruiting WIC Participants

Recruitment activities were rolled out over a 12-week period in the 80 sampled sites, with recruitment starting July 1, 2013 and ending November 18, 2013. Each site was assigned a recruitment window with the length of the recruitment window determined by the flow of new enrollees in the site. The target for each site was to sample 98 women and enroll in the study an average of 55 to 56 respondents per site during the recruitment window.

In all but three of the 80 sites, an on-site Westat field recruiter was responsible for screening and enrolling eligible participants into the study.¹⁶ To be eligible for the study, the participant needed to speak English or Spanish, be at least 16 years of age, and enroll in WIC for the first time for her current pregnancy or enroll a new baby less than 3 months old. WIC staff certifying new WIC enrollees identified eligible study participants. The on-site recruiter explained the study to the potential study participant, who was randomly assigned as a candidate for either the core or supplemental group. The recruiter then completed a computerized screener to verify study eligibility, obtained written informed consent, and conducted a computerized 10-minute enrollment interview. If interested participants could not stay to be enrolled on site, the recruiter followed up by telephone and conducted the screener and enrollment interview over the phone. All participants were given a \$50 incentive for enrolling in the study and subsequently \$20 for each completed interview.

A total of 6,775 WIC participants were referred to the study across the 80 sites and 4,367 were enrolled. Table 1-2 shows the disposition status of all participants referred. Study eligibility was

¹⁶ In three sites, WIC staff identified eligible women and sent their contact information to Westat; Westat interviewers recruited the women by telephone.

undetermined for 987 referred participants, 816 refused to complete the referral form or screener, and 171 left the WIC site before completing the screener and could not be reached by telephone.

Table 1-2. Status of all referred participants

Total referred	Eligible	Enrolled	Ineligible	Eligibility undetermined
6,775	4,489	4,367	1,299	987

1.5.2 Interviewing WIC Participants

We are conducting followup interviews with WIC participants over a 6-year period which began in July 2013 and ends in July 2019. Study participants assigned to the core sample are interviewed more frequently than those in the supplemental sample. As shown in Table 1-3, WIC participants in the core sample enrolled prenatally are contacted to be interviewed 17 times over approximately a 5-year period, and women enrolled in WIC after giving birth participate in 15 or 16 interviews (depending on the age of their child when they enroll). If their baby is less than 6 weeks old, they start with the 1-month interview; however, if their baby is between 6 weeks and 2.5 months old, they start with the 3-month interview. In the supplemental sample, women either receive a 1-month or a 3-month interview, but not both. Those who enrolled prenatally or before their child was 6 weeks old receive a 1-month interview, whereas those enrolled after the baby is 6 weeks old receive a 3-month interview. All supplemental sample women are interviewed at nine additional time points.

Table 1-3. Frequency of interviews for core and supplemental samples

Status of pregnancy at time of WIC enrollment	Interview schedule																Total	
	Prenatal	1 month	3 months	5 months	7 months	9 months	11 months	13 months	15 months	18 months	24 months	30 months	36 months	42 months	48 months	54 months		60 months
Core sample																		
Prenatal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	17
Infant <6 weeks		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	16
Infant 6 weeks-2.5 months			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	15

Table 1-3. Frequency of interviews for core and supplemental samples (continued)

Status of pregnancy at time of WIC enrollment	Interview schedule																Total	
	Prenatal	1 month	3 months	5 months	7 months	9 months	11 months	13 months	15 months	18 months	24 months	30 months	36 months	42 months	48 months	54 months		60 months
Supplemental sample																		
Prenatal	✓				✓			✓			✓	✓	✓	✓	✓	✓	✓	10
Infant <6 weeks	✓				✓			✓			✓	✓	✓	✓	✓	✓	✓	10
Infant 6 weeks-2.5 months			✓		✓			✓			✓	✓	✓	✓	✓	✓	✓	10

The telephone interviews are conducted in English or Spanish. All post-birth interviews except the 30-, 42-, and 54-month interviews include a 24-hour dietary recall using the Automated Multi-Pass Method (AMPM). The 24-hour dietary recall uses the USDA's 24-hour dietary recall system, which begins with the AMPM interview. The AMPM is constructed such that the mother is asked to recall all her child's dietary intake for the previous day in a very systematic fashion. She is guided through the day and asked to report all foods, beverages, and dietary supplements for each eating event during the 24-hour period, which are recorded by the interviewer. The interview produces a 24-hour snapshot of all foods, beverages, and dietary supplements consumed by the child, which are then coded and translated into calories, nutrients, and food group values. Participants receive a package of measuring guides to help them report their child's portion sizes during the interview. We will collect replicate intakes on a 10 percent subsample of toddlers at 13, 15, 18, 24, 36, 48, and 60 months to estimate "usual" intake.

The prenatal interviews were all completed within 60 days of enrollment. The followup interviews are scheduled based on the child's birthday and start 14 days before the child turns 1 month old, 3 months old, etc. Because women may enroll in WIC at any stage in their pregnancy and many participants were recruited when the baby was already born, the length of time each followup interview is in the field is about 15 months.

1.5.3 Collecting WIC Administrative Data

Periodically the study requests food package information and weight/length measurements from WIC administrative data. We collect maternal food package information at enrollment, and 1 and 6 months; child food package information at enrollment and 1, 6, 12, and 24 months; and weight and length measures of the children at birth, 6 months, 12 months, 24 months, 36 months, and 48 months. As part of regular clinic visits at these ages, WIC sites collect these data for most enrolled participants and report the information to the State. For participants who are in the core sample and have left WIC, we attempt to collect weight and length information from the child's health care provider. For those who do not have a health care provider, we arrange for a local home health agency to obtain weight and length measurements. At later ages, we ask participants who are no longer receiving WIC to return to the WIC site to be measured, visit their health care provider for measurement, or agree to a home health agency visit.

1.5.4 Conducting Site Visits and Key Informant Interviews

To characterize the policies and services of the sites, an onsite visit was conducted by Westat's partner, Altarum, to each of the 80 sites between June and November 2013. The visits included observation of service delivery and a 1-hour key informant interview with the site supervisor or coordinator and others identified by the State or site. Additional interviews were also conducted with one or more staff of each of the 27 SAs by telephone. The interviews covered staff qualifications and training, nutrition education, breastfeeding support, and food package choices and policies. The State WIC Director determined the appropriate staff member(s) for the SA interviews.

1.5.5 Conducting the WIC Staff Survey

To obtain detailed information about staff qualifications that may affect how services are delivered, Altarum conducted a web survey between July and December 2013 to collect information from WIC staff members who were working in the study sites during the time period when participants were being recruited for the study. The online survey covered staff demographic characteristics and education, WIC training, beliefs about WIC program impacts and influences on infant and toddler feeding practices, nutrition and breastfeeding education, materials, recommendations, and staff health behaviors. All staff members at each of the 80 study sites were asked to complete a survey. A total of 802 staff completed the survey and surveys were received from all 80 sites.

1.6 Weighting and Imputation

The data are weighted to support national estimates. The weights inflate the sample to represent the population and compensate for both the unequal sampling rates and nonresponse. For WIC ITFPS-2, the sample is weighted to represent the national population of infants enrolled in WIC for the first time either while the mother is pregnant, or postnatally before 3 months of age, whose mothers are at least 16 years old and speak either English or Spanish. All study findings are reported as percentages or proportions, and represent the characteristics, views, behaviors, and experiences of this population. Because the recruitment period for the study spanned 20 weeks, the weighted number of cases shown in the report tables is an estimate of the number of infants in the represented population who enrolled nationally during that 20-week period, rather than an estimate of the monthly or annualized total number of WIC participants nationally, and should not be used as such.

The complex sample design also affects variance estimation. We provide replicate weights that facilitate accurately estimating the variances given the sample design. Additionally, although almost all study participants have answered all the questions regarding key socio-demographic characteristics, there are few cases of item nonresponse for these variables. As these variables are used repeatedly in the analysis, we have imputed the missing socio-demographic information. Appendix B1 offers additional detail on weighting and imputation.

1.7 Sample Characteristics

As shown in Table 1-4, 4,489 new WIC enrollees were eligible to participate in the study and of those 4,367 (97 percent) were enrolled. Of these enrollees, 2,649 women are in the prenatal core sample and completed a prenatal interview. Similarly, across all the sampling groups, 3,777 respondents completed at least 50 percent of the core baseline module questions in the 1- or 3-month interview and were therefore eligible to continue in the study. These individuals comprise the main analysis sample.

Table 1-4. Study sample participation

Sample	Eligible sample (screened and eligible)	Enrolled sample (consented and enrolled)	Percentage of enrolled sample used for prenatal analysis (count)	Percentage of enrolled sample used for main analysis (count)
Total sample	4,489	4,367	60.7% (2,649)	86.5% (3,777)
Core sample	3,605	3,503	–	86.2% (3,020)
Prenatal core sample	3,122	3,037	87.2% (2,649)	85.5% (2,596)
Postnatal core sample	483	466	–	91.0% (424)
Supplemental sample	884	864	–	87.6% (757)
Prenatal supplemental sample	688	678	–	86.9% (589)
Postnatal supplemental sample	196	186	–	90.3% (168)

Because women were both recruited into the study and have their babies over a long time window, their interviews are occurring at different times. Table 1-5 shows the percentage of the analysis sample that has completed interviews through 13-months postpartum.

Table 1-5. Counts and percentage of respondents that completed interviews by sample type and interview month

Interview	Percentage of the analysis sample that completed the interviews		
	Total combined sample (N=3,777)	Core sample (N=3,020)	Supplemental sample ^a (N=757)
Prenatal	70.1% (2,649)	87.7% (2,649)	NA
Month 1	90.0% (3,398)	90.5% (2,734)	87.7% (664)
Month 3	76.3% (2,881)	92.3% (2,788)	12.3% (93)
Month 5	69.8% (2,636)	87.3% (2,636)	0.0% (0)
Month 7	83.0% (3,134)	83.2% (2,514)	81.8% (620)
Month 9	64.9% (2,451)	81.2% (2,451)	NA
Month 11	61.5% (2,322)	76.9% (2,322)	NA
Month 13	74.3% (2,807)	74.1% (2,239)	75.0% (568)

^a Supplemental sample is interviewed at either 1 month or 3 months, but not both.

NA denotes not applicable.

Table 1-6 provides a summary of the initial socio-demographic characteristics of the main analysis sample. The data in this table are based on the 3,777 women who completed a 1- or 3-month interview. The variables in the table represent the socio-demographic variables used in the analyses over the course of the WIC ITFPS-2. Some counts in Table 1-6 do not total to 3,777 because of item nonresponse, but these missing demographic variables were imputed for use in the analyses.

The socio-demographic variables in Table 1-6 serve as key analytical variables and the study will examine outcomes of interest among these subgroups. Of the 3,777 respondents, the majority are White (59 percent), unmarried (70 percent), at or below the 75 percent of poverty threshold

(63 percent), report their families to be at high or marginal food security (52 percent), and had no history of breastfeeding (54 percent). Approximately one-quarter (26 percent) are African American and almost 40 percent are of Hispanic or Latino ethnicity. Almost half (45 percent) considered themselves normal weight or underweight while only 28 percent were obese. Most of the women enrolled in WIC in their first or second trimester. In addition, only a small number (about 15 percent) enrolled their baby in WIC postnatally without having enrolled during pregnancy. For about 40 percent of women, enrollment in WIC was for their first child. Forty-nine percent of the women participate either in the Supplemental Nutrition Assistance Program (SNAP), or in SNAP plus other public assistance programs (such as Temporary Assistance for Needy Families (TANF), Medicaid, or the National School Lunch Program (NSLP)).

Table 1-6. Socio-demographic characteristics of main analysis sample^a

Socio-demographic characteristics	Percentage of main analysis sample (count)
Race of mother/caregiver	
African American	25.7 (956)
White	59.0 (2,193)
All Other	15.3 (567)
Ethnicity of mother/caregiver	
Hispanic or Latino	38.3 (1,443)
Not Hispanic or Latino	61.7 (2,329)
Maternal marital status	
Married	30.1 (1,132)
Not married (including divorced and widowed)	69.9 (2,632)
Food security (measured using 6-item module)	
High or Marginal Food Security	51.8 (1,898)
Low Food Security	31.2 (1,145)
Very Low Food Security	17.0 (623)
Participation in non-WIC programs	
Does not participate in other programs	15.9 (587)
Participates in SNAP or in SNAP and other programs	49.0 (1,816)
Participates in Other Programs Excluding SNAP	35.1 (1,300)
Birth order	
First born	41.3 (1,546)
Second born	27.2 (1,018)
Third or subsequent born	31.6 (1,183)
Timing of WIC enrollment	
1st trimester	29.6 (1,118)
2nd trimester	38.9 (1,471)
3rd trimester	16.1 (608)
Postnatal	15.4 (580)
Weight status of mother before pregnancy	
Normal or underweight	44.6 (1,653)
Overweight	27.6 (1,023)
Obese	27.9 (1,033)
Poverty level	
75% of poverty threshold or below	62.9 (2,296)
Above 75% but ≤ 130% of poverty threshold	26.9 (1,023)
Above 130% of poverty threshold	10.2 (371)

Table 1-6. Socio-demographic characteristics of main analysis sample (continued)

Socio-demographic characteristics	Percentage of main analysis sample (count)
Breastfeeding history	
No history	54.3 (2,034)
3 or less months	21.9 (821)
More than 3 months	23.7 (888)
Age of mother or caregiver at child birth	
16-19 years	11.9 (446)
20-25 years	41.5 (1,569)
26 years or older	46.6 (1,762)
Birth weight	
Low	7.3 (248)
Normal	91.5 (3,120)
High	1.2 (42)
Delivery type	
Vaginal	67.8 (2,294)
Caesarean	32.2 (1,091)
Number of nights mother stayed in hospital	
0-2 nights	68.7 (2,323)
3 or more nights	31.3 (1,059)
Time between birth of reference child and previous child	
Less than 27 months	24.2 (530)
27-68 months	45.7 (1,000)
More than 68 months or only child	30.1 (660)
Child WIC participation status	
Receiving WIC at 1 month	96.0 (3,260)
No longer receiving WIC at 1 month	4.0 (135)
Nature of breastfeeding support at hospital	
Weak	9.2 (305)
Moderate	24.7 (817)
Strong	66.1 (2,190)
Nature of breastfeeding support from WIC	
Weak	60.3 (1,642)
Moderate	24.8 (676)
Strong	14.8 (404)
Nature of nutrition education and skill training	
Received training on formula only	18.6 (514)
Received training on cereal only	9.6 (265)
Received training on both	53.7 (1,481)
Received training on neither	18.1 (500)
Birth complications	
Yes	11.6 (393)
No	88.4 (2,983)

^a As measured at the start of the study

Data source: Interview questions SD2, SD3, SD4, SD14, SD15, SD18, SD19, SD21, SD31, SD36-40, SD42, MH1, MH2, MH29, KA2, KA6, KA31, HF22, HF23, HF26, HF28, WC5, and WC7-11.

1.8 Analysis

We are conducting both descriptive and causal analyses to answer the 60 research questions posed by FNS as well as supplementary questions. Many of the research questions can be answered by descriptive analyses that tabulate the responses to specific interview questions;¹⁷ however, a subset focuses on understanding the underlying population and program factors that drive nutritional and weight outcomes. We estimate behavior models to answer these types of questions. Additionally, we repeat most of the past analyses from the FNS-sponsored WIC IFPS-1 and the two Gerber/Nestle FITS studies. We compare current findings to relevant past work and to current objectives and standards.

1.8.1 Descriptive Analyses

We use descriptive statistics (e.g., counts, proportions, means, medians, and cross-tabulations) to examine outcomes by subgroups of interest. We analyze the measures of interest by a standard set of socio-demographic variables shown previously in Table 1-6, and then compare the subgroups to determine if the differences between them are statistically significant. Bivariate analyses consider the impact of each variable individually on the outcome of interest. We use bivariate analyses, such as t-tests or chi-square tests of independence, to explore whether these associations are statistically significant. Although chi-square indicates whether an outcome varies significantly by subgroups (for example whether breastfeeding initiation rates vary across racial subgroups), it does not identify which subgroup(s) are different from others. To examine whether the difference between two specific subgroups is statistically significant (for example whether breastfeeding initiation rates are significantly different between white and African American women), we conduct followup tests between pairs of subgroups, also called pairwise tests. Throughout the report, results of these followup pairwise tests are described alongside the bivariate chi-square results. As many socio-demographic factors are known to affect infant feeding practices, Appendix C presents variables of interest from each chapter crossed by key socio-demographic variables and provides more detailed analyses on a number of topics. This appendix serves as a reference for answering how the results differ by WIC participant characteristics.

¹⁷ In addition, composite measures reflecting differences in WIC clinics' policies, service delivery, and staffing were developed to facilitate analysis of the influence of site-level activities on WIC participant feeding choices (see Appendix B2).

As many of these socio-demographic variables measure similar concepts, we explored the associations between each pair of variables using our prenatal analysis sample of 2,649 women based on chi-square tests of independence¹⁸ as shown in Table 1-7. Ethnicity, marital status, and participation in non-WIC benefit programs are significantly associated with the greatest number (six) of socio-demographic variables used in this study. This suggests that many of these socio-demographic variables are strongly related and may be measuring the same phenomenon.

Table 1-7. Correlated socio-demographic variables

	Race	Ethnicity	Marital status	Food security	Non-WIC benefits	Parity	Timing of WIC enrollment	Weight before pregnancy	Breastfeeding history	Poverty level
Race		✓	✓		✓				✓	
Ethnicity	✓			✓	✓		✓		✓	✓
Marital status	✓				✓	✓	✓		✓	✓
Food security		✓			✓			✓		✓
Non-WIC benefits	✓	✓	✓	✓		✓			✓	✓
Parity			✓		✓			✓		
Timing of WIC enrollment		✓	✓					✓		
Weight before pregnancy				✓		✓	✓		✓	
Breastfeeding history	✓	✓	✓		✓			✓		
Poverty level		✓	✓	✓	✓					

Data source: Interview questions SD2, SD3, SD4, SD14, SD15, SD18, SD19, SD21, SD36 – 40, MH1, MH2, MH29, KA2, and KA6.

1.8.2 Behavioral Models

For the subset of the research questions that focus on identifying the causal relationships that drive the outcomes and decisions observed, bivariate analyses alone are not sufficient to address the questions. Outcomes are jointly determined by a variety of factors, thus we use multivariate analyses such as regression analysis and survival analysis to explore how choices and characteristics impact, intention to breastfeed, breastfeeding initiation, duration, and cessation, and introduction of various foods, using weighted data. Multivariate analyses isolate the unique effects of individual variables on an outcome, while holding the influence of other variables constant. For example, multiple regression can be used to capture the unique effect of income on breastfeeding initiation,

¹⁸ Chi-square tests were appropriately adjusted for our complex sample design. Statistical significance is at the 95 percent level.

independent of any influence of the individuals' marital status. As compared to bivariate analyses, multivariate analysis typically finds a more limited set of socio-demographic variables have a statistically significant association with the outcome.

1.8.3 Statistical Tests

The majority of analyses for this report involve cross-tabulations of topical variables by one or more key socio-demographic variables. We conducted significance tests on the cross-tabs to determine whether the variable of interest is associated with the socio-demographic variable. When the variable of interest is a proportion, a chi-square test, appropriately adjusted for our complex sample design, was used to determine if observed differences were statistically significant or more likely the result of random sampling error. If the variable of interest is a mean, we used a t-test, also adjusted for our complex sample design, to determine whether the differences were statistically significant. We employed the Bonferroni correction method for comparing multiple means. For the models, we use replication methods to estimate the sampling errors of estimators, based on our complex sample design.

1.8.4 Missing Item Data

Item nonresponse is reflected in the total number of observations available for analysis. Responses of "Don't Know" were typically considered item nonresponse and were, therefore, treated as missing for the purposes of analysis. The one exception involves statements of belief or intention. In such cases, the response of "Don't Know" was included as a valid response.

Missing responses for key socio-demographic variables were imputed. Any difference in sample sizes between interview questions is attributable to item nonresponse for variables of interest that were not one of the standard set of key socio-demographic variables.

Prenatal Views on Breastfeeding

2

2.1 Overview

This chapter focuses on beliefs about the benefits of and barriers to breastfeeding, and explores intent to breastfeed among women who join WIC prenatally. Intentions to breastfeed differ from beliefs in that intentions reflect a psychological commitment toward the activity rather than a perception about the activity. Specifically, the analyses in this chapter address the following research questions:

- Do WIC mothers intend to breastfeed?
- Does the practice/behavior of women (intention to breastfeed) correspond to specific past feeding experiences (cultural norms, support received, personal feelings, barriers encountered, etc.)?

The work highlights findings that differ from the previous study, WIC IFPS-1, and explores the relationship between beliefs and intent. Because breastfeeding beliefs and intentions can vary substantially with individuals' background characteristics, in addition to the main analyses exploring the research questions, Appendix C1 presents each variable of interest crossed by key socio-demographic variables. This appendix serves as a reference for answering how the results for each of the analyses differ for different subgroups of prenatal WIC participants.

For most mothers in WIC ITFPS-2 who joined WIC prenatally, the prenatal interview was their first full interview of the study. Many of these mothers were new to WIC and, therefore, would have very limited exposure to the program (44.2 percent of WIC ITFPS-2 mothers indicated on the prenatal interview that they had no prior WIC experience). The interview sought information on: (1) the participants' knowledge of WIC benefits, including specifics about the food packages; (2) the participants' perceptions of WIC services, including nutrition education and breastfeeding education and support; (3) whom participants turn to for advice; and (4) participants' attitudes toward breastfeeding and their infant feeding intentions. The prenatal interview was kept purposefully short as it was most women's introduction to the study interviews. Some important background and circumstance information, such as whether the women were working during pregnancy or would return to work post-birth, was deferred to the 1- and 3-month interviews. Consequently, analyses in

subsequent chapters exploring correlates of actual breastfeeding initiation will include rich information about employment and other factors that may affect the decision to initiate and continue breastfeeding. Similarly, at this stage of analysis, we include only very general information on WIC clinics. We explore the variation in WIC program delivery in subsequent interviews and through a WIC staff survey. Future analyses will incorporate more detailed information about staff credentials and programs offered by WIC sites.

2.2 Background

Behavioral intention is a complex interplay of environment and cultural context, attitudes about the value of a goal, and belief in one's own ability to achieve the desired goal. According to the *theory of planned behavior* (Ajzen, 1991), the pathway to a behavioral goal begins with beliefs. These beliefs include: personal views on the desirability of the behavior; whether the behavior is valued both by those close to the individual and by the individual's social and cultural group; and self-efficacy, or the ability of the individual to carry out the behavior effectively.

Applying these concepts to the intention to breastfeed, there are several key factors that are expected to influence women's breastfeeding decisions. First, women's backgrounds affect their personal beliefs regarding the benefits of and barriers to breastfeeding. Consultation with trusted sources and trends within their cultural or ethnic groups contribute additionally to their evaluation of the value of breastfeeding. Past experience with breastfeeding guides further beliefs about the feasibility of breastfeeding. Together, these beliefs coalesce into intentions about initiating and maintaining breastfeeding.

2.2.1 Breastfeeding Decisions

Attitudes, Beliefs, and Knowledge. Previous research has shown that breastfeeding decisions are particularly influenced by personal beliefs related to breastfeeding self-efficacy, perceived personal strength and ability, and comfort level with breastfeeding in public (de Jager et al., 2013). Past work has grouped beliefs about breastfeeding into perceived benefits of and barriers to breastfeeding and sought to examine their importance. Studies found that benefits are positively associated, and barriers are negatively associated, with initiation and duration of breastfeeding (Baydar et al., 1997; McCann et al., 2007). Research on low-income women in Tennessee explored barriers to

breastfeeding and found that beliefs and concerns about breastfeeding in public, pain associated with breastfeeding, and fear of harming the baby were among the most commonly perceived barriers (Ware et al., 2013). Concerns about breastfeeding in public and worries about pain were echoed as barriers by low-income African American women in Baltimore, Maryland (Bentley et al., 2003).

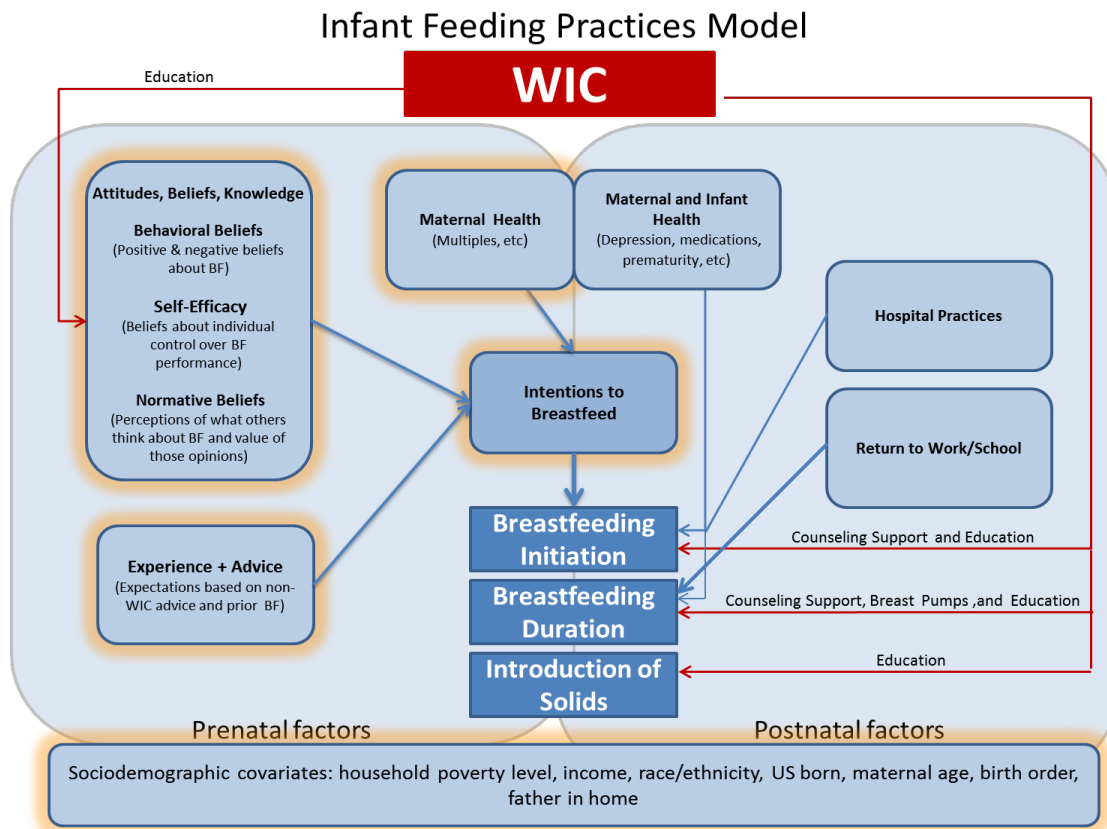
Cultural and social network influences on breastfeeding decisions have been explored as well. Race and ethnicity were found to be related to beliefs about breastfeeding, with greater proportions of Hispanic mothers generally agreeing with the statements associated with the benefits of breastfeeding than non-Hispanic mothers and greater proportions of African American mothers generally agreeing with the barriers to breastfeeding (Baydar et al., 1997; McCann et al., 2007). Though differences in initiation and duration between racial and ethnic groups are statistically significant (Grummer-Strawn et al., 2006; Christopher, 2012), these characteristics may be proxies for unmeasured cultural influences (Gibson et al., 2005; Simmie, 2006; Street and Lewallen, 2013). Nativity status may play similar role, as research on low-income women found that foreign-born women were more likely to report intentions to breastfeed than their native-born counterparts (Lee et al., 2005).

Experience and Advice. The influence of family and friends has also been shown to play a significant role in breastfeeding decisions (Baranowski et al., 1983; McLorg and Bryant, 1989; Bentley et al., 2003), with views of husbands and partners emerging as particularly important (Bentley et al., 1999; Arora et al., 2000; Wolfberg et al., 2004). Prior breastfeeding experience was a key factor found to be associated with increased intent to breastfeed among WIC-certified women in Mississippi (Mitra et al., 2004).

To help guide the analyses on breastfeeding beliefs and intentions, the WIC ITFPS-2 study team developed a conceptual model of infant feeding practices as shown in Figure 2-1. This conceptual model incorporates theory and the findings from the literature and hypothesizes that prenatal maternal beliefs are established first and, in turn, along with current advice and experiences and maternal health, influence intentions to breastfeed. The components that are highlighted in gold are the relationships explored in this chapter.

The presentation in this chapter parallels the conceptual model, with beliefs, experience, and advice, discussed first, and then intentions. The influence of family and friends and program awareness among prenatal WIC recipients and whether beliefs about breastfeeding have changed since the previous study (WIC IFPS-1) in the 1990s are also examined. Finally, we investigate how beliefs influence intentions.

Figure 2-1. Conceptual infant feeding practice model



2.3 The Prenatal Sample and Analysis Approach

The prenatal sample consists of women who joined WIC prenatally and completed the prenatal interview that was administered to the core sample. There are 2,649 women in the core prenatal analysis sample.¹⁹ These observations are weighted to reflect the prenatal WIC population.

In this chapter, we use descriptive analyses and bivariate tests to explore socio-demographic factors associated with beliefs about breastfeeding and intention to breastfeed, and we use followup tests to identify which socio-demographic groups are statistically significantly different from each other. We also use descriptive analyses to explore experience and advice about breastfeeding, and WIC

¹⁹ Only the core prenatal sample gets the prenatal interview.

program awareness. Finally, we use multivariate regression analyses to examine the independent effects of socio-demographic factors in explaining beliefs and intentions.²⁰

2.4 Prenatal Beliefs Regarding Breastfeeding

To explore beliefs about breastfeeding, our inquiry parallels some of the analyses that were conducted in WIC IFPS-1, which examined a series of breastfeeding belief statements and determined how these beliefs were thematically related. WIC IFPS-1 assessed 30 similar breastfeeding belief statements. After reviewing their findings, we excluded from data collection statements that were endorsed by few respondents so as to minimize the burden on our participants. We kept a subset of 13 of their statements and added a new statement regarding breastfeeding's influence on the child becoming overweight. Using a 5-point Likert scale, respondents could “strongly agree,” “agree,” “neither agree nor disagree,” “disagree,” or “strongly disagree” with each statement. Analysis of the data seeks to confirm that the responses can be distilled, as they were years ago in WIC IFPS-1, into two conceptual summary measures: the perceived benefits of breastfeeding and the perceived barriers to breastfeeding. We also examined how responses vary by race, ethnicity, and education (with Appendix C1 showing the variation by additional socio-demographic variables).

2.4.1 Benefits and Barrier Groupings

We ran confirmatory factor analysis on the belief statements to determine whether our data fit the perceived benefits and perceived barriers model used in the WIC IFPS-1. Factor analysis is an analytic method in which correlated observed variables are grouped together and separated from other variables with low or no correlation. The grouped variables are attributed to an unobserved thematic concept (a factor). We assessed multiple statistical indicators, including measures of model fit and internal consistency reliability, to determine whether belief statements were consistent with the benefits of and barriers to breastfeeding constructs.²¹

²⁰ See chapter 1 for a discussion of analysis approaches.

²¹ Factor loadings were required to be ≥ 0.4 ; We relied also on the comparative fit index (CFI), the goodness of fit index (GFI), the root mean square error of approximation (RMSEA), and the standardized room mean square error (SRMR). CFI=0.88; GFI=0.96; RMSEA=0.057; and SRMR=0.55.

The items determined to be perceived benefits in the WIC IFPS-1 study continue to resonate as a cohesive group of statements with current prenatal WIC women. The perceived benefit statements measured the same construct, and based on statistical evidence, the items were cohesively related.²²

In contrast, some of the statements previously found to be barriers by the WIC IFPS-1 study are no longer perceived that way. In fact, two of the items previously incorporated in the perceived barriers model no longer fit well within the barrier concept.²³ The two statements are “Breastfeeding means no one else can feed your baby” and “With bottle feeding, the mother knows that the baby is getting enough to eat.” Excluding these two statements, we examined cohesiveness of the remaining items and found that it is, at best, only marginally acceptable.²⁴ The correlations among the perceived barrier items are low. Although all the statements represent barriers to breastfeeding, it is unlikely that they all measure the same underlying thematic construct.

Table 2-1 lists the belief statements analyzed. The items are ordered by their statistical importance within the perceived benefits and perceived barriers models.²⁵ Those that are statistically most important among the perceived benefits are the health benefits associated with breastfeeding. The new statement regarding breastfeeding’s impact on child obesity is an item within the benefit factor but is the least important contributor. The two items associated with perceived inconvenience of breastfeeding are the most important items among perceived barriers. The two statements highlighted in gray and italicized are those that no longer resonate well as barriers.

²² Cronbach’s alpha was 0.75.

²³ Factor loadings were less than 0.4.

²⁴ Cronbach’s alpha equaled 0.58.

²⁵ The magnitude of factor loading determined statistical importance.

Table 2-1. Items that constitute the perceived benefits of and barriers to breastfeeding

Perceived benefits of breastfeeding	Perceived barriers to breastfeeding
Breastfed babies are healthier than formula-fed babies.	Breastfeeding ties you down.
Breastfeeding helps protect baby from diseases.	Breastfeeding takes too much time.
Breastfeeding is easier than formula feeding.	Breastfeeding in public is not something that I want to do.
Breastfeeding brings a mother closer to her baby.	Breastmilk leaking into your clothes is something that I worry about.
Breastfeeding helps women lose weight.	Breastfeeding is painful.
Breastmilk alone gives a new baby all he/she needs to eat.	<i>No longer resonate as barriers:</i> <i>Breastfeeding means no one else can feed your baby.</i>
Breastfeeding reduces the risk of a child becoming overweight.	<i>With bottle feeding, the mother knows that the baby is getting enough to eat.</i>

Data source: Prenatal interview questions KA18a-n.

The items are ordered by their statistical importance within the perceived benefits and perceived barriers models.

2.4.2 Change in Attitudes Over Time

Comparisons of the findings with those from WIC IFPS-1 reveal substantial changes in attitudes about breastfeeding over time as shown in Table 2-2. The data from the two studies differ somewhat in that WIC IFPS-1 data are based on responses from women who had just delivered their babies and their three response categories are less nuanced than our five categories. To make the data comparable, we grouped our “strongly agree” and “agree” responses and present data on the percentages of women who agree with the statements regarding the benefits of and barriers to breastfeeding. Because WIC IFPS-1 provided limited descriptive statistics, we do not have all the information needed to statistically test whether the proportions from the two studies are different. However, given the large differences between the proportions over time, one can be confident that these reflect true shifts in thinking of WIC mothers.

As Table 2-2 shows, overall views regarding breastfeeding have shifted to being more positive. Higher percentages of women agree with six of seven benefits statements and lower percentages agree with five of seven barrier statements. There has been about a 20 percentage point increase in those affirming that “Breastfed babies are healthier” and “Breastfeeding helps women lose weight.”

Table 2-2. Comparisons of percentages of WIC mothers agreeing with statements about the benefits of and barriers to breastfeeding

Maternal attitudes and beliefs	WIC ITFPS-2	WIC IFPS-1
	Percentage of mothers agreeing with statement	
Benefits of Breastfeeding		
Breastfed babies are healthier than formula-fed babies.	79.7	61
Breastfeeding helps protect the baby from diseases.	81.2	77
Breastfeeding is easier than formula feeding.	55.3	50
Breastfeeding brings a mother closer to her baby.	87.9	81
Breastmilk alone gives a new baby all he/she needs to eat.	71.3	71
Breastfeeding reduces the risk of a child becoming overweight.	50.0	Not asked
Breastfeeding helps women lose weight.	74.5	53
Barriers to Breastfeeding		
Breastfeeding ties you down.	17.3	41
Breastfeeding takes too much time.	14.7	34
Breastmilk leaking onto your clothes is something that I worry about.	27.4	46
Breastfeeding in public is not something that I want to do.	36.9	61
Breastfeeding is painful.	43.6	39
Breastfeeding means no one else can feed your baby.	50.8	48
With bottle feeding, the mother knows that the baby is getting enough to eat.	67.0	76
Unweighted n	2,649	Not reported
Weighted n	395,398	Not reported

Data source: Prenatal interview questions KA18a-n.

Data from WIC IFPS-1 were only available to one decimal place.

Italicized items no longer resonate as barriers within the perceived barriers model.

In terms of barriers, only 17 percent of women affirm the belief that breastfeeding ties you down, which is a drop from 41 percent in WIC IFPS-1. Similarly, there has been a 19 percentage point decrease in both the percentages of women affirming “Breastfeeding takes too much time” and “Breastmilk leaking onto their clothes is something they worry about.” Finally, the largest difference is in affirmative responses to “Breastfeeding in public is not something that I want to do,” with currently 37 percent of women affirming this statement as compared with 61 percent in 1997. This dramatic change may reflect modern legislation that now legally protects women who choose to breastfeed in public.

Revisiting the WIC IFPS-1 perceived benefits and barriers models reveals that there have been dramatic changes in the attitudes of WIC prenatal mothers regarding breastfeeding. To give some context for how large these changes in attitudes have been, we compare the changes in beliefs among WIC women to the national trends in Table 2-3. To the extent possible, we matched similar belief statements from the CDC Health Styles survey to the WIC IFPS-1 and WIC ITFPS-2 surveys.

Additionally, because the CDC Health Styles survey asks different questions across years, the time period of the two data series do not always match and extrapolation was needed to make them comparable. The table, therefore, displays the percentages affirming a given survey item in the first and last year of data collection, the percentage point difference over the data collection period (e.g., 1999 to 2007), and the adjusted difference when the trend is extrapolated cover the entire period from 1994 to 2013.

Table 2-3. Changes in beliefs about breastfeeding amongst all women compared to WIC women adjusted to reflect between 1994 and 2013

Belief statements	Percentage of women agreeing with statement			
	Year		Difference	Adjusted difference ^a
All women: ^b Feeding a baby formula instead of breast milk increases the chances the baby will get sick.	2013	1999	2.9	3.9
	24.6%	21.7%		
WIC women: ^c Breastfeeding helps protect the baby from diseases.	2013	1994	4.2	4.2
	81.2	77.0		
All women: A mother who breastfeeds has to give up too many lifestyle habits like favorite foods, cigarette smoking, and drinking alcohol.	2010	2000	3.6	6.8
	48.2	44.6		
WIC women: Breastfeeding ties you down.	2013	1994	23.7	23.7
	17.3	41.0		
All women: Breastfeeding is healthier for babies than formula feeding.	2010	1999	5.3	9.2
	72.9	67.6		
WIC women: Breastfed babies are healthier than formula-fed babies.	2013	1994	18.7	18.7
	79.7	61.0		
All women: I am comfortable when mothers breastfeed their babies near me in a public place, such as a shopping center, bus station, etc.	2007	1999	5.8	13.8
	44.1	49.9		
WIC women: Breastfeeding in public is not something I want to do.	2013	1994	24.1	24.1
	36.9	61		

^a Adjusted using straight line extrapolation to reflect the 19-year trend between WIC IFPS-1 (1994 data collection) and WIC ITFPS-2 (2013 data collection for prenatal interview).

^b Data on the breastfeeding beliefs of all women are from the CDC Health Styles survey, http://www.cdc.gov/breastfeeding/data/healthstyles_survey/survey_2013.htm.

^c Data on WIC women are from IFPS-1 for 1994 and the current study for 2013.

As Table 2-3 shows, the change in views was greater for WIC women as compared to the national sample of all women for all four matched pairs of belief statements. In three of the four belief pairings, the change in WIC women's attitudes outpaced the national change by more than 10 percentage points. The strongest evidence that WIC women's attitudes have changed more than the national trend comes from the third question that is basically the same across the surveys and asks if one agrees with the statement that breastfeeding is healthier for babies than formula feeding. The national data that there has been 9.2 percentage point increase in women agreeing with this

statement in 2013 than did in 1994 while amongst WIC women the increase is 18.7 percentage points.

Not surprisingly, these changes in WIC women's attitudes occurred over a time period in which WIC made substantial changes to further encourage breastfeeding. For example in 1994, P.L. 103-448 raised the minimum amount spent per woman on WIC Breastfeeding promotion and support. Similarly, in 1998, P.L. 105-336 authorized WIC State agencies to use food funds, in addition to nutrition services administrative funds, for the purchase or rental of breast pumps. Breastfeeding peer counseling has been steadily growing since its antecedents in the mid-1990s and began being funded via grants from FNS in 2004. The 2007 Interim WIC Food Package Rule and 2014 Final WIC Food Package Rule Food increased the quantities and variety of foods in the packages for exclusively breastfeeding mothers and infants and reduced the amount of formula provided to infants who are partially or solely formula fed. Finally, the Healthy Hunger Free Kids Act of 2010 (P.L. 111-296) put further emphasis on encouraging breastfeeding through increased staff training and an award program to recognize WIC local agencies that demonstrate exemplary breastfeeding promotion and support activities.

2.4.3 Attitudes Toward Perceived Benefits

Table 2-4 displays the percentage of prenatal WIC mothers agreeing with perceived benefits items overall and by mother's race, ethnicity, and education, as these socio-demographic characteristics can be proxies for cultural influences that shape beliefs, such as, the influence of family and friends, formal and informal role models, and traditions.

Benefits

Overall: >50 percent agree with each benefit statement.

Race: African Americans least positive.

Ethnicity: Hispanics most positive.

Education: Those with less education, generally less positive.

Overall. The majority of WIC prenatal mothers agree with the statements that breastfeeding helps the baby be healthy, helps protect the baby from diseases, and brings the mother and baby closer together getting the greatest endorsements. Nearly 75 percent agree with the statement that breastfeeding helps a woman lose weight, and only a slightly lower percentage agree that breastmilk gives a baby all that he or she needs to eat. Just over half of the mothers agree with the statement that breastfeeding is easier, whereas 50 percent agree with the statement that breastfeeding reduces the likelihood of the child becoming overweight, the one belief statement added since the WIC IFPS-1.

Table 2-4. Percentage of prenatal mothers agreeing with statements about the perceived benefits of breastfeeding by race, ethnicity, and education

Maternal attitudes and beliefs	All prenatal mothers	Percentage of prenatal mothers agreeing with the statement						
		Race			Ethnicity		Education	
		African American	White	All other	Hispanic	Non-Hispanic	High school or less	More than high school
Breastfed babies are healthier than formula-fed babies. ^{a,b}	79.7%	75.4	78.8	86.3	88.5	71.8	80.3	78.5
Breastfeeding helps protect the baby from diseases. ^{a,b,c}	81.2	74.0	82.4	85.0	87.9	75.2	79.1	84.8
Breastfeeding is easier than formula feeding. ^{a,b,c}	55.3	47.2	53.4	68.6	68.5	43.5	59.2	48.1
Breastfeeding brings mother closer to baby. ^{a,b}	87.9	84.0	88.4	90.3	92.8	83.5	87.8	88.0
Breastmilk alone gives new baby all he/she needs to eat. ^b	71.3	66.9	71.5	74.9	78.0	65.3	70.9	71.7
Breastfeeding reduces the risk of a child becoming overweight. ^b	50.0	45.0	51.3	51.3	58.0	42.8	48.9	51.5
Breastfeeding helps women lose weight. ^{b,c}	74.5	73.8	74.4	75.3	78.6	70.7	72.1	78.5
Unweighted n ^d	2,649	582	1,606	461	1,089	1,560	1,682	959
Weighted n	395,398	82,231	230,878	82,289	186,511	208,887	251,367	142,794

^a Chi-square statistic testing of race differences is significant at $p \leq 0.05$.

^b Chi-square statistic testing of ethnicity differences is significant at $p \leq 0.05$.

^c Chi-square statistic testing of education level of mother or caregiver differences is significant at $p \leq 0.05$.

^d n is the number of respondents to the last question in the table. For some questions, n is slightly different due to item nonresponse.

Data source: Prenatal interview questions KA18a-f, KA18n, and SD26. Screener questions SD2 and SD3.

Race. Looking at the data by race, African American mothers affirm the benefit statements in the lowest proportions whereas mothers in the “All other races” category affirm the benefit statements in the highest proportions. Testing whether race affected the responses, the Chi-square test for equal

proportions revealed that the percentages among the different racial categories were significantly different for the first four statements. Additional followup testing revealed that significantly lower proportions of African American mothers affirm the statements about breastfeeding protecting the baby from diseases, bringing a mother closer to her baby, and being easier than formula feeding as compared with both White and other-race mothers.

Ethnicity. Analysis of the data by ethnicity reveals that higher percentages of Hispanic mothers affirm each of the statements than do their non-Hispanic counterparts. All of these differences are statistically significant. This finding is consistent with WIC IFPS-1, which found that Hispanic women more favorably regarded the benefits of breastfeeding.

Education. Three of the perceived benefit statements exhibit variation in response by education level. A statistically significantly higher proportion of prenatal mothers with more than a high school education affirm that breastfeeding helps protect babies from disease and that it helps mothers lose weight. Additionally, a statistically significantly lower proportion of prenatal mothers with more than a high school education perceive that breastfeeding is easier than formula.

Race and Ethnicity Over Time. As shown in Appendix B3a, responses by all racial and ethnic subgroups are uniformly more positive now than they were 19 years ago, with more women agreeing with all the benefit statements. Additionally, the relative positions by race and ethnicity regarding benefits remain generally unchanged, with Hispanic women the most positive, followed by women in the “All other races” category, then Whites, and then African Americans.

2.4.4 Attitudes Toward Perceived Barriers

Table 2-5 displays the percentages of WIC prenatal mothers agreeing with the perceived barrier items overall and by race, ethnicity, and education. For presentation purposes, we include the two items that no longer fit well with the barriers construct. They are italicized to distinguish them.

Barriers

Overall: <50 percent agree with most barrier statements.

Race: No strong pattern.

Ethnicity: No strong pattern.

Education: Those with less education, generally more negative.

Overall. The range in the percentages of women agreeing with barrier statements is wider than that for benefits, suggesting that there are disparate views regarding barriers. Less than 20 percent of prenatal mothers agree with the statements that “Breastfeeding ties you down” or “Breastfeeding

takes too much time”; whereas more than 50 percent of women agree with the statements that “Breastfeeding means no one else can feed your baby” and “With bottle feeding, the mother knows the baby is getting enough to eat.”

Table 2-5. Percentage of prenatal mothers agreeing with statements about the perceived barriers to breastfeeding by race, ethnicity, and education

Maternal attitudes and beliefs	All prenatal mothers	Percentage of prenatal mothers agreeing with the statement						
		Race			Ethnicity		Education	
		African American	White	All other	Hispanic	Non-Hispanic	High school or less	More than high school
Breastfeeding ties you down. ^a	17.3%	18.2	17.5	16.1	15.3	19.1	17.5	17.2
Breastfeeding takes too much time. ^a	14.7	15.6	13.8	16.4	17.3	12.4	14.7	14.7
Breastfeeding in public is not something I want to do. ^b	36.9	39.2	35.7	38.2	35.1	38.6	40.0	31.6
Breastmilk leaking onto your clothes is something I worry about. ^{a,b,c}	27.4	34.4	25.2	26.6	23.4	31.0	29.2	24.0
Breastfeeding is painful. ^{a,b,c}	43.6	44.4	41.1	49.6	45.6	41.8	44.2	42.1
Items that no longer resonate as barriers								
<i>Breastfeeding means no one else can feed your baby.^{a,b,c}</i>	50.8	55.4	45.6	60.7	60.3	42.3	59.1	35.8
<i>With bottle feeding, the mother knows that the baby is getting enough to eat.^{a,b}</i>	67.0	65.0	68.1	66.1	63.6	70.1	68.7	63.8
Unweighted n ^d	2,649	582	1,606	461	1,089	1,560	1,682	959
Weighted n	395,398	82,231	230,878	82,289	186,511	208,887	251,367	142,794

^a Chi-square statistic testing of ethnicity differences is significant at $p \leq 0.05$.

^b Chi-square statistic testing of education differences is significant at $p \leq 0.05$.

^c Chi-square statistic testing of race differences is significant at $p \leq 0.05$.

^d n is the number of respondents to the last question in the table. For some questions, n is slightly different due to item nonresponse.

Data source: Prenatal interview questions KA18g-m, SD26. Screener questions SD2 and SD3.

Italicized items no longer fit well in the perceived barriers model.

Race. Statistical testing reveals that responses to statements about leaking, pain, and no one else can feed the baby differ by race. However, followup testing shows that the influence of race on perceived barriers does not follow a consistent pattern; instead, it varies by the type of barrier. A statistically significantly higher proportion of African American prenatal mothers worry about breastmilk leaking into their clothing than do White mothers or mothers in the “All other races” category. The proportion of White mothers agreeing with the statement that “Breastfeeding is painful.” was statistically significantly lower than the proportion of mothers in the “All other races” category, but the proportion of African American mothers agreeing with this statement was not statistically significantly different from the proportion in the two other racial categories. For the barrier that “...no one else can feed the baby,” only White mothers have statistically significantly different responses, with a lower proportion agreeing compared with African American mothers or mothers from the “All other races” category.

Ethnicity. Statistical tests reveal that ethnicity significantly affects the percentage of women who agree with all the barrier statements except breastfeeding in public. However, unlike with benefits, the effect of ethnicity on one’s attitudes regarding barriers is mixed. For some statements (e.g., “...no one else can feed your baby”) a higher percentage of Hispanics agrees with the statements; whereas for other statements (e.g., “Breastfeeding ties you down”), a lower percentage agrees with the statements relative to non-Hispanics.

Education. For all but the first two barrier statements, responses vary with education level. The percentages agreeing with the five remaining statements are significantly higher for those with less education, suggesting that agreement with barriers lessens with higher educational attainment.

Race and Ethnicity Over Time. As shown in Appendix B3a, responses by race and ethnicity have changed over time. Generally speaking, all racial subgroups see fewer barriers to breastfeeding than WIC IFPS-1 respondents did nearly 20 years ago, with almost always a lower percentage of women agreeing with each barrier statement. Attitudes toward barriers by ethnicity have shifted over time, but generally these changes do not following a systematic pattern.

2.4.5 Composite Belief Measures by Race, Ethnicity, and Education

In addition to examining how responses to individual belief statements vary by demographic characteristics and have changed over time, the study team also explored how the overall concepts of benefits and barriers differ among the WIC subpopulations. This analysis involved distilling the

benefit and belief statements into two additive indices.²⁶ We assigned numeric values to each response as follows: strongly agree=5, agree=4, neither agree nor disagree=3, disagree=2, and strongly disagree=1. These values were summed, and the sum rescaled to 100.

Table 2-6 displays the mean scores for the belief indices by race, ethnicity, and education. A score of 100 indicates that the mother strongly agreed with all the statements. Mean scores for the benefits statements range from 75 to 80, indicating a relatively high number of women strongly agreeing with benefit statements. Mean scores for the barriers index range from 52 to 54, indicating mixed responses to barrier statements. These summary indices reveal patterns similar to those discussed previously for the individual benefit and belief statements. For the benefit index, virtually all the differences in means by race, ethnicity, and education are statistically significant. In contrast, for the barrier index, only the differences in the mean by education level are statistically significant.

Table 2-6. Mean composite benefit and barrier scores by race, ethnicity, and education

Index	Race			Ethnicity		Education	
	African American	White	All other	Hispanic	Non-Hispanic	High school or less	More than high school
Perceived Benefits Index ^{a,b,c}	75.0	77.5	78.5	80.0	74.7	76.6	78.3
Perceived Barriers Index ^c	54.3	52.7	53.8	52.8	53.7	53.8	52.3
Unweighted n	582	1,606	461	1,089	1,560	1,682	959
Weighted n	82,231	230,878	82,289	186,511	208,887	251,367	142,794

^a Differences between African American and both White and other races are statistically significant. Differences between White and other races are not significantly different.

^b Differences by ethnicity are statistically significant at $p \leq 0.05$.

^c Difference by education are statistically significant at $p \leq 0.05$.

Data source: Prenatal interview questions KA18a-n and SD26. Screener questions SD2 and SD3.

²⁶ This follows the methodology used in WIC IFPS-1. That study subsequently uses the scale measures as predictors in multivariate model formula supplementation.

2.5 Experience and Advice About Infant Feeding and WIC Program Awareness

Research indicates that support and education are the factors influencing breastfeeding initiation and duration. The study examined whom WIC mothers talk to about the decision to breastfeed or formula feed, their awareness of the WIC program, and what WIC nutritional and educational services they have received.

2.5.1 Experience and Advice About Infant Feeding

Many WIC women have children already and therefore made breastfeeding decisions in the past. Specifically, 59 percent of the prenatal women have previous children and, of those, 82 percent had initiated breastfeeding with a past child. In total, 48 percent ($.59 \times .82$) of prenatal women had initiated breastfeeding with a previous child.

In addition to relying on their direct experience, many women seek advice about breastfeeding from others. The prenatal interview asked participants about conversations they may have had regarding their infant feeding plans, inquiring whether they spoke with a husband/boyfriend, mother, other relatives, friends, people at WIC, or their doctor. Not surprisingly, 78 percent (as shown in Appendix B3a) of women confer with their husband or boyfriend about this decision. Staff at WIC was the second most common group women speak to about breastfeeding, with 68 percent reporting they talked with WIC staff. Smaller percentages of women reported speaking to mothers (62 percent), doctors (51 percent), friends (40 percent), and other relatives (39 percent) about breastfeeding. Irrespective of whom women turn to, to discuss infant feeding plans, more than 80 percent of the women reported that the conversation was important to helping them make a decision.

2.5.2 WIC Awareness

Many study participants had limited WIC exposure at the time of the prenatal interview, as only those women enrolling in WIC for the first time for their current pregnancy were eligible to participate in the study and approximately 41 percent of the prenatal sample was expecting a first child. Within the prenatal sample only 55.7 percent of women indicated they had received WIC

benefits for a prior pregnancy or child. Nonetheless, the study explores prenatal women's knowledge of the WIC program policies, the exclusive breastfeeding package, and the amount of formula offered as well as whether they received breastfeeding and nutrition information and education from their WIC site. The WIC program promotes breastfeeding as the optimal infant feeding choice unless there are medical reasons contraindicating it.²⁷ The interview asked women who joined WIC prenatally whether they “think that WIC recommends breastfeeding only, formula feeding only, or that both are equally ok?” As Table 2-7 shows, 40 percent of the WIC prenatal population believes that WIC recommends breastfeeding only, whereas 58 percent believe that WIC recommends both breastfeeding and formula feeding equally. The majority of women are aware of the exclusive breastfeeding package but only about half know about how the quantity of formula varies with breastfeeding and the baby's age. Seventy-two percent of prenatal women say they received information on breastfeeding, whereas 92 percent report they received information on diet.

Table 2-7. WIC program awareness

WIC program awareness and utilization	Percentage of all prenatal mothers
Woman believes: WIC recommends	
Breastfeeding only	40.7
Formula feeding only	0.5
Both are equally ok	57.9
Don't Know	0.9
Exclusive breastfeeding package is offered at WIC clinic	
Yes	63.5
No	5.4
Don't Know	31.1
Amount of infant formula varies with age of baby	
Yes	49.1
No	8.0
Don't Know	42.9
Amount of infant formula varies with how much breastfeeding	
Yes	51.8
No	6.8
Don't Know	41.4
Woman reports receiving: Breastfeeding information	
Yes	71.7
No	27.8
Don't Know	0.5
Information on eating	
Yes	91.8
No	8.0
Don't Know	0.2
Unweighted n ^a	2,649
Weighted n	395,398

^a n is the number of respondents to the last question in the table. For some questions, n is slightly different due to item nonresponse.

Data source: Prenatal interview questions WC1, WC2, WC3, WC4, WC5 and WC6.

²⁷ <http://www.fns.usda.gov/wic/breastfeeding-promotion-and-support-wic>

Investigation of this 20 percentage point disparity in the types of information received revealed that the intention to formula feed was not a factor in the information given but that having previous children and being in the first trimester of pregnancy both lowered the likelihood that a woman received breastfeeding information. For very different reasons, both these groups may not be interested in breastfeeding information at their initial WIC visit. Although the percentage of women getting breastfeeding information varies with whether a woman has had previous children or is in her first trimester, the differences are not large enough to explain the overall disparity. The more important factor in determining if a woman gets information on breastfeeding appears to be her WIC site. At 13 of the 80 WIC sites participating in this study, more than 40 percent of study participants indicated that they did not receive breastfeeding information. At one site, 60 percent of women indicated that they did not receive the information. The variation suggests that WIC site characteristics or policies may be responsible for the disparity in types of information received. Followup testing revealed that sites located in states that allow only staff with college degrees and/or credentials (licensed practical nurse (LPN), registered nurse (RN), registered dietitian (RD), dietetic technician (DT)) to provide nutrition education had a greater proportion of women (11 percentage points higher) indicating that they received breastfeeding information.²⁸

2.6 Intentions to Breastfeed

To measure breastfeeding intentions, the study team used the infant feeding intentions (IFI) scale based on the methodology put forward by Nommsen-Rivers et al. (2009), as their work is generalizable within low-income groups in the United States. We examined how intentions vary by socio-demographic characteristics within the WIC-participating prenatal population, and explored the relationship between beliefs and intentions.

Using the IFI scale, the interview asked respondents to indicate their levels of agreement using a standard 5-point Likert scale with the following five statements:

- I am planning to only formula feed my baby and do not plan to breastfeed at all.
- I am planning to breastfeed my baby or at least try.

²⁸ State policy requiring staff that provides nutrition education to have college degrees and/or credentials may influence the style or comprehensiveness of nutrition education interactions with participants; therefore, we use the policy variable as an approximate measure of state emphasis on comprehensive nutrition education.

- When my baby is 1 month old, I will be breastfeeding without using any formula or other milk.
- When my baby is 3 months old, I will be breastfeeding my baby without using any formula or other milk.
- When my baby is 6 months old, I will be breastfeeding my baby without using any formula or other milk.

Each response was assigned a value ranging from 0 to 4, with 4 being the most positive score for all but one question in which the scale is reversed. Responses were then summed to get the IFI scale, which ranges from 0 to 16, with higher scores indicating stronger intention to breastfeed. The mean IFI scale for the WIC prenatal population is 9.8. Nommsen-Rivers and Dewey (2009) found a mean score of 11.8 in their sample of low-income women who were pregnant with their first child. Similarly, looking only at those in the prenatal cohort who are pregnant with their first child, the mean IFI score rises to 10.2.

The study examined how the mean IFI score varies by socio-demographic subcategories, performing group comparisons²⁹ to determine whether differences between means are statistically significant.³⁰ We created a base group within each socio-demographic variable to which the other groups are compared. The base group is the socio-demographic subcategory with the highest frequency of responses. Table 2-8 presents the subgroup means and t-statistics. To facilitate reading the table, we highlight all the statically significant differences: cases in which the means are higher than the base case are highlighted in rose, whereas cases in which the means are lower than the base case are highlighted in blue.

Numerous socio-demographic variables, when examined separately, are associated with an individual's intent to breastfeed. Being Hispanic, married, participating in Federal programs other than SNAP, income relative to the poverty guidelines, having breastfed previously for more than 3 months, and educational attainment are all statistically significant factors associated with higher intentions to breastfeed. In contrast, being African American, being pregnant with a second child, having been on WIC previously, not living with the baby's father, and engaging in discussions about infant feeding plans with no more than one person are statistically significant characteristics that are associated with lower mean intentions to breastfeed. One unexpected finding that differs from the

²⁹ Pairwise t-tests.

³⁰ Appendix C1 presents the distribution of mean IFI scores by these key socio-demographic variables.

Table 2-8. Comparison mean infant feeding intention (IFI) index by socio-demographic factors

Socio-demographic	Mean	t-stat
Race		
African American ^a	9.2	-2.71
All Other	10.2	1.03
Base Group: White	9.9	-
Ethnicity		
Hispanic or Latino ^a	10.2	2.98
Base Group: Not Hispanic or Latino	9.5	-
Maternal Marital Status		
Married ^a	10.5	4.46
Base Group: Not married (including widowed or divorced)	9.5	-
Food Security (measured using 6-item module)		
Low Food Security	9.8	-0.23
Very Low Food Security	10.0	0.65
Base Group: High or Marginal Food Security	9.8	-
Participation in non-WIC benefit program(s)		
Participate in other programs excluding SNAP ^a	10.0	2.74
Does not participate in any other benefit programs ^a	10.7	5.87
Base Group: Participates in SNAP or in SNAP and other programs	9.4	-
Parity		
Second born	9.6	-2.35
Third or subsequent born ^a	9.5	-3.17
Base Group: First born	10.2	-
Timing of WIC Enrollment		
1 st trimester	10.2	1.97
3 rd trimester	9.2	-1.97
Base Group: 2 nd trimester	9.8	-
Weight Status of Mother before Pregnancy		
Obese	9.9	0.66
Overweight	9.9	0.87
Base Group: Normal or underweight	9.7	-
Poverty Level		
Above 75% but no more than 130% of poverty guideline ^a	10.2	3.18
Above 130% of poverty guideline ^a	10.5	3.08
Base Group: 75% of poverty threshold or below	9.6	-
Breastfeeding History		
Three or less months	9.2	-1.26
More than three months ^a	11.0	6.66
Base Group: No History	9.5	-
Education		
More than High School ^a	10.5	5.78
Base Group: High School or Less	9.4	-
Born in US		
Mother is not born in US	10.0	1.48
Base Group: Mother is born in US	9.7	-
Prior WIC Receipt		
Has received benefits from WIC for 3 or more years in total ^a	9.5	-2.72
Has received benefits from WIC for up to 2 years in total ^a	9.6	-2.54
Base Group: Never received benefits from WIC before this pregnancy	10.2	-
Mother living with father of the baby		
Mother not living with father of the baby ^a	9.2	-4.97
Base Group: Mother living with father of the baby	10.3	-
Conversations about infant feeding plans		
Spoke with one person or none ^a	8.5	-5.68
Base Group: Spoke with two or more people	10.0	-

^a Mean is significantly different from base group mean at $p \leq 0.05$.

Data Source: Prenatal interview questions KA1, KA2, KA19a-e, SD14, SD15, SD18, SD21, SD36-40, and MH29. Screener questions SD2, SD3 and SD4. Log question 20.

Rose indicates mean is statistically significantly higher than base case. Blue indicates mean is significantly lower than the base case.

literature is that the mother being born outside the United States does not influence the intention to breastfeed. It may be the case that the majority of women in our sample not born in the United States may have come here as children and have been acculturated.

2.7 Multivariate Analysis of Beliefs and Intentions

Because breastfeeding intentions are influenced by a variety of socio-demographic characteristics that are themselves correlated, we used multivariate regression analysis to estimate the independent effects of these variables on intention. This analysis parsed out the effect of each explanatory variable while holding constant the effects of the others. Our conceptual model hypothesizes that beliefs influence intentions; therefore, the initial regression model estimated IFI scores using the belief indices constructed earlier, and all the socio-demographic variables that were significantly associated with mean IFI scores (see Table 2-8). These background variables are proxies for cultural influences, support systems, personal experiences, and education that influence infant feeding intentions. This multivariate model captures the essential relationships of the theoretical model between background characteristics, experiences, beliefs, and infant feeding intentions.

The initial regression model revealed that, after including beliefs, only a few of the socio-demographic variables remained significant in explaining differences in IFI scale scores. This is not surprising, as we expect the impact of socio-demographic variables is through shaping beliefs rather than having a direct effect on intentions. Additionally, some of the measures, such as marital status and living with the father, are highly correlated and their effect was captured by one variable. We explored several variants of regression models consistent with our Infant Feeding Practices Model that used different combinations of socio-demographic variables. We eliminated the background characteristics that were significant individually but not significant in the multivariate context.³¹ These were race, ethnicity, marital status, participation in non-WIC benefits, poverty level, and prior WIC receipt. For parsimony, we collapsed socio-demographic categories from three to two if all were significant in comparison to the base group in Table 2-9.

Table 2-9 summarizes the results of the final regression model. The model explains nearly 34 percent of the variability in IFI scores. The belief indices are highly significant and the sign on each coefficient is as expected: holding all else constant, the benefits index is positively associated

³¹ Although past studies indicate race is predictor of breastfeeding behavior, we found that once beliefs are controlled for, race is no longer significant. This held true for model specification with race alone and in conjunction with ethnicity.

with increases in the IFI scale and the barrier index is negatively associated with the IFI scale. Parity, breastfeeding history, education, and mother living with the father all have the expected signs. All else held constant—education, previous breastfeeding experience, mother living with the father, and speaking to multiple sources about infant feeding plans increase intentions to breastfeed, whereas having previous children lowers the intention to breastfeed. The regression coefficients are reported in Appendix B3a.

Table 2-9. Summary of statistically significant regression results of the effect of belief indices and socio-demographic variables on IFI scale

Explanatory variable	Effect on IFI score
Perceived Benefit Index	Higher if more perceived benefits
Perceived Barrier Index	Lower if more perceived barriers
Parity: Second or subsequent born compared to first born	Lower if second or subsequent born
Breastfeeding History: Some history compared to no history	Higher if some history
Education: More than high school compare to less than high school	Higher if more education
Mother living with father of baby	Higher if living with father
Spoke with more than one person about infant feeding plans compared to one or less	Higher if spoke with more than one person

Data source: Prenatal interview questions KA18, KA19a-e, KA22, SD15, KA1,KA2, KA6, SD26, and SD20.

2.8 Summary

There have been substantial changes in WIC prenatal mothers' perceptions of breastfeeding since the WIC IFPS-1. The perceived benefits and barrier model put forward in the past study remains robust for benefits as the benefit statements still appear to represent a thematic construct. However, the model is not robust for barrier statements, which no longer seem to represent a single concept. Women today are much more positive about breastfeeding than they were nearly 20 years ago during the WIC IFPS-1. A higher percentage of women report agreeing with the benefits of breastfeeding and a much smaller percentage report agreeing with most barriers than in the past. Both the percentages of women affirming individual benefits statements as well as the overall benefit index score suggest that among racial/ethnic groups, Hispanics are the most positive about the benefits of breastfeeding and African American are the least positive. This relative ranking has remained unchanged since WIC IFPS-1. In contrast, the results on barriers suggest that these attitudes do not vary systematically with race, ethnicity, or education and that the changes over time do not follow a consistent pattern by these demographic variables.

The analysis of the intention to breastfeed reveals that a variety of socio-demographic factors are individually related to one's feeding intention. However, most of these socio-demographic variables appear to influence, or serve as proxies for, beliefs. After controlling for beliefs in the regression analysis, only a few socio-demographic variables continued to have a direct effect on a woman's feeding intentions. The next chapter addresses breastfeeding initiation, utilizing data from the 1-and 3-month interviews. These interviews provide a richer set of circumstance variables, allowing for more in-depth analyses of the factors that influence the decision to breastfeed.

3.1 Overview

This chapter focuses on factors associated with breastfeeding initiation, including hospital experience. The timeframe runs from birth through 1-month postpartum. Topics addressed in this chapter include the following:

- What is the breastfeeding initiation rate for study mothers?

*Examples of research questions addressed:*³²

- Do study mothers initiate breastfeeding in the hospital?
- How does the rate of initiation compare to past rates, and those found in other studies?

- What characteristics and experiences are associated with breastfeeding initiation among study mothers?

Examples of research questions addressed:

- Was the mother encouraged to breastfeed her infant? If so, by whom?
- Are neonatal circumstances associated with breastfeeding initiation?

- What are the birth hospital experiences of study mothers?

Examples of research questions addressed:

- What is the first feeding of study infants in the hospital?
- How long after birth was breastfeeding initiated?
- What are mothers' reported breastfeeding problems while in the hospital? Among those who had common breastfeeding problems, what are the number and percent receiving help from the hospital staff?
- What, if any, hospital supports for breastfeeding did the mother use?

³² A complete list of research questions is in Appendix A.

- What are the feeding practices of study mothers at hospital discharge?

Examples of research questions addressed:

- What was the type(s) of feeding at hospital discharge?
- What characteristics and experiences are associated with breastfeeding at hospital discharge?

- What are the feeding practices of study mothers at 1-month postpartum?

Examples of research questions addressed:

- What is the mother's practice regarding breastfeeding and formula feeding within the first few weeks of life?
- Does receipt of an in-hospital gift package relate to feeding practices at 1-month postpartum?
- What factors contribute to a study participant being successful at breastfeeding her infant during the first few weeks of life?

3.2 Background

Efforts to Promote Breastfeeding. As summarized in Chapter 2, since the last major study of the infant feeding practices of WIC participants in 1994, there have been several national efforts to promote breastfeeding among the WIC population. Promotion initiatives included increasing spending on breastfeeding outreach, providing breastfeeding aides such as breast pumps, supplying peer counseling, and offering an enhanced food package (VII) for women who exclusively breastfeed (Oliveira et al., 2002). In 1997, the U.S. Department of Agriculture (USDA) began a national breastfeeding promotion campaign called *Loving Support Makes Breastfeeding Work* to encourage WIC participants to breastfeed. The campaign is used to varying degrees by all WIC programs. It employs a social marketing strategy, and features mass media, educational materials, technical assistance and training, and partnerships to build “breastfeeding-friendly communities” (Whitford, 2011). In addition, there were major changes to WIC food packages in 2009 to make them consistent with established dietary recommendations for infants and young children. The new packages encourage and support breastfeeding by providing (1) a greater quantity and variety of foods to fully breastfeeding mothers and their infants, (2) lower quantities of formula to supplement partially breastfed infants, and (3) food for all mothers who extend breastfeeding beyond 6 months (Institute of Medicine, 2006).

In parallel to WIC's increasing emphasis on breastfeeding, numerous Federal agencies and national organizations have engaged in breastfeeding promotion and policy activities. In 1997, the American Academy of Pediatrics (AAP) released its policy statement "Breastfeeding and the Use of Human Milk." The policy, and subsequent updates, underscores the importance not only of breastfeeding initiation, but also duration and exclusivity (Eidelman et al., 2012). In 1998, the U.S. Breastfeeding Committee (USBC) was established through a partnership among breastfeeding advocates and several Federal agencies³³ with a mission "to improve the Nation's health by working collaboratively to protect, promote, and support breastfeeding" (USBC, 2001). Since the formation of the USBC, many Federal initiatives have promoted breastfeeding including Healthy People 2010 and 2020 (HHS/ODPHP, 2010), the Surgeon General's Call to Action to Support Breastfeeding (HHS, 2011), and breastfeeding support provisions in the 2010 Patient Protection and Affordable Care Act.

There has also been growing recognition of the important roles hospitals play in supporting breastfeeding. Building on international initiatives, the Baby Friendly USA (BFUSA) was established in 1997 as the accrediting body and national authority for Baby-Friendly Hospital Initiative (BFHI) in the United States. The goal of BFHI is to give mothers the information, confidence, and skills necessary to successfully breastfeed. BFHI designation requires hospitals to provide training for all levels of staff, and to adopt evidence-based practices that support breastfeeding.³⁴ Although there is increased emphasis on Baby-Friendly Hospital Practices, and more hospitals are embracing this approach, most U.S. hospital practices still do not conform to the international recommendations (Centers for Disease Control and Prevention (CDC), 2011). In an effort to increase the number of Baby-Friendly hospitals in the United States, Best Fed Beginnings was launched in 2011 to provide coaching to hospitals, raise awareness of BFHI, and support community-based breastfeeding coalitions.

Trends in Breastfeeding Rates. The increased emphasis and support of breastfeeding has affected breastfeeding initiation rates in the United States. Over the past 20 years, there has been a substantial increase in the overall breastfeeding initiation rates (CDC, 2013; McDowell, Wang, & Kennedy-Stephenson, 2008) as well as among WIC participants (Johnson et al., 2013). While WIC participation has been associated with lower rates of breastfeeding initiation (Deming, Briefel, & Reidy, 2014; Ryan & Zhou, 2006), there is evidence that breastfeeding initiation among WIC women

³³ USDA, CDC, the U.S. Department of Health and Human Services' (HHS) Maternal and Child Health Bureau, and the HHS Office on Women's Health.

³⁴ For a list of the 10 required steps, see <https://www.babyfriendlyusa.org/about-us/baby-friendly-hospital-initiative/the-ten-steps>.

is improving. Joyce and Reeder (2014) analyzed data from the Pregnancy Risk Assessment Monitoring System (PRAMS), the Pediatric Nutrition Surveillance System (PedNSS), and the National Immunization Survey (NIS) from 2004-2010. Across all three sources, the percentage of ever breastfed children has consistently risen among infants on WIC and among all infants.

Factors Affecting Breastfeeding Initiation. Research shows that breastfeeding initiation rates vary significantly by socio-demographic factors. Disparities in breastfeeding initiation rates among racial and ethnic groups are well documented (CDC, 2006; CDC, 2010; Li & Grummer-Strawn, 2002). Despite progress, African American women have significantly lower rates of initiation than other racial groups (CDC, 2013; Marshall et al., 2013). Among low-income women, Hispanic women are more likely to initiate breastfeeding than their non-Hispanic counterparts (Hurley et al., 2008). Differences by education and nativity status have also been found. More highly educated women have higher rates of breastfeeding initiation than their less educated counterparts (Heck et al., 2006). Immigrants are more likely to breastfeed than native-born women (Celi et al., 2005).

In addition to socio-demographic characteristics, past experience, family circumstances, and economic situation affect women's likelihood of breastfeeding. Meyerink and Marquis (2002) found that, among low-income women in Alabama, initiating breastfeeding was positively correlated with previous breastfeeding experience. In contrast, Sutherland et al. (2012) found that breastfeeding initiation decreases with the number of deliveries. Previous research has also shown that women have a lower likelihood of initiating breastfeeding if they are food insecure during pregnancy (Brown et al., 2013); receive benefits from the Federal Supplemental Nutrition Assistance Program (SNAP) (Darfour-Odura & Kim, 2014); have low poverty income ratios (Li et al., 2005); or expect to work full-time postpartum (Fein & Roe, 1998).

Positive support, both from family and providers, affects the likelihood that a woman will initiate breastfeeding as well as the duration. Support from the infant's father (Arora et al., 2000; Bar-Yam & Darby, 1997) and from family and friends (Dennis, 2002; Raj & Plictha, 1998) can increase the likelihood that a mother will initiate breastfeeding. Although the AAP endorses breastfeeding as safe for women who smoke (Gartner et al., 2005), research has demonstrated that many pediatricians incorrectly believe that breastfeeding is contraindicated for women who smoke (Lucero et al., 2009). Women who smoke during pregnancy are less likely than nonsmokers to initiate breastfeeding (Weiser et al., 2009).

While socio-demographic factors have been the most widely documented in their influence on breastfeeding behavior, birth circumstances also matter. Delivery mode, birth complications, and

prematurity status have all been demonstrated to impact breastfeeding initiation (Dewey et al., 2003). Cesarean delivery, compared with giving birth vaginally, is associated with both a significant delay and lower overall rates of breastfeeding initiation (DiMatteo et al., 1996; Rowe-Murray & Fisher, 2002; Thulier & Mercer, 2009; Zanardo et al., 2010). Infant prematurity and/or low birth weight status is also associated with lower rates of breastfeeding initiation (e.g., Li et al., 2002; Merewood et al., 2006). In a comprehensive study of all Massachusetts births in 2002, breastfeeding initiation rates were lowest among preterm infants of the youngest gestational ages.

Finally, Baby-Friendly Hospital Practices are associated with both higher rates of breastfeeding initiation and exclusivity (Merewood et al., 2005; Philipp et al., 2001) as well as increases in duration (DiGirolamo, Grummer-Strawn, & Fein, 2008; Murray, Ricketts, & Dellaport, 2007). Furthermore, the higher breastfeeding rates at U.S. Baby-Friendly hospitals transcend demographic factors that are traditionally linked to low breastfeeding rates (Merewood et al., 2005). A study of hospitals in Alabama found that breastfeeding initiation rates were greater with the following practices in place: new employees' breastfeeding education, nurses' receipt of breastfeeding education in the past year, prenatal breastfeeding classes offered, having a lactation coordinator, and having a written breastfeeding policy (Li et al., 2014).

Some hospitals also provide gift packages to new mothers upon discharge. These may contain items that subtly discourage breastfeeding, particularly with regard to duration or exclusivity. There is some evidence that women receiving gift packs with formula are less likely to initiate breastfeeding (Langellier et al., 2014), and a substantial body of research has shown that gift packs containing formula reduce the duration of exclusive breastfeeding and breastfeeding overall (Bergevin, Dougherty, & Kramer, 1983; Dungy, Christensen-Szalanski, Losch, & Russell, 1992; Langellier et al., 2014; Rosenberg, Eastham, Kaschagen, & Sandoval, 2008; Snell et al., 1992). Less research has been done on providing pacifiers or bottles in gift packs specifically; but evidence shows that avoiding pacifier use in the hospital itself promotes longer duration of breastfeeding (DiGirolamo et al., 2008), and introducing pacifiers early after hospital discharge is associated with shorter duration of any breastfeeding and reduced exclusivity of breastfeeding (Howard et al., 2003).

3.3 Sample and Analysis Approach

Study participants are asked questions about breastfeeding initiation in both the 1- and 3-month interviews. However, the number of interviews study participants take varies with whether they

joined WIC pre- or postnatally and are in the core or supplemental samples. Table 3-1 summarizes the interviews women were eligible for based on the sample they are in and when they joined WIC. The primary focus of the 1-month and 3-month interviews differed but both interviews included questions on breastfeeding initiation and initial problems. The 1-month interview also sought information on the mother's hospital experience, including breastfeeding supports.

Table 3-1. Interview eligibility by sample group and timing of when women joined WIC

Sample and timing of when the woman joined WIC	Interviews		
	Prenatal	1 Month	3 Month
Core			
Joined prenatally	✓	✓	✓
Joined postnatally before child was 6 weeks		✓	✓
Joined postnatally when child was 6-12 weeks old			✓
Supplemental			
Joined prenatally		✓	
Joined postnatally before child was 6 weeks		✓	
Joined postnatally when child was 6-12 weeks old			✓

Table 3-2 presents the number of respondents for each of the three initial interviews. The sum of unique respondents who answered at least the 1-month or the 3-month interview comprises the main analysis sample. Findings in this report are drawn from the analysis sample unless otherwise stated. All responses are weighted so that findings reflect the WIC population as described in Chapter 1. Percentages are based on valid responses to questions; meaning that missing responses, responses of “Don’t Know,” and refusals to answer the question are excluded from calculations unless otherwise stated. When available, we present data from the WIC IFPS-1 alongside current findings so that change over time can be evaluated.

Table 3-2. Number of respondents by interview month and main analysis sample

Sample structure	Prenatal interview	1-Month interview	3-Month interview	Analysis sample
Core prenatal sample	2,649	2,424	2,399	2,596
Core postnatal sample	NA	310	389	424
Supplemental prenatal sample	NA	546	43	589
Supplemental postnatal sample	NA	118	50	168
Total	2,649	3,398	2,881	3,777

NA denotes not applicable.

The analysis in this chapter begins by assessing whether background characteristics are associated with breastfeeding milestones using bivariate analysis, which consider the impact of each variable individually on the outcome of interest. To examine whether the difference between two specific subgroups is statistically significant (for example whether breastfeeding initiation rates are

significantly different between White and African American women), we conduct followup tests between pairs of subgroups. As many socio-demographic factors are known to affect infant feeding practices, Appendix C2 presents each variable of interest crossed by a series of socio-demographic variables as well as provides more detailed analyses on a number of topics. This appendix serves as a reference for answering how the results differ by WIC participant characteristics.

We use multivariate regression analyses to identify the factors that influence the breastfeeding decision as well as their relative importance. Regression analysis accounts for the fact that the decision to initiate breastfeeding is jointly determined by a variety of variables by isolating the effect of individual influences while holding the others constant.

Because bivariate and multivariate analyses each address important but different questions, in the sections that follow we first explore factors that affect breastfeeding outcomes through bivariate analyses and followup tests, and then through multivariate regression analyses, to create a full picture of the variables associated with breastfeeding initiation.³⁵

3.4 Breastfeeding Initiation Among Study Participants

The WIC ITFPS-2 survey data reveal that breastfeeding initiation rates have risen dramatically since the WIC IFPS-1 20 years ago. The current breastfeeding initiation rate is 83 percent—a

Breastfeeding Initiation Rate for Study Participants Is 83 percent

Rose by 27 percentage points since 1994

27 percentage point increase, and a 48 percent increase—from the 56 percent initiating breastfeeding reported in the WIC IFPS-1. This large increase in breastfeeding initiation mirrors the national trend and is corroborated by other data series that collect breastfeeding initiation information on WIC participants.

Alternative sources of data uniformly show that breastfeeding initiation rates have dramatically increased over time in the United States overall. In Table B3b-1 in Appendix B3b, the NIS, the National Health Examination and Nutrition Study (NHANES), the Ross Products Division Abbott Laboratories Survey (Ross Mothers Survey), and PedNSS all reveal a substantial increase in breastfeeding initiation rates over the past 20 years both nationally and among those participating in WIC. We use the NIS as our primary benchmark because it is ongoing. Figure 3-1 presents

³⁵ See Chapter 1 for a more detailed description of analysis approaches.

breastfeeding initiation rates among WIC recipients as compared to the NIS estimates for 1994 and 2013. Because the NIS does not span the entire period between 1994 and 2013, we use straight-line extrapolation based on the annual rate of change over existing years, to estimate the initiation rates over the full 20-year period. In 1994, the WIC IFPS-1 estimated the breastfeeding initiation rate to be 56 percent. That same year, extrapolated NIS data suggest that 57 percent of women on WIC initiated breastfeeding. By 2013, the WIC ITFPS-2 finds the breastfeeding initiation rate is 83 percent, while the extrapolated NIS measures the rate to be 74 percent. The WIC ITFPS-2 estimates that the breastfeeding initiation rate rose by 27 percentage points over the past 20 years while the NIS estimates a more modest gain of 17 percentage points.³⁶

Figure 3-1. Breastfeeding initiation rates 1994 and 2013, WIC IFPS-1, WIC IFPS-2, and NIS

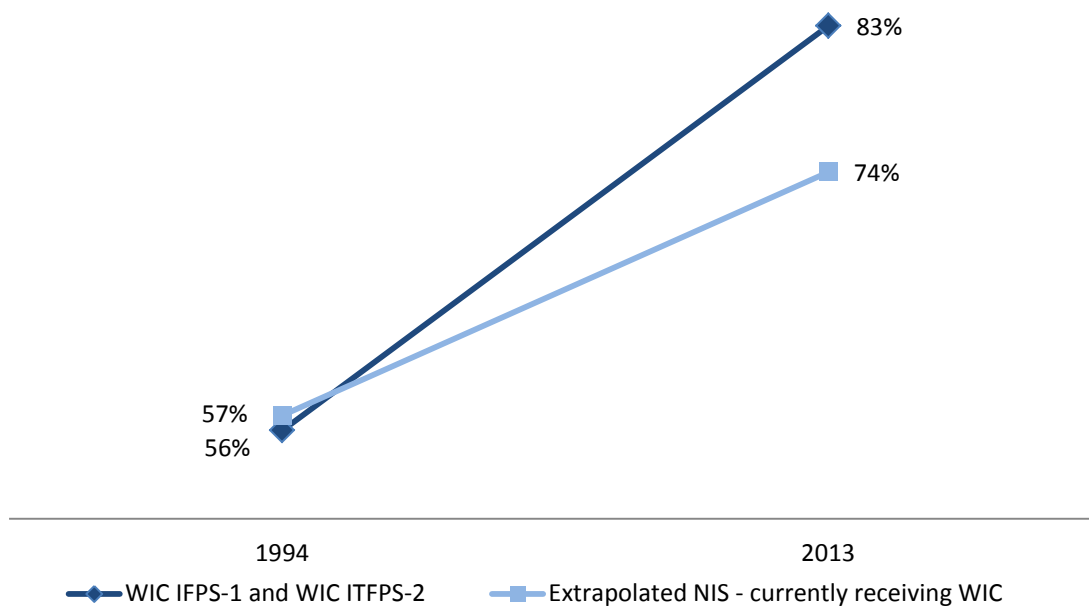


Table B3b2-1 in Appendix B3b contains more detail on data presented here.

³⁶ The NIS surveyed families with infants ages 19-36 months and asked retrospectively about breastfeeding initiation. Such long recall periods can lead to both increased errors in reporting, and a tendency to discount initiation attempts that did not result in long-term breastfeeding. The WIC IFPS-1 and WIC ITFPS-2 approach of detailed questions about initiation may reduce such errors.

3.5 Factors Associated with Breastfeeding Initiation

Past research has shown that the decision to breastfeed is related to one's personal views, characteristics, and experiences. Factors such as intentions, socio-demographic characteristics, experiences, family factors, economic situation, and support in the hospital and at home are all associated with likelihood of initiating breastfeeding. In the following sections we present the relations between these individual characteristics, circumstances, and experiences and breastfeeding initiation using bivariate analyses. Subsequently, we use multivariate analysis to explore the independent effects of these factors when other potentially overlapping influences are held constant.

3.5.1 Intentions

As expected, intentions to breastfeed are highly correlated with breastfeeding initiation. Table 3-3 displays the breastfeeding initiation rates of those who joined WIC prenatally by their Infant Feeding Intentions (IFI) scale score. The survey asked prenatal women five questions regarding their intentions to breastfeed in order to develop each woman's IFI scale score (Nommsen-Rivers & Dewey, 2009). The score is intended to reflect the respondent's likelihood of breastfeeding. Table 3-3 indicates that IFI scores are highly correlated with breastfeeding initiation rates. Women with the highest scores (16) uniformly initiated breastfeeding regardless of race or ethnicity. Those with the lowest range of scores (0-3.5) had the lowest percentages of women initiating breastfeeding. Interestingly, more than 70 percent of women with modest intention scores (4-7.5) initiate breastfeeding. Also, noteworthy is the relative weakness of the IFI score in explaining differences in breastfeeding initiation for women of other races and Hispanics. For these groups, even women who have a low IFI (4-7.5) have a high probability of initiating breastfeeding (more than 80 percent).

3.5.2 Background Characteristics, Support, and Neonatal Circumstances

There are a host of background characteristics that are associated with initiating breastfeeding. Similar to many previous studies, the study team first used bivariate analyses to assess if breastfeeding initiation rates differ by various background characteristics. This approach considers each background variable separately in determining if it is associated with breastfeeding initiation. This analysis confirms past findings that socio-demographic influences include race, ethnicity, nativity status, marital status, and education. Additionally, past experience and current circumstances

associated with higher breastfeeding rates include having previously breastfed, not smoking during pregnancy, the father living in the home, not participating in other benefits programs, higher income levels, and not smoking during pregnancy. Support from family members, WIC, physicians, and the hospital staff are all important factors influencing initiation. In contrast, the study also finds that with the large increases in breastfeeding initiation rates, a few variables, such as mother's age, are no longer associated with differences in initiation rates. Similarly, neonatal circumstances no longer appear to impede breastfeeding initiation.

Table 3-3. Percentage of prenatally enrolled study mothers within IFI scale score ranges who initiate breastfeeding by race and ethnicity

IFI Scale	Percentage women who joined WIC prenatally that initiate breastfeeding					
	All ^a %	Race			Ethnicity	
		African American %	White %	Other %	Hispanic %	Non-Hispanic %
0 – 3.5						
Initiated breastfeeding	15.6%	10.2%	14.2%	38.4%	29.8%	11.2%
Unweighted n	95	31	56	8	18	77
Weighted n	13,952	4,994	7,284	1,674	3,330	10,622
4 – 7.5						
Initiated breastfeeding ^b	70.8	67.6	66.4	90	82.4	61.6
Unweighted n ^b	499	138	290	71	190	309
Weighted n ^b	75,553	19,572	43,336	12,645	33,331	42,222
8 – 11.5						
Initiated breastfeeding ^b	88.6	83.2	87.8	95	93.6	83.8
Unweighted n ^b	890	180	538	172	389	501
Weighted n ^b	135,568	23,790	81,349	30,429	67,719	67,850
12 – 15.5						
Initiated breastfeeding ^b	96.6	91.2	97.6	98.4	98.8	94.2
Unweighted n ^b	682	130	425	127	316	366
Weighted n ^b	100,259	19,355	59,207	21,697	51,136	49,123
16						
Initiated breastfeeding	100	100	100	100	100	100
Unweighted n	156	25	108	23	58	98
Weighted n	21,957	3,683	13,932	4,342	9,828	12,129

^a n is less than 2,649 due to item nonresponse to question HF9.

^b Chi-square statistic testing on differences of breastfeeding initiation rates and ethnicity given IFI scale score is significant at $p \leq 0.05$.

The analysis also examines whether differences between WIC service sites affect breastfeeding initiation using summary site-level measures that reflect characteristics of each of the WIC ITFPS-2 selected WIC sites. These summary “composite measures” capture site-level differences in how

breastfeeding peer counseling and breastfeeding education and support are delivered, and site-level differences in staff education. All the composite measures are positively associated with initiation rates.

Background Characteristics

Table 3-4 shows breastfeeding rates by select background characteristics and compares the current findings to those from the WIC IFPS-1. The table shows that breastfeeding initiation rates have increased across all socio-demographic subgroups.

Furthermore, similar to the WIC IFPS-1, bivariate analysis of the current data reveals that breastfeeding initiation rates vary significantly by virtually all the socio-demographic variables listed in Table 3-4.

Summary of Characteristics Associated with Higher Breastfeeding Initiation Rates

	<i>Bivariate</i>
<i>Race:</i> Other (other than White or African American)	✓
<i>Ethnicity:</i> Hispanic	✓
<i>Nativity:</i> Non-US born	✓
<i>Marital status:</i> Married	✓
<i>Education:</i> >than high school	✓
<i>Breastfeeding History:</i> Some history	✓
<i>Residency:</i> Father lives with mother	✓
<i>Benefits:</i> Not on SNAP	✓
<i>Poverty level:</i> Over 130 percent threshold	✓
<i>Encouraged by family:</i> Baby's father, mother, or other relative	✓
<i>Supported/Advised:</i> WIC, physician, hospital staff	✓
<i>WIC support:</i> WIC staff calls postpartum	✓
<i>Parity:</i> Fewer than three children	
<i>Health:</i> No smoking during pregnancy	✓
<i>WIC Site-Level Measures:</i>	
Breastfeeding Peer Counseling	✓
Breastfeeding Education and Support	✓
WIC Staff Education	✓

One difference between the WIC IFPS-1 and the WIC ITFPS-2 is that the previous study found the mother's age was associated with breastfeeding initiation while the current study does not. This is explained by the large (38 percentage point) increase in breastfeeding initiation by 16- to 19-year-olds that has brought their rates up to the levels of older mothers. Another noteworthy change over time is the 41 percentage point gain in African American women's breastfeeding initiation rates but this group still has a relatively low initiation rate (74 percent). Subsequent followup testing within socio-demographic categories indicates that mothers in the following socio-demographic sub-groups have significantly higher breastfeeding rates than their counterparts: those who are of a race other than White or African American, Hispanic, non-native born, married, and have more than a high school education and those with incomes over 130 percent of poverty threshold.

Table 3-4. Percentage of study mothers within select socio-demographic groups who initiate breastfeeding

Characteristic ^a	Percentage of study mothers initiating breastfeeding					% Point difference	% Difference
	WIC ITFPS-2			WIC IFPS-1			
	% of study mothers	Un-weighted n	Weighted n	% of study mothers	n		
All mothers	83.4%	3,777	442,905	55.5%	874	27.9	50%
Race ^{b,c}							
African American	74.2	959	94,599	33.5	449	40.7	121
White	84.2	2,226	261,108	52.9	202	31.3	59
Other	91.2	592	87,198	62.3	55	28.9	46
Ethnicity ^{b,c}							
Hispanic ^a	91.8	1,445	204,628	84.2	168	7.6	9
Non-Hispanic	76.2	2,332	238,276	NA		NA	NA
Mother's age at birth ^c							
16-19 years	82.4	446	53,874	44.8	201	37.6	84
20-25 years	82.4	1,569	177,761	57.0	382	25.4	45
26 or older	84.6	1,762	211,269	61.5	291	23.1	38
Nativity status ^{b,c}							
Born in the U.S.	79.0	2,828	312,378	47.7	703	31.3	66
Not born in the U.S.	94.2	949	130,526	88.3	152	5.9	7
Marital status ^{b,c}							
Married	90.2	1,137	142,191	65.8	376	24.4	37
Not Married	80.2	2,640	300,713	47.0	478	33.2	71
Educational attainment ^{b,c,d}							
Grades 1 through 11	80.8	888	109,689	53.2	323	27.6	52
High School Diploma	80.8	1,443	165,591	51.1	366	29.7	58
More than High School	87.6	1,431	165,824	71.1	168	16.5	23
Income poverty threshold ^b							
< 75% of poverty	81.4	2,374	277,693	Not comparable			
> 75% but ≤130% of poverty	86.6	1,021	118,212				
> 130% of poverty	87.2	382	47,000				
Breastfeeding history (months of previous experience) ^b							
No experience	76.2	2,062	237,123	NA			
≤3 months experience	87.4	823	98,493	NA			
>3 months experience	96.0	892	107,288	NA			
Cumulative time in WIC							
Less than 1 year	82.9	250	32,001	NA			
1 to 2 years	82.6	644	82,810	NA			
3 to 4 years	78.3	498	68,915	NA			
5 or more years	82.9	472	65,804	NA			
Parity ^b							
1 st born	84.8	1,576	185,471	55.1	349	29.7	54
2 nd born	85.8	1,018	118,279	57.3	164	28.5	50
3 rd or subsequent born	79.6	1,183	139,155	54.6	348	25.0	46
Father's residence ^{b,d}							
Lives with mother	87.8	2,032	246,567	61.8	380	26.0	42
Doesn't live with mother	78.4	1,739	195,318	51.2	494	27.2	53
Food security (based on 6-item module)							
High or marginal	82.8	1,959	232,232	NA			
Low	84.1	1,174	138,856	NA			
Very low	84.2	644	71,817	NA			

Table 3-4. Percentage of study mothers within select socio-demographic groups who initiate breastfeeding (continued)

Characteristic ^a	Percentage of study mothers initiating breastfeeding					% Point difference	% Difference
	WIC ITFPS-2			WIC IFPS-1			
	% of study mothers	Un-weighted n	Weighted n	% of study mothers	n		
Non-WIC program participation ^b							
Not on any other programs	91.2	601	76,878	NA			
On other program(s) and SNAP	78.2	1,857	209,926	NA			
On other program(s) but not SNAP	86.8	1,319	156,100	NA			
Work status during pregnancy ^b							
Worked during pregnancy	86.0	2,027	230,325	56.2	339	29.8	53
Didn't work during pregnancy	80.8	1,356	168,046	54.6	496	26.2	50
Smoked during pregnancy ^b							
Yes	59.4	433	42,368	NA			
No	86.2	3,334	399,331	NA			

^a There are definitional differences between the current study and the WIC IFPS-1 on some characteristics. The WIC IFPS-1 included race and ethnicity in the same question while the WIC ITFPS-2 asks two separate questions. The WIC IFPS-1 had lower bound of 14 years for age while it is 16 for the current study. The WIC IFPS-1 used 9th grade or less; 10th or 11th grades, 12th grade; more than high school which we mapped to three categories for the WIC ITFPS-2: grades 1-11, high school diploma, more than high school.

^b For the current study, Chi-square statistic testing indicates that the association of this variable with breastfeeding initiation is statistically significant at the 0.05 significance level.

^c For the WIC IFPS-1, Chi-square statistic testing indicates that the association of this variable with breastfeeding initiation is statistically significant at the 0.05 significance level.

^d n is less than 3,777 due to item nonresponse. Also, for the education variable three respondents who indicated that they had had no schooling were excluded. The exclusion is consistent with the previous study.

NA denotes not applicable.

As Table 3-4 further shows, in addition to socio-demographic characteristics, breastfeeding initiation rates also vary by previous experiences and family circumstances. Followup tests of the subgroup percentages reveal that initiation rates rise with duration of previous breastfeeding experience, if the mother lives with the father, and if the mother did not smoke during pregnancy, which is a proxy for risky health behaviors. In contrast, individuals who participate in SNAP, either alone or in conjunction with other benefit programs, have statistically significantly lower rates of breastfeeding initiation than those not on SNAP. Food security does not impact breastfeeding initiation rates and neither does the cumulative time the mother has been on WIC (across all her children). Finally, both work status during pregnancy and parity are associated with breastfeeding initiation based on the Chi-square test, but the more focused followup tests indicate that those who work during pregnancy and those with fewer than three children initiate breastfeeding at higher rates only if a significance level is used that is outside the common standard for significance testing,³⁷ tempering the emphasis that should be placed on these two variables as predictors of breastfeeding initiation. Therefore, we

³⁷ Using a standard of $p < .10$.

cannot robustly conclude that working during pregnancy or parity is correlated with breastfeeding initiation. Neither variable was statistically significant in the WIC IFPS-1.

Support Received

Consistent with the literature, we find that breastfeeding initiation rates are associated with various sources of encouragement including the infant's family members, WIC clinic staff, and medical providers. The findings on encouragement are consistent across all sources, suggesting that getting positive advice and encouragement to breastfeed is an important contributor to the decision making process. Table 3-5 shows how breastfeeding initiation rates vary by sources of encouragement and support. These factors were not examined individually in the WIC IFPS-1. The current interview questions measuring support for breastfeeding within the family asked whether the person has encouraged, discouraged, offered mixed advice, or received no advice regarding breastfeeding. We coded those that indicated they had been encouraged to breastfeed by the family member as a yes and collapsed the other responses and coded them as a no to reflect a lack of strong encouragement. Followup testing reveals that breastfeeding initiation rates are higher for respondents that are encouraged by any family member, are advised by WIC that breastfeeding is better, or have the infant's physician recommended breastfeeding. Additionally, detailed analysis of physician recommendations reveals that women who smoke during pregnancy are significantly less likely to receive the recommendation to breastfeed from their infants' physicians.³⁸

In addition to advising that breastfeeding is better, WIC staff often visit the women in the hospital right after delivery or call sometime after the birth. WIC staff hospital visits are associated with initiation,³⁹ but this correlation is not particularly robust and followup testing reveals that initiation rates are only significantly higher for those receiving visits if a significance level outside the common standard for significance testing is used,⁴⁰ thus reducing the emphasis that should be placed on this finding. Calls by the WIC staff are strongly associated with breastfeeding initiation rates and followup testing indicates that those receiving calls have a significantly higher rate of initiation.⁴¹

³⁸ Approximately 31 percent of women who smoke during pregnancy were encouraged to breastfeed by their infants' physicians while 40 percent of women who did not smoke were encouraged to breastfeed by their infants' physicians.

³⁹ This analysis excluded the small number of women who indicated that they did not need a call.

⁴⁰ Using a standard of $p < .10$.

⁴¹ We also examined whether women's knowledge of the WIC food packages is associated with breastfeeding initiation and found that women who know about the special food package for exclusively breastfeeding do not have higher rates of breastfeeding initiation.

As Table 3-5 shows, whether women feel supported by the hospital staff also is an important contributor to the decision to breastfeed. The 1-month interview asked women about the encouragement they received while in the hospital. To get a broad measure of how support is perceived, the study team aggregated the answers to two questions to reflect the nature and intensity of support at the hospital: (1) “While in the hospital did your doctor, the nurses or other hospital staff encourage you to breastfeed?” and (2) “Was there someone in the hospital whose job it was to help you with breastfeeding, like a lactation consultant or other trained specialist?” If the respondent indicated yes to both questions, support was classified as strong; if she answered yes to either one of the questions, support was classified as moderate; and if she answered no to both questions, support was classified as weak. Not surprisingly, 92 percent of women who reported getting strong support initiated breastfeeding while 74 percent of those reporting moderate support did. Only 48 percent of women who felt they got weak support initiated breastfeeding. Followup testing reveals that the positive relationship between breastfeeding initiation rates and whether respondent that had strong or moderate hospital support is statistically significant.

Table 3-5. Percentage of study mothers within sources of support groups who initiate breastfeeding

Source of support	% of mothers initiating breastfeeding	Unweighted n	Weighted n
Encouraged to breastfeed by father of infant^{a,b}			
Yes	94.0%	2,077	252,752
No	66.4	1,303	145,258
Encouraged to breastfeed by mother of respondent^{a,b}			
Yes	94.4	1,881	228,796
No	69.6	1,500	169,287
Encouraged to breastfeed by other relatives^{a,b}			
Yes	93.8	1,238	148,644
No	78.0	2,146	249,938
Advised by WIC that breastfeeding is better^{a,b}			
Yes	86.2	2,961	352,658
No	64.2	395	42,783
WIC staff visited in hospital^{a,b}			
Yes	87.0	605	69,421
No	83.2	2,117	250,792
WIC staff called^{a,b}			
Yes	90.2	957	108,630
No	81.0	1,785	214,373
Infant's doctor recommends breastfeeding^{a,b}			
Yes	94.0	1,284	156,714
No	77.4	2,079	240,014
Nature of breastfeeding support at hospital^{a,b}			
Strong	92.2	2,446	286,640
Moderate	74.0	924	111,578
Weak	47.6	368	39,782

^a n is less than 3,777 due to item nonresponse.

^b Chi-square statistic testing indicates that the association is statistically significant at the 0.05 significance level.

WIC Site Service Delivery Characteristics

The study also examined whether the WIC site-level composite measures reflecting the quantity and method of service delivery and education of the service providers, were associated with breastfeeding initiation rates.⁴² Composite variables reflecting differences in WIC clinics' policies, service delivery, and staffing were developed to facilitate analysis of the influence of site-level activities on WIC participant feeding choices. These composites were developed using: data from the state and local key informant interviews; the study site profiles, and the site staff surveys. The composites used in these analyses measure differences in how breastfeeding peer counseling and breastfeeding education and support are delivered, and differences in staff education. Differences in service delivery between sites were captured by five composite variables grouped into three conceptual factors: one composite measure for breastfeeding Peer Counseling, two composite measures of breastfeeding education and support for WIC caregivers, and two composite measures of WIC staff education. For the analysis, the team examined whether breastfeeding initiation varied with the composite scores.⁴³ All the composites are statistically significant suggesting that offering more services or using more educated staff members has a positive effect on initiation.

Neonatal Circumstances

Birth complications and subsequent health problems can potentially affect the decision to breastfeed. Figure 3-2 presents data on the frequency of specific birth circumstances that may influence the decision to breastfeed, including the birth of multiple babies, premature birth, a stay in the neonatal intensive care unit (NICU), a stay in the hospital of 3 nights or longer (a proxy for complications), caesarian delivery, and birth weight that is so low or high as to pose a health risk. To be consistent with the WIC IFPS-1, low birth weight is defined at less than or equal to 5 lbs. 9 oz. and high birth weight was 9 lbs. 14 oz. This definition differs from standards consistent with CDC rules for collecting PedNSS data, which define low at-risk and high at-risk birth weights as less than 5 lbs. 8 oz. (2500

Birth Complications Do Not Impede Breastfeeding

No differences in breastfeeding initiation rates based on neonatal circumstances

⁴² See Appendix B2 for details of the WIC site-level composite variables.

⁴³ We used a logistic regression to determine if the composites were statistically significant. We included site dummy variables to control for potentially confounding characteristics of the sites such as site size.

grams) and greater than 8 lbs. 13 oz. (4000 grams), respectively.⁴⁴ Figure 3-2 highlights that only about 2 percent of the births are multiples but nearly 11 percent of study infants are born prematurely and 12 percent require a stay in the NICU. Almost a third of mothers stay in the hospital at least 3 nights and a similar share has caesarian deliveries. Using the WIC IFPS-1 definition for high/low birth weight, approximately 9 percent of births fall outside of the normal weight range.

Figure 3-2. Percentage of study mothers/infants by select birth circumstances

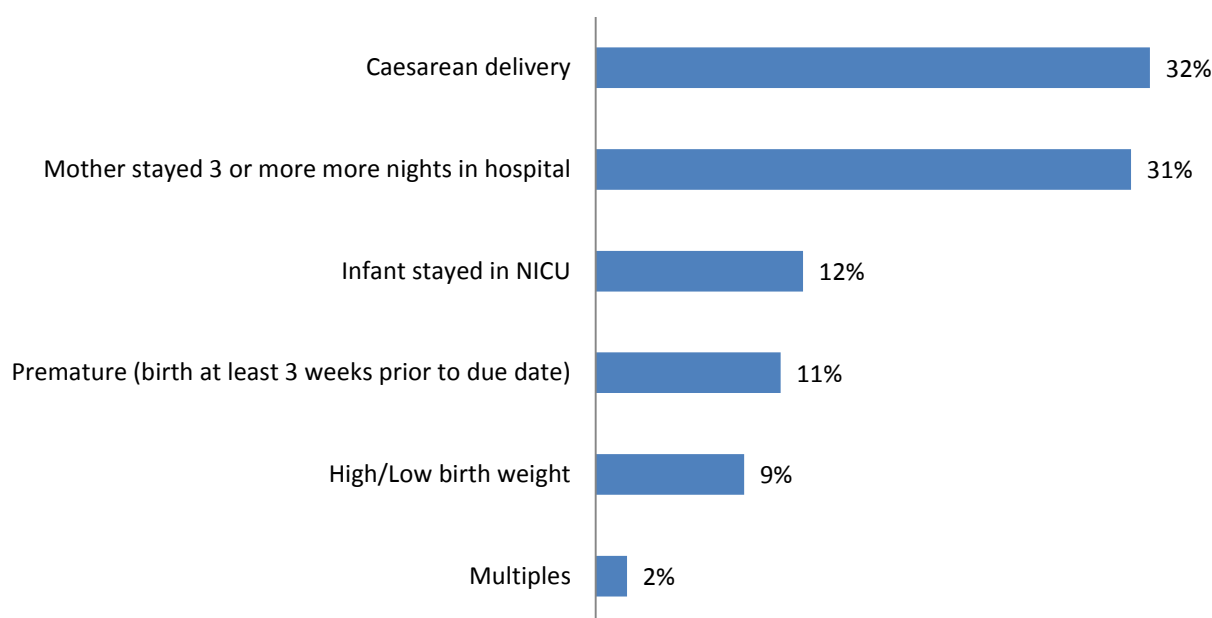


Table B3b-2 in Appendix B3b contains more detail on the data presented in this figure.

Table 3-6 shows the percentage of study mothers who initiate breastfeeding by the select birth circumstances described, including CDC's definitions of birth weights that put infants at risk of health problems. In contrast to many of the findings in the literature, analysis of the current data reveals that breastfeeding initiation rates are not associated with these birth circumstances. The current findings also differ from those in the WIC IFPS-1 which found that breastfeeding initiation rates were associated with birth weight and the mother's length of stay in the hospital. It appears that health issues such as low birth weight or other complications reflected by longer lengths of stay are no longer impediments to initiating breastfeeding. The breastfeeding initiation rate for low

⁴⁴ This definition differs from standards consistent with CDC rules for collecting PedNSS data, which define low at-risk and high at-risk birth weights as less than 5 lbs. 8 oz. (2500 grams) and greater than 8 lbs. 13 oz. (4000 grams), respectively. Data using the CDC definition are reported in Table B3b-2 in Appendix B3b.

weight babies—those below 5 lbs. 9 oz.—rose 48 percentage points between the two studies and the rate for mothers that spend 3 or more nights in the hospital rose by 34 percentage points. These findings likely reflect evolution in attitudes and hospital practices over time. There are two cautions regarding the interpretation of the finding regarding birth circumstances. First, these are relatively blunt measures of potential health complications and within each group there is substantial variation. Severe health circumstance may still impact the likelihood the mother will breastfeed. Exploring this is hampered by the second caution that these are relatively rare events and the sample sizes are small.

Table 3-6. Percentage of study mothers within select birth circumstance groups who initiate breastfeeding

Characteristic	Percentage of mothers initiating breastfeeding					% Point difference	% Difference
	WIC ITFPS-2			WIC IFPS-1			
	% of Mothers	Un-weighted n	Weighted n	% of Mothers	n		
All mothers	83.4%	3,777	442,905	55.5%	874	27.9	50%
Birth weight ^{a,b}							
Low (≤ 5 lbs. 9 oz.)	80.2	277	32,481	32.6	64	47.6	146
Normal	83.8	3,452	405,057	56.4	783	27.4	49
High (≥9 lbs. 14 oz.)	75.0	48	5,367	77.4	26	-2.4	-3
Not at-risk	84.0	2,935	346,752	NA	NA	NA	NA
Low at-risk birth	80.2	219	26,083	NA	NA	NA	NA
weight ^a (≤ 5 lbs. 8 oz.)							
High at-risk birth	84.4	253	28,001	NA	NA	NA	NA
weight ^c (≥8 lbs. 13 oz.)							
Mother's length of stay in hospital ^{b,c}							
0-2 nights	83.8	2,605	301,830	57.8	646	26.0	45
3 or more nights	82.8	1,172	141,075	48.5	212	34.3	71
Type of delivery							
Vaginal	83.6	2,564	293,928	NA	NA	NA	NA
Caesarean	83.2	1,213	148,977	NA	NA	NA	NA
Multiple birth							
Yes	79.4	56	7,478	NA	NA	NA	NA
No	83.6	3,526	413,433	NA	NA	NA	NA
Premature (birth is 3 prior to due date)							
Yes	79.6	356	42,376	NA	NA	NA	NA
No	84.2	3,056	359,078	NA	NA	NA	NA
NICU stay							
Yes	83.7	393	47,301	NA	NA	NA	NA
No	83.8	2,983	349,923	NA	NA	NA	NA

^a Normal birth weight is defined as between 5 lbs. 9 oz. and 9 lbs. 14 oz. and no-risk is weight between 5 lbs. 8 oz. and 8 lbs. 13 oz.

^b For the WIC IFPS-1, Chi-square statistic testing indicates that the association of this variable with breastfeeding initiation is statistically significant at the 0.05 significance level.

^c The subcategories have changed over time. The categories in the WIC IFPS-1 were number of days in the hospital postpartum: 0 or 1, 2, 3, or 4 or more. These days were collapsed to be more consistent with the night reported in this study. Specifically, 0 to 2 days postpartum is reported in the 0-2 nights category and 3 to 4 or more days is reported in the 3 or more nights category.

NA denotes not applicable.

3.5.3 Multivariate Analysis of the Factors That Affect Breastfeeding Initiation

The data clearly indicate that a variety of factors contribute to early breastfeeding success. Nativity status, marital status, education, breastfeeding history, and various sources of support are all associated with breastfeeding initiation when looked at individually. However, many of these factors jointly influence the outcome, making it

Summary of Characteristics Associated with Higher Breastfeeding Initiation Rates

	<i>Bivariate</i>	<i>Regression</i>
<i>Race:</i> Other (other than White or African American)	✓	
<i>Ethnicity:</i> Hispanic	✓	✓
<i>Nativity:</i> Non-US born	✓	✓
<i>Marital status:</i> Married	✓	
<i>Education:</i> >than high school	✓	
<i>Breastfeeding History:</i> Some history	✓	✓
<i>Residency:</i> Father lives with mother	✓	
<i>Benefits:</i> On no other programs	✓	
<i>Poverty level:</i> Over 130 percent threshold	✓	
<i>Encouraged by family:</i> Baby's father, mother, or other relative	✓	✓
<i>Supported/Advised:</i> WIC, physician, hospital staff	✓	✓
<i>WIC support:</i> WIC staff calls postpartum	✓	✓
<i>Parity:</i> Fewer than three children		✓
<i>Health:</i> No smoking during pregnancy	✓	✓
<i>WIC Site-Level Measures:</i>		
Breastfeeding Peer Counseling	✓	
Breastfeeding Education and Support	✓	
WIC Staff Education	✓	

impossible to determine their independent effects on breastfeeding using the bivariate analyses.

Multivariate regression analysis permits the examination of how these factors independently affect breastfeeding decisions while holding all other factors constant. The focus of the regression analysis is on the direction and significance of individual explanatory variables rather than the magnitude of any particular effect.

We use a logistic regression to estimate the likelihood a woman initiates breastfeeding. The dependent variable, or outcome of interest, is dichotomous: if breastfeeding was initiated the variable is set equal to one (1) and if breastfeeding was not initiated the variable is set equal to zero (0). Guided by the behavioral model developed for this study, we considered a variety of potential explanatory variables. We began with a preliminary regression that included all variables associated with breastfeeding initiation based on the bivariate analyses, as well as measures of maternal and infant health suggested by the behavioral model (mother's length of hospital stay, smoking during pregnancy, whether the infant had a NICU stay, and the WIC site service delivery composites).⁴⁵

⁴⁵ The following variables were not significant in the regressions: race, marital status, nativity status, education, NICU stay, income poverty, mother's length of stay (LOS), and the five WIC site composites. The lack of significance of the WIC composites is not surprising in that we have information on the mother's direct experience with WIC which is a more powerful factor affecting her breastfeeding decision than the way her WIC site delivers services.

If potential covariates were highly correlated—e.g., marital status and the father’s residence—they could not be used in the same regression without multicollinearity problems arising: highly correlated variables capture information on the same underlying factor(s) and are basically duplicative. Therefore, with highly correlated variables, the alternative variables were incorporated into the regression separately and Akaike information criteria (AIC) were used to compare models with different alternative measures. When comparing different models, those with lower AIC indicated less information loss. For example, specifications with father’s residence generally had lower AIC statistics than versions with marital status, so we used father’s residence as the explanatory variable in this regression instead of marital status. Additionally, WIC recommending breastfeeding and getting a call postpartum from a WIC staff member are highly correlated. Based in the AIC statistic, we included getting a call from WIC staff in the regression. Finally, we removed variables from the final model that were not close to being statistically significant.

Table 3-7 presents the results from the breastfeeding initiation regression. The study team weighted the data to account for the complex survey design. A total of 3,299 unweighted observations were weighted to represent 389,019 study participants. The signs of the statistically significant covariates are reported. Positive signs indicate that the variable increases the likelihood of breastfeeding. Negative signs imply the variable decreases the likelihood of initiating breastfeeding. For covariates that are not statistically significant, no sign is reported on the coefficient.

As shown in the summary box on page 3-19, many of the background characteristics that prove to be significant individually are also significant in the multivariate content and the directions of the effects are consistent between the analyses. The regression results show that the factors increasing the likelihood of breastfeeding initiation include being Hispanic; being foreign-born; having previous breastfeeding experience; not having older children; getting support from family members, WIC, the infant’s physician, and the hospital; and not smoking during pregnancy. Support and encouragement are clearly important contributors to increasing the likelihood of breastfeeding and all these variables proved to be statistically significant in the bivariate analyses and in the regression. Similarly, both strong and moderate types of support, relative to weak support from the hospital, remain significant predictors of breastfeeding initiation based on the regression estimates. Smoking during pregnancy has a significant effect on breastfeeding initiation with those who smoked being less likely to initiate breastfeeding. In contrast, race, father in the residence, mother’s education, and participation in other benefits program are significantly associated with breastfeeding initiation in the bivariate analyses but not in the multivariate analyses as they are likely correlated with some of the other explanatory variables. Finally, parity, which was only statistically significant using a criterion that is

outside the common standard for significance testing⁴⁶ in the bivariate chi-square analysis, is statistically significant when all other factors are controlled.

Table 3-7. Signs and significance of the coefficients of the logistic regression of breastfeeding initiation

Explanatory variable	Coefficient	Characteristics independently associated with breastfeeding initiation
Race	Not Significant	–
Ethnicity: Hispanic vs. non-Hispanic	Positive	Hispanic
Father's residence	Not Significant	–
Nativity status: Non-native vs. native born	Positive	Foreign born
Education	Not Significant	–
Breastfeeding history: 3 or fewer months vs. no history	Positive	Prior breastfeeding experience
Breastfeeding history: More than 3 months vs. no history	Positive	Prior breastfeeding experience
Parity: Second born vs. first born	Negative	First born child
Parity: Third or subsequent born vs. firstborn	Negative	First born child
Participation in non-WIC benefit programs	Not Significant	–
Father encouraged breastfeeding vs. other	Positive	Father encouraged
Respondent's mother encouraged breastfeeding vs. other	Positive	Respondent's mother encouraged
Other relatives encouraged breastfeeding vs. other	Positive	Other relatives encouraged
Call from WIC staff member postpartum vs. not	Positive	Postpartum call from WIC
Infant's doctor encouraged breastfeeding vs. other	Positive	Doctor encouraged
Hospital support for breastfeeding: Moderate support vs. weak support	Positive	Moderate support from hospital
Hospital support for breastfeeding: Strong support vs. weak support	Positive	Strong support from hospital
Mother smoked during pregnancy: Smoked vs. did not smoke	Negative	No smoking during pregnancy
Mother worked during pregnancy	Not Significant	–

The findings in Table 3-7 are somewhat different than those in the WIC IFPS-1. Both studies conclude that ethnicity, nativity status, breastfeeding history, parity, encouragement from the respondent's mother, WIC information, and the infant's doctor's advice are significant predictors of breastfeeding initiation. Though significant in the previous study, education and father's residence are not significant in our regression work. The previous study did not include whether the mother smoked during pregnancy or the mother worked during pregnancy in their regression model.

⁴⁶ Using a standard of $p < .10$.

3.6 Hospital Experience and Practices

Hospitals play a critical role in supporting breastfeeding initiation. Breastfeeding initiation almost always occurs while the mother is in the hospital. Over the past 20 years, hospitals practices surrounding breastfeeding and birthing in general have changed substantially. Changes in delivery protocols are intertwined with changes in breastfeeding practices. Additionally, medical technology and the breastfeeding supports that hospitals provide have evolved. To assess the influence of hospital support on breastfeeding initiation, we first briefly profile study mothers' delivery experiences and then explore how these experiences relate to breastfeeding decisions.

3.6.1 Place of Birth and Length of Stay

The 1-month instrument inquired about women's hospital experiences. This interview was completed by 3,398 respondents. Of those women, more than 99 percent gave birth in a hospital or birthing center.⁴⁷ Less than 1 percent of these births were in a birthing center. All references to hospitals in the sections that follow include birthing centers unless otherwise stated. The majority (68 percent) of study mothers stayed 2 or fewer nights in the hospital. Figure 3-3 displays the percentage distribution of study mothers by the number of nights they spent in the hospital for the current study and as compared to the WIC IFPS-1 findings.⁴⁸ Over the last 20 years, a greater share of women stay 2 nights and the number of women staying less than 2 nights has dropped substantially. With women typically staying 2 nights, hospitals play a significant role in most women's initial feeding decisions.

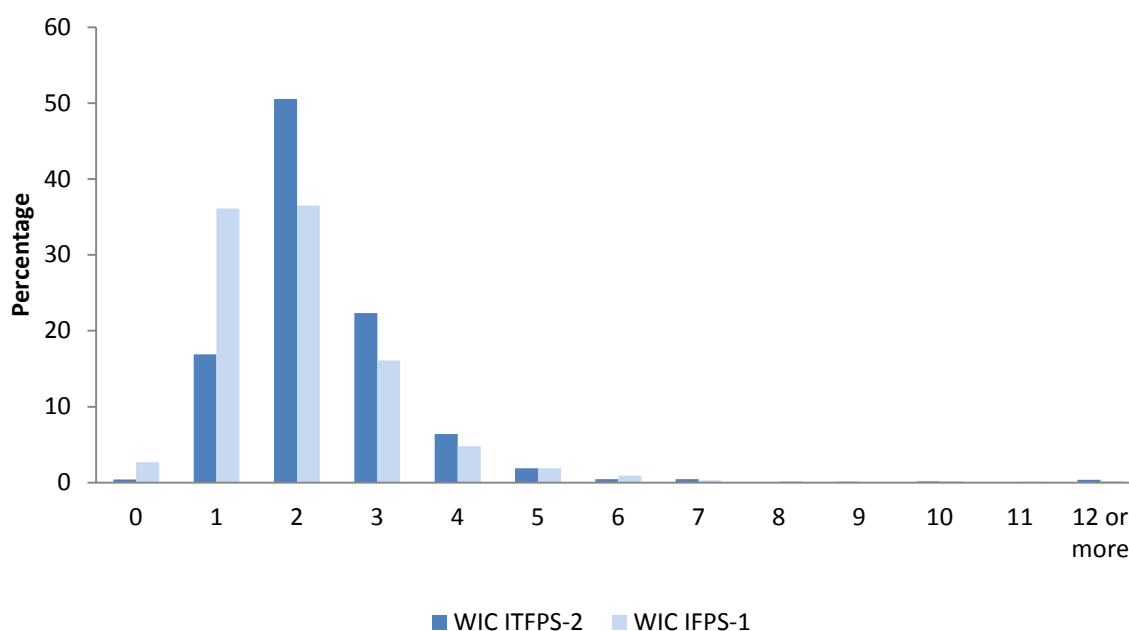
We find a similar change in pattern in the distribution of study infants' length of stay in the hospital between the WIC ITFPS-2 and the WIC IFPS-1⁴⁹ as shown in Table B3b-3 in Appendix B3b. Since the WIC IFPS-1, there has been a tightening of the distribution around the mode of 2 nights, reflecting the same standard length of stay as seen with the mothers. However, the WIC ITFPS-2 data reveal that infant stays have a much wider range—at the highest extreme, mothers spend 2 weeks in the hospital while some babies are in the hospital for more than 12 weeks.

⁴⁷ A total of 3,384 respondents indicated that they gave birth in a hospital or birthing center.

⁴⁸ Baydar et al., 1997, p110.

⁴⁹ Figure B3b-1 in Appendix B3b offers data on all study mothers, not just those giving birth in hospitals or birthing centers.

Figure 3-3. Percentage of study mothers by number of nights/days^a spent in the hospital^b



^a The WIC IFPS-1 measured hospital length of stay in days; the WIC ITFPS-2 measures length of stay in nights.

^b Includes birthing centers.

Table B3b-3 in Appendix B3b contains more detail on the data in this figure.

3.6.2 Hospital Practices

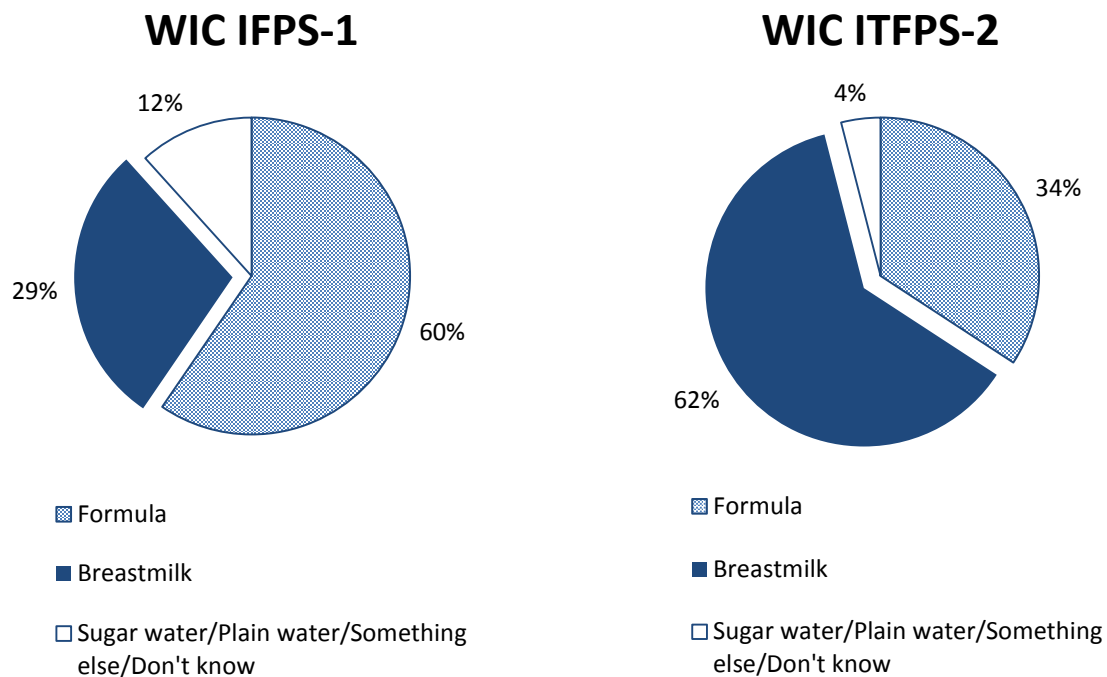
During the typical 2-day delivery stay, the hospital can influence breastfeeding decisions through a variety of ways, including the first feeding given to the infant, the timing of initiation, and having the baby room-in with the mother. All of these practices are part of the Baby Friendly Practices accreditation criteria for hospitals. Some actions such as the first feeding or the timing of initiation may reflect the mother's wishes but in some cases the hospital staff is ultimately making these decisions. These practices can affect initiation and are critical to the likelihood the mother is still breastfeeding at discharge.

First Feeding and Timing of Breastfeeding Initiation

A key hospital practice that is associated with breastfeeding initiation is whether infants receive breastmilk for their first feeding. Figure 3-4 shows that the majority (62 percent) of infants currently

receive breastmilk as a first feeding in the hospital. This is substantially lower than the breastfeeding initiation rate of 83 percent, suggesting that nearly a quarter of the infants who start breastfeeding are given something other than breastmilk as their first feeding. Nevertheless, comparing current findings to those in the WIC IFPS-1, there has been a 33 (62-29) percentage point increase in the percentage of infants receiving breastmilk as their first feeding. This finding is commensurate with the 27 percentage point increase of the breastfeeding initiation rate. The WIC IFPS-1 found that first feeding was associated with father's residence and length of maternal hospital stay⁵⁰ but we do not find evidence of these associations.

Figure 3-4. Among study mothers delivering in hospitals, the percentage of study infants by type of first feeding



The WIC ITFPS-2 survey also asks study mothers when they began breastfeeding, whether it was within the first hour after birth or later. In Table B3b-4 of Appendix B3b, the data show that of study mothers who give birth in a hospital, nearly 80 percent initiate breastfeeding while in hospital. More than half (57 percent) initiate within the first hour after birth. This is a notable increase from the percentage reported in the WIC IFPS-1, which was less than 20 percent.

⁵⁰ Baydar et al., 1997, p111.

Rooming Arrangement

When the newborn stays in the mother's room both day and night, the child is said to room-in. Mothers who send their infants to the nursery for extensive periods of time are thought to have fewer opportunities to breastfeed and, upon leaving the hospital, may not have the confidence that mothers who experience rooming-in may gain. In the WIC IFPS-1, researchers asked whether the infant stayed overnight in the nursery. They found that 72 percent of mothers spend at least 1 night of their postpartum hospital stay away from their newborn. They also found significant differences in this practice by race and ethnicity. The current data indicate this hospital practice has changed dramatically and 88 percent of study mothers indicated that their babies roomed-in. In other words, nearly all women now keep the baby in the room both night and day and very few infants spend time in the nursery. Additionally, with almost all babies rooming-in, there is no longer an association between rooming arrangement and race. However, rooming arrangement continues to be associated with ethnicity. Relative to rooming-in, a lower percentage of Hispanic women rely on both the nursery and their rooms but a higher percentage of Hispanic women use the nursery only (see Appendix C2, Tables C2-8a–C2-8b). Given high initiation rates among Hispanic women, it is somewhat unexpected that a greater percentage would rely on nursery only.

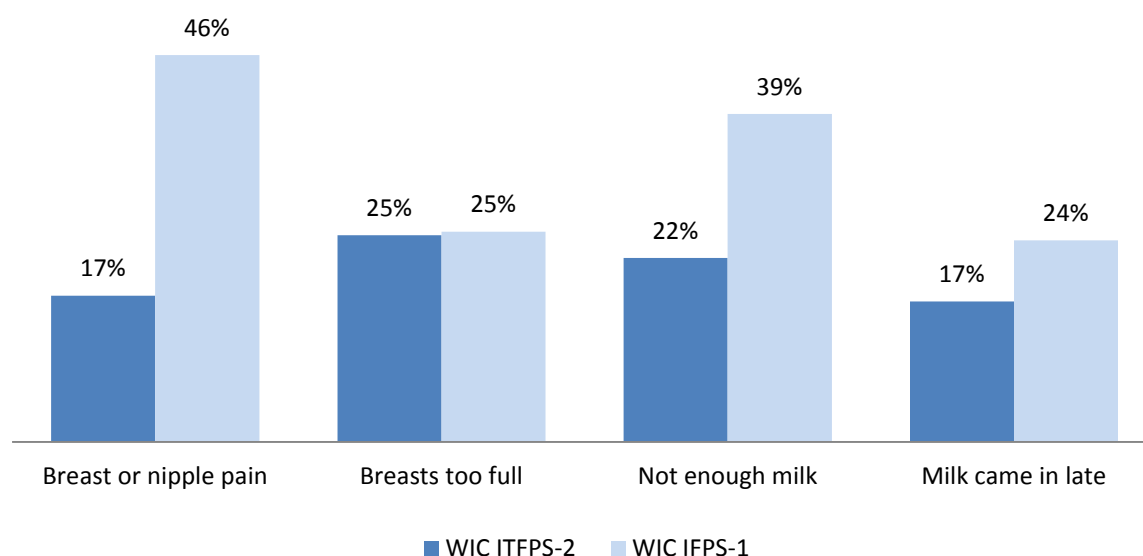
3.6.3 Support for Breastfeeding Problems

Hospitals staff can play a key role in remediating initial breastfeeding problems. Breastfeeding problems are relatively common with one-third (33 percent) of women who initiate breastfeeding while in the hospital report having breastfeeding problems. Though one-third represents a substantial number of women experiencing problems, this is a notable decline from the nearly three-quarters of women reporting breastfeeding problems in the WIC IFPS-1.⁵¹ Figure 3-5 shows the current incidence of common breastfeeding problems among WIC mothers who initiate breastfeeding while in the hospital compared to the WIC IFPS-1 findings. There have been notable declines over time in the percentage of women who report breast or nipple pain, not enough milk, and that their milk came in late. A possible reason for the decline in percentage of women reporting problems is that these problems are being quickly remedied with the assistance of the hospital staff. Alternatively, through education, women may have more realistic expectations about breastfeeding,

⁵¹ Baydar et al., 1997, p112.

and, therefore, not consider these issues worthy of reporting. Consistent with the previous study, about a quarter of women who initiate in the hospital complain that their breasts are too full.

Figure 3-5. Among mothers who initiate breastfeeding while in the hospital,^a the incidence of common breastfeeding problems



^a Include birthing centers.

Table B3b-5 in Appendix B3b contains more detail on the data in this figure.

Table 3-8 presents data on the hospital breastfeeding supports used by study mothers who reported breastfeeding problems while in the hospital. (Appendix C2 provides information on hospitals services used by all study mothers who give birth in a hospital, not just those who experience breastfeeding problems). Hospital staff assisted 88 percent of women with their reported breastfeeding problem. Among specifically listed services, 68 percent of women used lactation consultations, and 45 percent used breastfeeding equipment—including breast pumps, breast shields, and other equipment supporting breastfeeding. Nearly 45 percent of women who reported breastfeeding problems used informational pamphlets, brochures, and TV classes that the hospital offered.

Table 3-8. Among mothers who report breastfeeding problems while in the hospital,^a the percentage that used various breastfeeding support services

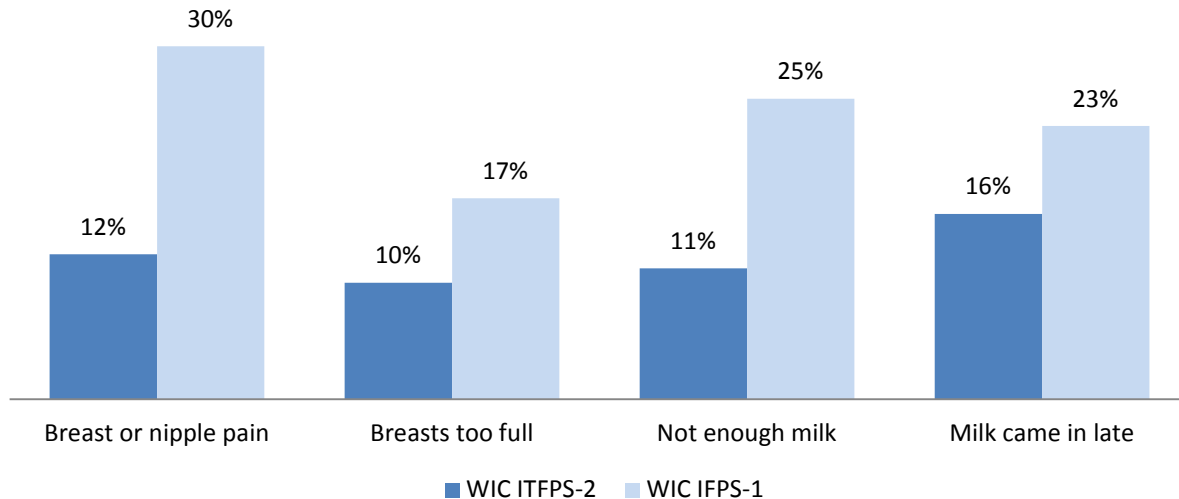
Type of breastfeeding support service used while in hospital	% of mothers who experienced breastfeeding problems	Unweighted n	Weighted n
Hospital staff assisted with reported breastfeeding problem	88.2%	850	116,587
Additional support services used			
Pamphlets/brochures/TV classes	44.6	844	115,884
Lactation consultant	68.2	847	115,889
Trained specialist	32.2	847	116,370
Breastfeeding support group/class	8.6	848	116,359
Equipment for breastfeeding support	45.4	850	116,587
Counseling that was requested	21.2	850	116,587
Counseling that was not requested	28.8	848	116,387
Hotline number to call or number of specific person to call	36.0	850	116,587
Other	2.6	850	116,587

^a Includes birthing centers.

Figure 3-6 shows the percentage of study mothers who had common breastfeeding problems and did not receive help from hospital staff. Among these women, delay in milk production was the most frequent problem and not enough milk was the second most frequent problem. Taken together nearly 30 percent (11+16) of these women cited a milk production problem. The WIC IFPS-1 found that 48 percent (25+23) of WIC mothers who reported problems with their milk did not get help from the hospital staff.⁵²

⁵² Baydar et al., 1997, p114.

Figure 3-6. Among study mothers reporting a common breastfeeding problem while in the hospital,^a the percentage that did not receive help from hospital staff by type of problem



^a Includes birthing centers.

Table B3b-6 in Appendix B3b contains more detail on the data in this figure.

3.7 Breastfeeding at Hospital Discharge

Although breastfeeding rates at hospital discharge are lower than initiation rates, 75 percent of study mothers reported breastfeeding at discharge, with 40 percent exclusively as Table 3-9 shows. Similar to initiation rates, a much higher percentage of study mothers are breastfeeding at hospital discharge than was the case 20 years ago. Additionally, over the past 20 years, breastfeeding initiation rose by 27 percentage points while breastfeeding at discharge rose nearly 30 percentage points.

There is nearly a 9 percentage point difference between the breastfeeding initiation and breastfeeding at hospital discharge rates. This difference is only slightly lower than the 11 percentage point difference it was 20 years ago. To understand why women stop breastfeeding in the hospital, we explore the relationship between breastfeeding status at hospital discharge and key hospital practices.

Table 3-9. Comparison of percentages of study mothers by breastfeeding status at hospital discharge

Status	WIC ITFPS-2			WIC IFPS-1		% Point difference	% Difference
	% of Study Mothers	Un-weighted n	Weighted n	% of Study Mothers	n		
Initiated breastfeeding	83.4%	3,777	442,905	56%	874	27.4	49%
Breastfeeding at discharge	74.7	3,378	397,833	45	NA	29.6	66
Exclusively breastfeeding	40.3	3,378	397,833	30	NA	10.4	35
Feeding breastmilk and formula	34.4	3,378	397,833	15	NA	19.4	129

NA denotes not applicable.

3.7.1 Practices Associated with Breastfeeding at Discharge

Table 3-10 presents breastfeeding status at hospital discharge by type of first feeding. The top half of the table represents current results and the bottom half reflects results from the WIC IFPS-1. As with the previous study, there is a statistically significant association between the type of first feeding and feeding at discharge but this relationship is not as strong as it was 20 years ago. Followup testing indicates that those mothers who offer breastmilk as a first feeding are more likely to be exclusively breastfeeding at hospital discharge. But, the percentage of women in this category has dropped from 79 percent in the previous study to 59 percent currently. The previous study found that at discharge, approximately 20 percent (6+14) of women were breastfeeding to some degree if the baby had been given formula as a first feeding. Current data indicate that the percentage has risen to about 38 percent (6+32), an approximate 90 percent increase. Those who offer formula as a first feeding are more likely to be exclusively formula feed at discharge.

Table 3-10. Among study mothers who give birth in hospitals,^a the percentage of mothers by type of first feeding and feeding choice at discharge

Type of first feeding ^b	Percentage of study mothers by feeding choice at discharge			Unweighted n ^c	Weighted n
	% Exclusively breastfeeding	% Exclusively formula feeding	% Feeding breastmilk and formula		
WIC ITFPS-2					
Breastmilk	59.0%	5.6%	35.4%	2,089	278,261
Formula	6.0	61.6	32.4	1,141	154,277
Other/	34.8	20.4	44.8	146	16,793
Don't know					
WIC IFPS-1					
Breastmilk	79	3	18	251	NA
Formula	6	80	14	448	NA
Other	30	58	9	103	NA

^a Includes birthing centers.

^b Chi-square statistic testing indicates that the association between type of first feeding and feeding choice at discharge is statistically significant at the 0.05 significance level.

^c For the WIC ITFPS-2 data, n is less than 3,384 due to item nonresponse.

NA denotes not applicable.

Table 3-11 examines the relationship between other key Baby-Friendly Hospital Practices and breastfeeding status at hospital discharge. Among the practices presented, there is an association between feeding choice at discharge and timing of initiation and rooming arrangement. Followup testing reveals that if the mother initiated breastfeeding within the first hour after birth, she is more likely to be exclusively breastfeeding at discharge. Rooming arrangements offer more mixed results. Exclusive breastfeeding is only more likely when comparing those who roomed-in with those who relied solely on the nursery. In contrast, feeding status at discharge is not associated with whether the hospital staff assisted the mother with breastfeeding problems, which may reflect the fact that over 88 percent of study mothers who report problems obtain assistance from hospital staff.

Table 3-11. Among study mothers who give birth in hospitals,^a the percentage of mothers who experienced select hospital practices by feeding choice at discharge

Select hospital practice	Percentage of study mothers by feeding choice at discharge			Unweighted n	Weighted n
	% Exclusively breastfeeding	% Exclusively formula feeding	% Feeding both breastmilk and formula		
Timing of initiation ^b					
First hour after birth	60.2%	6.4%	33.4%	1,525	200,329
More than 1 hour after birth	37.0	10.2	52.6	1,074	152,134
Hospital assisted with breastfeeding problems					
Yes	33.4	15.8	50.8	753	102,759
No	21.6	22.8	55.6	96	13,761
Rooming arrangement while in hospital ^b					
Room only	43.0	23.6	33.6	2,629	350,520
Nursery only	22.8	48.4	28.8	135	16,314
Both	34.8	32.2	33.0	226	29,285

^a Includes birthing centers.

^b Chi-square statistic testing indicates that the association between feeding choice and this variable is statistically significant at the 0.05 significance level.

3.7.2 Multivariate Analysis of the Factors That Affect Breastfeeding at Discharge

To examine the independent effects of the factors that influence the likelihood a woman is breastfeeding at hospital discharge, we estimate the following two regression models:

- Dichotomous choice model of breastfeeding at hospital discharge (logistic regression); and
- Categorical choice model of breastfeeding at hospital discharge (multinomial logistic regression).

In the first model, breastfeeding at discharge is first measured as a dichotomous variable (1=breastfeeding at discharge; 0=not breastfeeding at discharge). In the second model, breastfeeding at discharge is measured as a categorical variable (1=exclusively breastfeeding; 2=combination of breastfeeding and formula; and 3=exclusively formula feeding). The advantage of the second specification is that it allows for the possibility that different factors affect breastfeeding exclusivity, formula exclusivity, and combination feeding.

We considered all the background characteristic variables associated with breastfeeding initiation along with a series of hospital experience factors as potential explanatory variables. For variables that

were highly correlated, we used AIC to compare the alternative model specifications and determine which variable to use. We eliminated variables from final regression results that were not close to being significant.⁵³ Table 3-12 reports regression results for the logistic regression where the binary measure of breastfeeding at discharge is used. A total of 2,297 unweighted observations were weighted to represent 311,484 WIC participants.

Table 3-12. Signs and significance of coefficients of the logistic regression of breastfeeding status at hospital discharge

Explanatory variable	Coefficient	Characteristics independently associated with breastfeeding at discharge
Income poverty: > 75% but ≤ 130% of poverty guideline vs. <75% of guideline	Not significant	–
Income poverty: >130% of poverty guideline vs. < 75% of guideline	Positive	Higher income
Breastfeeding history: Less than 3 months vs. no history	Positive	Prior breastfeeding experience
Breastfeeding history: More than 3 months vs. no history	Positive	Prior breastfeeding experience
Parity: Second born vs. first born	Negative	First born child
Parity: Third or subsequent born vs. first born	Negative	First born child
Father encouraged breastfeeding vs. other	Positive	Father encouraged
Infant's doctor encouraged breastfeeding vs. other	Positive	Doctor encouraged
Type of first feeding: Formula vs. breastmilk	Negative	First feeding: breastmilk
Type of first feeding: Something else vs. breastmilk	Not significant	–
Rooming arrangement: Infant stayed both places vs. in nursery only	Positive	Infant in room and nursery
Experienced breastfeeding problems while in hospital	Negative	No breastfeeding problems in hospital
WIC staff called postpartum vs. not	Positive	Postpartum call from WIC

The regression results reveal that many of the socio-demographics variables that affect initiation are not predictive of breastfeeding at discharge while several hospital experience variables are significant factors. The regression results show that the factors uniquely increasing the likelihood of breastfeeding at discharge are: income above 130 percent of the

Factors Increasing the Likelihood of Breastfeeding at Discharge Are:

Income: >130% of poverty guideline

Parity: No other children

Breastfeeding History: Some history

Encouraged by family: Baby's father

Supported/Advised: Physician

WIC support: WIC staff called postpartum

First feeding: Not formula

Rooming arrangement: Both in room and nursery

Breastfeeding problems: None

⁵³ The following variables were not significant in the regression runs: race, ethnicity, nativity status, father's residence, participation in other (non-WIC) benefit programs, birth weight, NICU stay, hospital support, whether the mother smoked during pregnancy, whether the mother started breastfeeding within the first hour after birth, encouragement to breastfeed from the respondent's mother or other relatives, affirmation that WIC thought breastfeeding was the better feeding choice, and the five WIC site composites.

poverty guideline, having breastfed before, not having other children, getting encouragement from the infant's father or doctor, getting a call from WIC postpartum, not having formula as the first feeding, having infant spending significant time in the room, and not having breastfeeding problems.

Our regression approach for breastfeeding at hospital discharge differs from that used in the WIC IFPS-1. The previous study ran regressions to determine the likelihood of breastfeeding feeding at discharge given the type of first feeding. Thus, they had two regressions—one to estimate the likelihood of breastfeeding at discharge given that the infant first consumed formula and a second regression to estimate the likelihood of breastfeeding at discharge given that the infant first consumed breastmilk. They took this approach because “the type of first feeding very strongly determines the feeding practices at hospital discharge.”⁵⁴ As Table 3-12 makes clear, the strength of this relationship has changed somewhat over the last years. The current approach explores whether first feeding is predictive when the other variables, particularly race, ethnicity, and nativity status, are controlled for. We find that variables such as ethnicity and nativity statuses affect breastfeeding initiation, but they do not contribute to the likelihood of breastfeeding at discharge.

Our second model of breastfeeding at discharge is a multinomial logit that categorizes the outcome into one of three categories: exclusive breastfeeding, combination breastmilk and formula feeding, and exclusive formula feeding. Like the other regressions, this analysis began by examining all variables associated with breastfeeding at discharge in a preliminary regression and then we excluded those variables that were not close to being significant. The final model specification relied on the same variables as those in Table 3-12. In the model, 2,297 unweighted observations were weighted to represent 311,484 study participants.

Results from the multinomial logistic model identify factors that contribute independently to the likelihood of exclusively breastfeeding and exclusively formula feeding as compared to combination feeding. Different factors are associated with each of these outcomes. Factors increasing the likelihood of *exclusive* breastfeeding are being in the highest income group, having breastfed previously for more than 3 months, and getting encouragement from the physician. Factors increasing the likelihood of *exclusive* formula feeding

Factors Increasing the Likelihood of Exclusive Feeding at Discharge Are:

Exclusive Breastfeeding:

Income: >130% of poverty guideline

Breastfeeding History: >3 months

Supported/Advised: Physician

Exclusive Formula Feeding:

Parity: Have other children

Breastfeeding History: No history

First feeding: Formula

Breastfeeding problems: Had problems

⁵⁴ Baydar et al., 1997, p116.

include having other children, no breastfeeding history, formula as the first feeding, breastfeeding problems while in the hospital, and not getting a call from the WIC staff postpartum.

3.8 Feeding Practices at 1-Month Postpartum

The early weeks of the infant's life are a critical time for establishing breastfeeding. Table 3-13 shows the percentage of study mothers by feeding choice at 1 month, comparing current findings to the WIC IFPS-1.

At 1 month, 62 percent of women are still breastfeeding and 31 percent exclusively.

There have been dramatic increases in the percentages breastfeeding 1-month postpartum especially among those exclusively breastfeeding. There has been a 28 percentage point increase in any breastfeeding at 1 month, an 18 percentage point increase in exclusive breastfeeding, and a 10 percentage point increase in women engaging in combination feeding.

Table 3-13. Comparison of percentages of study mothers by breastfeeding status at 1-month postpartum

Breastfeeding status at 1 month	WIC IFPS-2			WIC IFPS-1		% Point difference	% Difference
	% of study mothers	Un-weighted n	Weighted n	% of study mothers	N		
Breastfeeding	61.6%	3,396	399,822	33.2%	577	28.4	86
Exclusively breastfeeding	30.8	3,396	399,822	13.0	577	17.8	137
Feeding breastmilk and formula	30.6	3,396	399,822	20.2	577	10.4	51

Using the data in Tables 3-9 and 3-13, it is clear that there continues to be a drop-off in the breastfeeding rate between discharge and 1 month: between these two time periods, the overall breastfeeding rate falls by about 13 ($=74.7 - 61.6$) percentage points. However, the percentage change in the breastfeeding rate over the first month of life is lower in the current study than in the previous: the 1-month attrition rate is about one in six women as opposed to approximately one in four women found in the WIC IFPS-1 study. Thus, not only are a greater percentage of women breastfeeding at hospital discharge than found previously, but a smaller percentage stop within the first few weeks of initiation. The 1-month cessation rate for exclusive breastfeeding shows even greater improvement: currently nearly one in four women stop exclusive breastfeeding within the first month but this is down from approximately one in two women.

3.8.1 Gift Baskets

Hospitals may influence infant feeding decisions through the gifts they provide new mothers at discharge. Many hospitals offer gift packages or baskets to women at discharge and items in them may impact the likelihood that the mother continues to breastfeed after she goes home. Items in gift baskets may include formula, coupons for formula, pacifiers, and new (empty) bottles. These items may discourage breastfeeding even among women who have been successful at initiating breastfeeding while in the hospital. The WIC IFPS-1 reported that 93 percent of women receive a gift package when leaving the hospital. This practice is no longer as common: we find that just over half (55 percent) of all study mothers receive a gift pack at discharge from the hospital. In other words, there has been about a 38 percentage point decline in receipt of gift baskets between the two studies.

The study team finds that women who are breastfeeding exclusively are less likely to get a gift basket. This variation may be driven by hospitals tailoring gifts given the woman's feeding choice or mothers who are exclusively breastfeeding may turn the gifts down. Regardless of the reason, we find that 48 percent of women who are exclusively breastfeeding at discharge receive gift packages while 59 percent of those who are formula feeding report getting gifts. Similarly, 61 percent of women that are combination feeding at discharge report getting gift packages.

The fact that breastfeeding status at discharge is associated with receipt of gift baskets confounds the analysis of the influence of gift packages on future feeding choices. Therefore, we analyze the effect receiving a gift basket has on feeding choices at 1 month only for women who were exclusively breastfeeding at hospital discharge. We find that receiving a gift basket does influence subsequent feeding choices. Specifically, we find that a significantly greater percentage of women who were exclusively breastfeeding at discharge are exclusively formula feeding at 1 month if formula was in their gift pack (13 percent) than if formula was not (8 percent). In addition, we find that a significantly lower percentage of women who were exclusively breastfeeding at discharge are exclusively breastfeeding at 1 month if a pacifier was in their gift package (58 percent) than if it was not (68 percent). These findings suggest that certain hospital gifts may influence future feeding choice.

3.8.2 Breastfeeding Support from Family, WIC, and Medical Provider

After discharge from the hospital, encouragement to breastfeed may become increasingly important. Table 3-14 presents the percentages of women by feeding choice at 1-month postpartum by sources of breastfeeding support. Chi-square testing indicates that there is an association between each of the listed sources of support and feeding choice at 1 month. Subsequent followup testing reveals that women who are encouraged to breastfeed by the baby's father are more likely to be exclusively breastfeeding at 1 month. Conversely, women who are not encouraged by the baby's father are more likely to be exclusively formula feeding. Those who are advised by WIC that breastfeeding is better are more likely to be exclusively breastfeeding while those who do not receive this advice are more likely to exclusively formula feed. Similarly, if the infant's doctor recommends breastfeeding, the woman is more likely to be exclusively breastfeeding at 1 month. Calls to postpartum women by WIC staff are associated with feeding choice at 1 month. Followup testing indicates that a significantly greater percentage of women who received calls are exclusively breastfeeding and combination feeding than women who did not receive calls.

Table 3-14. Percentage of study mothers by sources of breastfeeding support and feeding choice at 1-month postpartum

Source of support	Percentage of WIC mother by feeding choice at 1 month			Un-weighted n ^a	Weighted n
	% Exclusively breastfeeding	% Exclusively formula feeding	% Feeding both breastmilk and formula		
Encouraged to breastfeed by baby's father ^b					
Yes	36.8%	28.2%	35.0%	2,075	284,541
No	19.6	57.0	23.4	1,303	164,657
Encouraged to breastfeed by mother of respondent ^b					
Yes	35.8	28.4	36.0	1,879	258,150
No	23.4	53.0	23.8	1,500	191,152
Encouraged to breastfeed by other relatives ^b					
Yes	37.4	26.6	36.0	1,235	167,419
No	26.4	46.2	27.4	2,147	282,421
Advised by WIC that breastfeeding is better ^b					
Yes	32.6	36.6	30.8	2,960	397,772
No	12.4	57.2	30.2	394	48,496
WIC staff called ^b					
Yes	35.4	29.6	35.0	861	108,864
No	29.8	40.4	29.8	1,525	207,899
The baby's doctor recommends breastfeeding ^b					
Yes	46.2	23.0	30.8	1,282	176,467
No	20.2	49.2	30.6	2,079	271,281

^a n is less than 3,398 due to item nonresponse.

^b Chi-square statistic testing indicates that the association between exclusive breastfeeding and this variable is statistically significant at the 0.05 significance level.

3.8.3 Food Packages and Feeding Choice

WIC offers food packages that correspond to a participant's feeding choice. There is an enhanced food package designed to meet the nutritional needs associated with exclusive breastfeeding. Twenty-seven percent of women receive the fully breastfed package, 15 percent of women receive the partially breastfed package, and 58 percent of women receive the fully formula fed package as their initial postpartum food package. Table 3-15 examines how choice of food package corresponds to feeding choice at 1-month postpartum. Almost 75 percent of women-infant pairs receiving the exclusive breastfeeding package are feeding only breastmilk at 1-month postpartum. In fact, most women's food package choice corresponds with their feeding choice at 1 month. But, data indicate that over a quarter (28 percent) of women who receive a partially breastfeeding package are exclusively breastfeeding; thus, the package chosen may not be meeting their unique nutritional needs. Another quarter (28 percent) receive the package intended for fully formula fed babies but are feeding both breastmilk and formula at 1-month postpartum, so these women may be receiving too much infant formula.⁵⁵

Table 3-15. Percentage of study mothers by WIC food package and feeding choice at 1-month postpartum

Type of food package	Percentage of WIC mother by feeding choice at 1 month			Un-weighted n ^a	Weighted n
	% Exclusively breastfeeding	% Exclusively formula feeding	% Feeding both breastmilk and formula		
Fully breastfed	74.8%	3.6%	21.6%	782	109,650
Partially breastfed	28.0	12.8	59.2	439	58,948
Fully formula fed	7.2	64.6	28.2	1,732	231,755

^a Based on administrative data from all 27 states.

3.9 Summary

Breastfeeding initiation rates among the study participants have risen dramatically over the past 20 years since the last major study, the WIC IFPS-1. The increase parallels national trends. It may also reflect the emphasis that WIC has placed on the importance of breastfeeding since the last study as well as changes in hospital practice. Bivariate analysis, which considers the impact of each variable individually on the outcome of interest, reveals breastfeeding initiation is associated with a

⁵⁵ Women can request changes to the food package when they deem it necessary, in some sites as often as once per month if that month's vouchers have not already been redeemed.

wide variety of factors: race; ethnicity; nativity status; marital status; education; breastfeeding history; father's residence status; poverty level; participation in other benefit programs; health; support from various family members, medical professionals, and WIC; and local WIC program characteristics. However, multivariate regression analysis, which yields information on those factors that exert unique influence on breastfeeding initiation, narrows this to a smaller set of key variables that drive breastfeeding initiation, including: ethnicity; nativity status; breastfeeding history; support from family members, medical professionals, and WIC; parity; and health. In contrast to past studies, we find neonatal circumstances do not impede breastfeeding initiation.

Similar to the WIC IFPS-1, we find breastfeeding rates decline approximately 9 percentage points between initiation and hospital discharge. Although there has been an increase in the percentage of women experiencing Baby-Friendly Hospital Practices over the past 20 years, the decline that occurs in breastfeeding rates while women are in the hospital has remained basically the same. Factors influencing the likelihood of breastfeeding at discharge include some of the same factors that drive initiation (breastfeeding history, parity, and being encouraged), as well as hospital experiences such as not having formula as the first feeding, rooming-in, and not having breastfeeding problems.

Finally, at 1 month, 62 percent of the women are still breastfeeding and 32 percent are exclusively breastfeeding. This also represents a substantial increase over the past 20 years, especially for exclusive breastfeeding rates. The evidence suggests that feeding choices in these early weeks of the infant's life are associated with gifts received from the hospital and sources of encouragement.

An overarching theme that emerges from this analysis is the critical role of encouragement and support. In each decision phase—initiation, discharge, and 1-month—getting support and encouragement from family, WIC staff, and providers prove to be statistically significant factors in increasing the breastfeeding rate.

4.1 Overview

This chapter focuses on factors associated with early feeding practices between birth and 7 months of age. Topics addressed in this chapter include the following:

- How long do study mothers breastfeed?

*Examples of research questions addressed:*⁵⁶

- What factors play into a mother being successful at breastfeeding her infant during the first few weeks of life and 4-6 months of life?
- What factors are associated with successful breastfeeding for the first 6 months of her infant's life?

- What percentage of study women exclusive breastfeed?

Examples of research questions addressed:

- What is the participant's practice on breastfeeding and formula feeding her infant?

- What are the breastfeeding routines of study mothers?

Examples of research questions addressed:

- What is the frequency of breastfeeding or formula feedings and foods (total and by breast, formula, combinations, and foods) given?
- How does the mother/caregiver determine the daily feeding schedule for the infant?
- What are the feeding practices with pumping or expressing human milk?

⁵⁶ A complete list of research questions appears in Appendix A.

- What are the sources of information on feeding practices that study mothers use?

Examples of research questions addressed:

- Where does the mother/caregiver get nutrition information (e.g., WIC, web sites, social media, family, friends, social networks, health care providers, etc.)?
- What are staff and mothers/caregivers knowledge, attitudes, and beliefs about nutrition and behavior for infants and toddlers?

- What experiences are associated with the timing of formula supplementation?

Examples of research questions addressed:

- What non-program and program factors contribute to the likelihood of initiating formula supplementation?

4.2 Background

Breastfeeding Practices Through 7 Months. As shown in Chapter 3, although 83 percent of WIC women initiate breastfeeding, by 1 month only 62 percent are still breastfeeding and 32 percent are exclusive. Clearly, two important parameters of breastfeeding are *exclusivity* and *duration*.⁵⁷ The American Academy of Pediatrics (AAP) recommends that infants be exclusively breastfed for the first 6 months of life and that breastfeeding continue with appropriate complementary foods for at least 1 year or more (AAP, 2012a). The Healthy People 2020 benchmark for breastfeeding duration is 61 percent at 6 months (U.S. Department of Health and Human Services, 2010). Overall breastfeeding rates in the United States increased considerably in the past 20 years (McDowell, Wang, & Kennedy-Stephenson, 2008; Centers for Disease Control and Prevention (CDC), 2013), and the percentages of breastfed infants who were either exclusively breastfeeding or receiving any breastmilk at 6 months also increased during this period by approximately 40 percent (CDC, 2015; Li, Darling, Maurice, Barker, & Grummer-Strawn, 2005; McDowell et al., 2008). Despite improvements over the last few decades (Grummer-Strawn & Shealy 2009; Ryan, Wenjun, & Acosta 2002), however, relatively few mothers and children in the United States meet breastfeeding recommendations.

Breastfeeding exclusivity and duration differ across a variety of socio-demographic characteristics. Research has shown that breastfeeding duration is lower among African American infants compared

⁵⁷ Breastfeeding duration is defined for this study as the age at which the infant no longer is fed any breastmilk, either from the breast or a bottle.

with White and Hispanic infants, despite increasing over time in all racial and ethnic groups (also increased during this period by approximately 40 percent (CDC, 2013). Exclusivity and duration are lower among women who are younger, primiparous, obese, and have lower socioeconomic status (Hendricks, Briefel, Novak, & Ziegler, 2006; Meyerink & Marquis, 2002; Whalen & Cramton, 2010). Additionally, women participating in WIC who initiate breastfeeding have shorter duration of breastfeeding relative to nonparticipants, even after controlling for other factors including race, ethnicity, and socioeconomic status (Jensen, 2012). Within WIC participants, women with prior breastfeeding experience breastfed for an average of 2 months longer compared to women without prior experience (Tenfelde, Finnegan, Miller, & Hill, 2012).

In addition to feeding directly from the breast, women may use pumps to express breastmilk to stimulate milk production or allow feeding of human milk from a bottle. Research has demonstrated that women who express breastmilk have a longer duration of breastfeeding than women who do not express milk (Win, Binns, Zhao, Scott, & Oddy, 2006). WIC issues breast pumps to some postpartum participants to support continued breastfeeding, and this practice has been shown to impact breastfeeding duration and exclusivity positively; WIC mothers who received an electric pump from WIC as soon as they requested one delayed the introduction of formula for 4 additional months over mothers who were not given a pump (Meehan et al., 2008).

Information and Support for Feeding Choices. Positive support from family and providers affects the likelihood that a woman will continue breastfeeding. Support may come in the form of social support, information, resources, or assistance in overcoming barriers to continued breastfeeding. In addition to support women may receive at home, WIC support programs and WIC policies are both designed to promote breastfeeding duration and exclusivity.

Social support for breastfeeding has been identified as a determinant of breastfeeding duration (Whalen & Cramton, 2010; Meedya, Fahy, & Kable, 2010). In studies of WIC women, those who reported having social support were less likely to stop breastfeeding than women without social support (Tenfelde et al., 2012), and being married was found to be positively associated with breastfeeding duration (Darfour-Oudouro & Kim, 2014). Other non-WIC research shows that a father's positive attitude about breastfeeding is also positively associated with exclusive breastfeeding duration (Semenic, Loiselle, & Gottlieb, 2008).

WIC supports breastfeeding mothers in several ways. The U.S. Department of Agriculture (USDA) supports the *Loving Support Makes Breastfeeding Work* campaign with extensive resources for local agencies and State Agencies to support staff training in the area of breastfeeding support, including a

standardized competency-based curriculum in the skills required to promote and support breastfeeding in the WIC setting.⁵⁸ In 2004, USDA initiated a program to begin to fund peer counseling (PC) as a core WIC service, and initial program enhancements began in selected sites around the country. PC has been shown to be an effective intervention in increasing breastfeeding (Bronner, Barker, Vogelhut, & Resnik, 2001; Chapman, Damio, & Perez-Escamilla, 2004; Olson, Haider, Vangjel, Bolton, & Gold, 2008), and improving breastfeeding duration and exclusivity (Chapman, Morel, Anderson, Damio, & Perez-Escamilla, 2010). The WIC food packages were also changed substantially in 2009 to better incentivize and support breastfeeding by: (1) increasing the value of the WIC package for mothers who fully breastfeed, (2) reducing the amount of formula for mothers who partially breastfeed, (3) calibrating formula amounts for infants by age, and (4) postponing complementary infant foods. Evidence that the food package changes improve breastfeeding duration and exclusivity have been mixed, with studies in California showing a substantial positive effect on exclusive breastfeeding duration and no increase in full formula feeding (Langellier, Chaparro, Wang, & Whaley, 2014; Whaley, Ritchie, Spector, & Gomez, 2012); however, another study examining the same issues in 17 Local WIC Agencies across the country showed only a slight increase in breastfeeding duration in the early months and a significant increase in full formula feeding (Wilde, Wolf, Fernandez, & Collins, 2011).

Numerous public health efforts have also emerged in recent years to promote extended breastfeeding. The 2010 Patient Protection and Affordable Care Act (ACA) requires an employer to provide reasonable break time for an employee to express breastmilk for her nursing child for 1 year after the child's birth, and to provide a place, other than a bathroom, for the employee to express breastmilk. The ACA also requires new private health insurance plans, including those available in the new health insurance marketplaces, to provide coverage for breastfeeding support, supplies, and lactation counseling; and 49 states, the District of Columbia, and the Virgin Islands have laws that specifically allow women to breastfeed in any public or private location (National Conference of State Legislatures, 2015).

There are also personal barriers to extended breastfeeding, including perceived breastfeeding problems, and circumstances such as employment or child care, that can make continued breastfeeding more difficult. Perceived breastfeeding problems can take many forms, from physical challenges associated with breastfeeding to perceptions that the breastmilk supply is insufficient and formula supplementation is therefore necessary (Whalen & Cramton, 2010). A growing literature also substantiates that maternal return to work, particularly before 7-months postpartum, may

⁵⁸ <http://lovingsupport.nal.usda.gov/content/grow-and-glow-wic>.

negatively affect breastfeeding duration and exclusivity (Berger, Hill, & Waldfogel, 2005; Kimbro, 2006; Langelier, Chaparro, & Whaley, 2012; Roe, Whittington, Fein, & Teisl, 1999; Shim, Kim, & Heiniger, 2012; Taveras et al., 2003; Thulier & Mercer, 2009). Having infants in non-parental care has also been associated with shorter duration of breastfeeding (Shim et al., 2012).

Formula Feeding Practices and Formula Supplementation. Several studies have found that among women who initiate breastfeeding, the most critical period for introduction of formula and breastfeeding cessation is during the first month postpartum when 20 to 50 percent of low-income women stop breastfeeding (Bonuck, Trombley, Freeman, & McKee, 2005; Kimbro, 2006; Tenfelde, et al., 2012). In addition to logistical barriers to breastfeeding discussed earlier associated with employment and child care, research has identified several common reasons for formula supplementation, including but not limited to personal preferences, difficulties latching on, infant fussiness, concerns about adequacy of the breastmilk supply, and difficulties with pumping (Brimoh & Davies, 2014; Kair, Flaherman, Newby, & Colaizy, 2015; Li, Fein, Chen, & Grummer-Strawn, 2008).

WIC policies about providing formula also help to encourage exclusivity and extended duration. The goal is to provide sufficient formula to meet the nutritional needs of the infant while still encouraging breastfeeding as the best practice. For fully formula fed infants, the WIC Program provides infant formula with the amount determined by the age of the infant. For partially breastfeeding women, WIC provides the minimal amount of formula that meets but does not exceed the breastfeeding infant's nutritional needs. WIC does not provide any formula to fully breastfeeding women, instead offering greater amounts of food for the women themselves to support their breastfeeding effort.

For those mothers using formula, state WIC programs have created guidelines for the importance of following instructions for formula preparation instructions. Currently there is no evidence to document the extent of non-adherence to formula preparation instructions, although anecdotal reports suggest that some parents dilute formula to try and save money.

4.3 Sample and Analysis Approach

4.3.1 Sample

The analyses in this chapter examine breastfeeding duration, exclusivity, and formula supplementation using data through the 7-month interview. These topics are covered primarily during the 5- and 7-month interviews. Table 4-1 shows the number of respondents to the 5- and 7-month interviews. While the entire sample (core plus supplemental) receives the 7-month interview, only the core sample receives the 5-month interview. Because not everyone in the sample gets the 5-month interview and some participants do not respond to interview requests, the responses to the 5- and 7-month interviews are both less than the full sample size. The responses to each interview are weighted so that findings reflect the WIC population as described in Chapter 1.

Table 4-1. Number of respondents by interview month

Sample structure	5-Month interview	7-Month interview
Core prenatal sample	2,267	2,194
Core postnatal sample	348	320
Supplemental prenatal sample	–	500
Supplemental postnatal sample	–	120
Total	2,615	3,134

In this chapter, we also present data from a survey of WIC staff at the 80 sites participating in this study. A total of 758 staff surveys were completed. The staff survey asks questions tailored to the respondent's job position. Employees who identified nutrition-related primary roles and duties received additional questions pertaining to nutrition education, breastfeeding support, and food packages. These data are not weighted to reflect all WIC sites; they are presented to provide contextual information.

4.3.2 Analysis

The analysis examines breastfeeding choices and formula supplementation through 7 months, exploring changes over time and bivariate relationships to assess if socio-demographic characteristics are associated with these feeding practices.⁵⁹ When available, we present data from WIC IFPS-1 alongside current findings so that change between studies can be examined. As we have done in

⁵⁹ All analyses are based on valid responses to questions; therefore, missing responses, responses of “Don’t Know,” and refusals to answer the question are excluded from calculations unless otherwise stated.

previous chapters, we use bivariate analysis to examine whether an outcome of interest varies by subgroup, and followup tests between pairs of subgroups to determine which subgroups are statistically significantly different from each other. Appendix C3 presents each variable of interest crossed by a series of socio-demographic variables. The analysis in this chapter also explores which factors influence the likelihood of formula supplementation among breastfeeding mothers, using survival analysis. Survival analysis, a multivariate analysis, permits the examination of the unique effects of individual variables on risk of formula supplementation, at any time through 7 months, apart from the effects of other predictors.

The analyses outlined above include exploration of cross-sectional, repeated cross-sectional, and longitudinal measures. This stems from the fact that some questions are asked during every interview resulting in a series of repeated measures, while others are only asked a few times or just once. Each month of data is a snapshot of the WIC population at the given interview. Because not everyone participates in each interview, the sample sizes vary by interview month. Many of the analyses show repeated snapshots, while others involve longitudinal analyses of the same individuals over time. For repeated measures, care should be taken not to infer longitudinal trends, as the study participants answering the questions may differ from month to month.

4.4 Breastfeeding Duration and Exclusivity Through 7 Months

4.4.1 Duration

The percentage of WIC women who continue to breastfeed after leaving the hospital has risen notably since the WIC IFPS-1 study 20 years ago. Figure 4-1 shows the percentage of study mothers who initiate breastfeeding and continue to breastfeed (exclusively or in combination with formula) at each interview month.

Since the WIC IFPS-1, the percentage of

WIC women breastfeeding has increased nearly 28 percentage points at the 1-month interview, almost 21 percentage points at the 3-month interview, close to 16 percentage points at the 5-month interview, and over 13 percentage points at the 7-month interview.

Key Findings:

Breastfeeding rates through 7 months have risen dramatically over the past 20 years.

- 26 percent of study mothers are still breastfeeding at 7 months;
- Exclusive breastfeeding rates have more than doubled in 20 years; and
- Among African American WIC mothers, the exclusive breastfeeding rate at 1 month has risen 23 percentage points (over 700 percent) since the WIC IFPS-1.

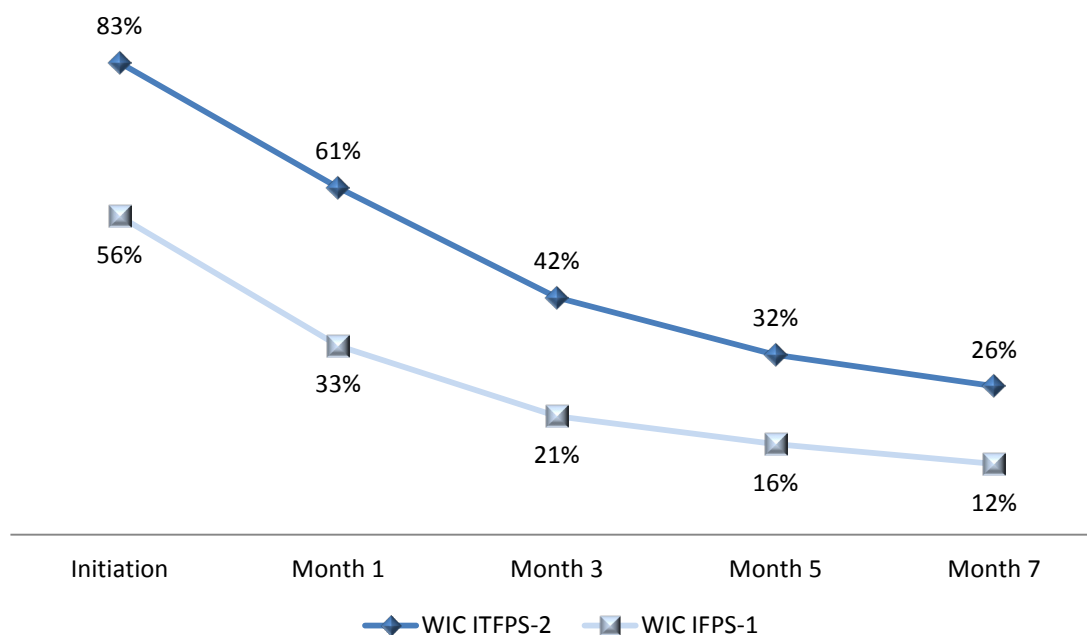
Figure 4-1. Breastfeeding rates by month, WIC ITFPS-2 and WIC IFPS-1

Table B3c-2 in Appendix B3c contains more detail on these data.

Though the breastfeeding rate at 7-months postpartum has risen dramatically, there is still a notable drop-off from the initiation rate. The similar slopes of the WIC IFPS-1 and the WIC ITFPS-2 trend lines suggest that despite the increases in breastfeeding initiation and duration, the drop-off rate has not changed substantially over the past 20 years. The WIC ITFPS-2 data show a 57 percentage point decline in breastfeeding rates between initiation and 7 months. Though the WIC ITFPS-2 data indicate the larger *percentage point* decline, the *percentage* decline in women breastfeeding is actually lower in the WIC ITFPS-2 data (69 percent) than in the WIC IFPS-1 data (79 percent) because so many more WIC ITFPS-2 mothers initiated breastfeeding than did WIC IFPS-1 mothers 20 years ago.

The increase in breastfeeding rates among WIC women is consistent with national trends as well as the trends observed among WIC women from other surveys. Numerous national data sources indicate that breastfeeding duration for both all women and WIC women have increased substantially over the past 20 years. To facilitate the comparison of current findings with other sources, we use the National Immunization Survey (NIS) as a benchmark as it represents the general patterns suggested by other surveys, while noting that the retrospective nature of the breastfeeding questions in the NIS is different from the frequent interview approach in WIC IFPS-1 and WIC

ITFPS-2.⁶⁰ Figure 4-2 displays the change in the 6-month breastfeeding rate, a commonly reported measurement point across numerous surveys, for WIC women over the past 20 years based on WIC IFPS-1, WIC ITFPS-2, and the NIS. (In Table B3c-1 in Appendix B3c, we show the national and WIC trend data from four different sources.) NIS data are not available for the full 20 years, so we use straight-line extrapolation, based on rates of change for existing years of data, to estimate values for the missing years. Taken together, the two WIC studies indicate that the breastfeeding rate at 6 months has risen from 14 percent to 31 percent since 1994. Similarly, the NIS shows an increase from 17 to 40 percent for WIC women and from 27 to 52 percent for all women. Although the percentage point increases are lower for WIC women, the percentage changes in their breastfeeding rates at 6 months are actually higher because 20 years ago so few breastfed at least 6 months.

Figure 4-2. Comparison of the 6-month breastfeeding rates overtime, WIC mothers and all women

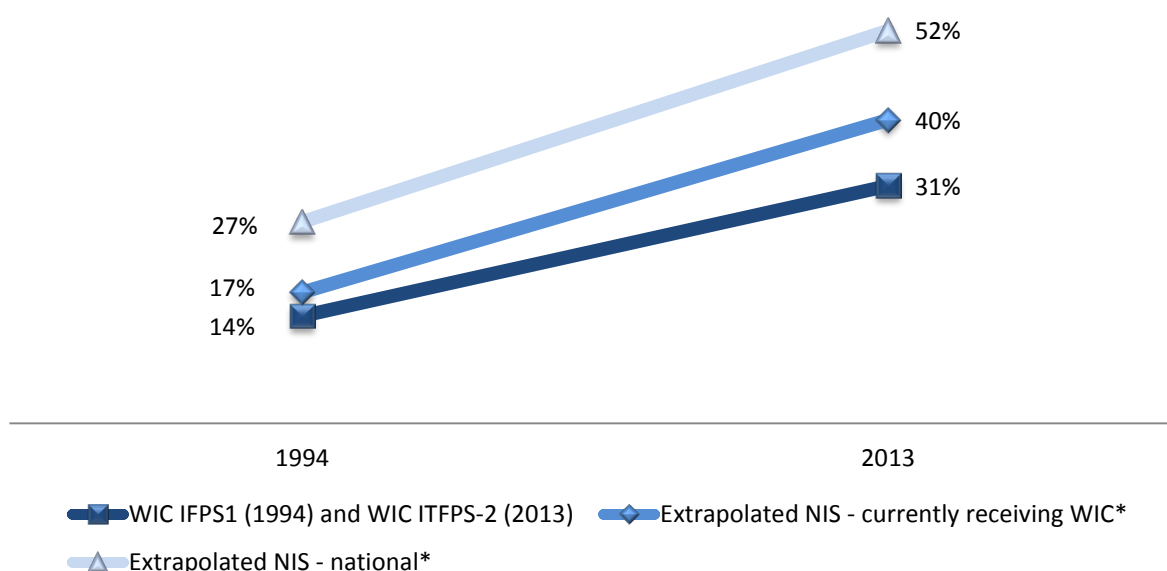


Table B3c-1 in Appendix B3c contains more detail on these data.

* Extrapolated data are based on straight line extrapolation given the average annual percentage point change.

⁶⁰ The NIS surveyed families with infants ages 19-36 months and asked retrospectively about breastfeeding duration. Such long recall periods can lead to both increased errors in reporting, and a tendency to round timeframes to milestone ages. The WIC IFPS-1 and WIC ITFPS-2 approach of frequent interviews about current or recent behavior may reduce such errors.

4.4.2 Exclusivity

Over the past 20 years, there also has been a marked increase in the percentage of women choosing to breastfeed exclusively, and the length of time they do so. As Table 4-2 shows, in each interview month the current percentage of women exclusively breastfeeding is more than two times the percentage reported in the WIC IFPS-1. These increases have been accompanied by reductions in the percentages of women relying solely on formula.

Table 4-2. Percentage of study mothers by breastfeeding choice by interview month, WIC ITFPS-2 and WIC IFPS-1

Feeding practice by interview month	Percentage of study mothers	
	WIC ITFPS-2 ^a	WIC IFPS-1
1- month interview		
Exclusive breastfeeding	30.3%	13.0%
Exclusive formula feeding	39.0	65.3
Combination feeding	30.7	20.2
Neither breastmilk nor formula	Not asked	.14
Unweighted n	3,395	577
Weighted n	451,699	NA
3-month interview		
Exclusive breastfeeding	19.8	8.9
Exclusive formula feeding	58.3	78.9
Combination feeding	21.9	11.9
Neither breastmilk nor formula	Not asked	0.7
Unweighted n	2,788	755
Weighted n	442,248	NA
5-month interview		
Exclusive breastfeeding	15.9	7.1
Exclusive formula feeding	68.4	83.3
Combination feeding	15.7	8.8
Neither breastmilk nor formula	Not asked	0.8
Unweighted n	2,615	819
Weighted n	442,754	NA
7-month interview		
Exclusive breastfeeding	14.5	5.7
Exclusive formula feeding	72.7	85.8
Combination feeding	11.6	6.7
Neither breastmilk nor formula	1.2 ^b	1.7
Unweighted n	3,134	827
Weighted n	442,719	NA

^a Tables C3-37 and C3-37a-r in Appendix C3 contain more detail on the WIC ITFPS-2 data.

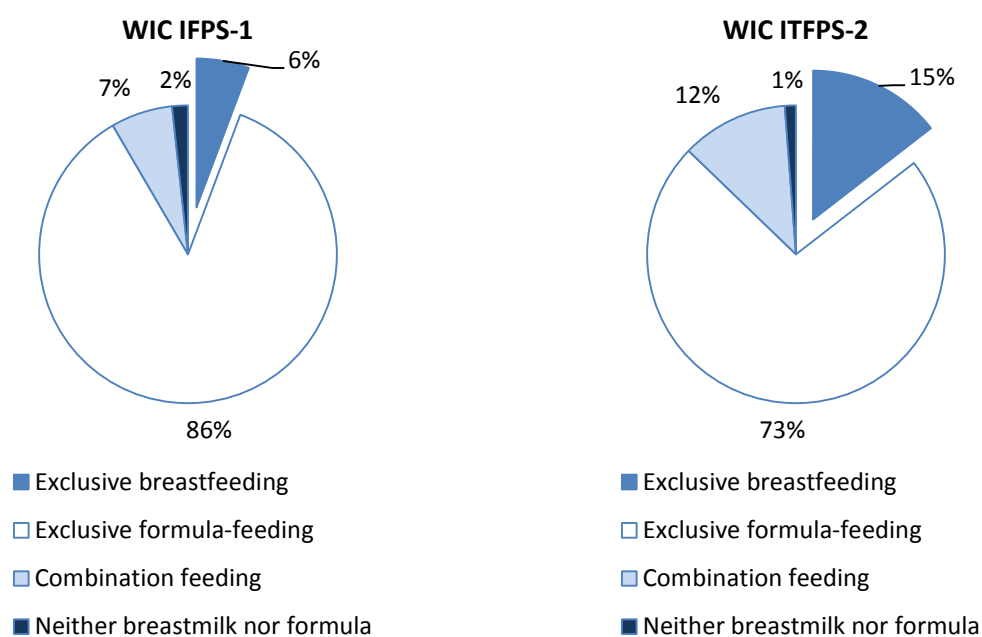
^b Nearly all (98%) of these women were receiving WIC. Over 90 percent of the WIC mothers who reported feeding neither breastmilk nor formula during the interview nonetheless reported feeding formula during the 24-hour dietary recall, suggesting either a misunderstanding of the interview question, or an attempt to represent an inconsistent pattern of feeding.

NA denotes not applicable.

The trends are attenuated among current study mothers who were not enrolled in WIC prenatally, but enrolled the baby postnatally. At the time of the 1-month interview, postnatal enrollees report breastfeeding at significantly lower rates, either exclusively or in combination with formula, than do mothers who joined WIC prenatally (22 percent vs. 32 percent for exclusive breastfeeding; 25 percent vs. 32 percent for combination feeding). Postnatal enrollees also report exclusive formula feeding at higher rates than prenatal enrollees (52 percent vs. 37 percent), suggesting that many postnatal enrollees are joining WIC at least in part to obtain formula.

To further illustrate the shift toward exclusive breastfeeding, Figure 4-3 depicts the distribution of women by feeding practice at 7 months from the two WIC studies. First, over the past 20 years, the percentage of WIC mothers feeding formula exclusively declined from 86 to 73 percent. Second, the offsetting increase in breastfeeding is split between exclusive breastfeeding at 14 percent and combination feeding at 12 percent. In terms of percentage change, there has been a 154 percent increase in exclusive breastfeeding compared to a 73 percent increase in combination feeding.

Figure 4-3. Percentages of women by feeding practice at 7 months, WIC IFPS-1 and WIC ITFPS-2



Numbers may exceed 100 percent due to rounding.

Table C3-37 in Appendix C3 contains more detail on these data.

Analysis of exclusive breastfeeding rates by select socio-demographic variables reveals a striking increase in the percentage of African American WIC mothers exclusively breastfeeding since the WIC IFPS-1 study. Figure 4-4 displays the percentages of African American mothers choosing to exclusively breastfeed at 1 and 3 months, the period for which results from the previous study are available. Compared to rates reported in the previous study, there has been a 23 percentage point change (over 700 percent) in exclusive breastfeeding among African American mothers at 1 month and a 10 percentage point change (nearly 300 percent) at 3 months. The change over time for White mothers is similar to that of African American mothers, with notable increases in exclusive breastfeeding at both 1 and 3 months. However, for women categorized in the Other racial category, the current study reveals a 5 percentage point decline (14 percent) in exclusive breastfeeding as compared to the past study. The detailed data shown in Table B3c-3 in Appendix B3c indicate that over the 20 years between studies, this group shifted toward combination feeding in the first month of life.⁶¹

Figure 4-4. Exclusive breastfeeding rates among African American mothers, WIC IFPS-1 and WIC ITFPS-2

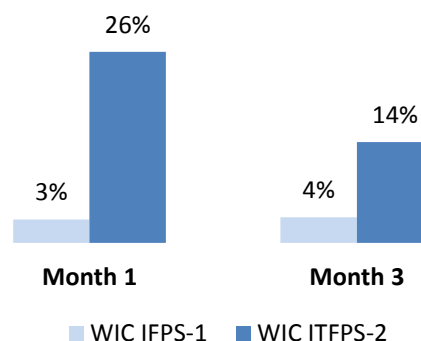


Table B3c-3 in Appendix B3c contains more detail on data presented here.

As Figure 4-5 shows, despite the dramatic increase in exclusive breastfeeding among African American mothers, they still have the lowest rates of exclusive breastfeeding among the three racial groups. Additionally, the decline in their exclusive breastfeeding rate between the 1- and 3-month interviews is sharper than that for the others, a 12 percentage point (47 percent) drop-off compared to 10 and 11 percentage points (31 and 34 percent, respectively) for White mothers and mothers categorized in the Other racial group, respectively. The result is that African American mothers have a significantly lower rate by 3 months than the other two racial groups. These findings are consistent with those from the previous study, the WIC IFPS-1.

⁶¹ The decline in exclusive breastfeeding and shift toward combination feeding by those categorized in the other racial group may reflect racial and ethnic changes in the composition of this category, as national demographics have changed significantly over the past 20 years and the current study separates race and ethnicity questions while the previous one did not.

Figure 4-5. Exclusive breastfeeding rates by race for each interview month

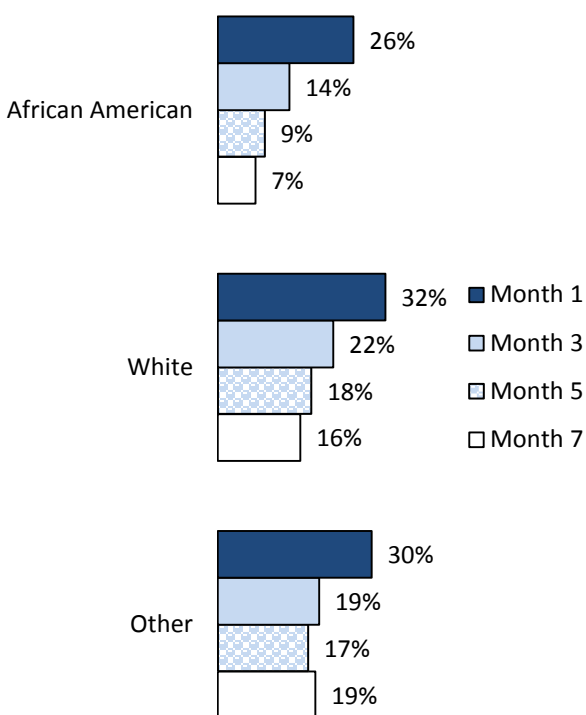
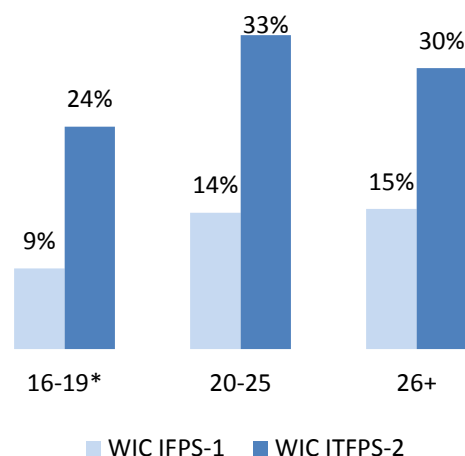


Table B3c-3 in Appendix B3c contains more detail on these data.

Increases at 3 months are similar to those seen at 1 month, with a 10 percentage point increase for both the youngest and middle cohorts, which represent over a 100 percent increase in each case. These data are shown in Table B3c-3 in Appendix B3c.

Analysis of exclusive breastfeeding by age of the mother at birth reveals that the practice is now more common within all three age groups than it was in the previous WIC study. Figure 4-6 presents exclusive breastfeeding rates at 1 month from both studies as an example of the change. Exclusive breastfeeding among those in the youngest cohort saw a 15 percentage point (over 190 percent) increase at 1 month between studies. Currently, nearly one in four of the youngest study mothers exclusively breastfeed. One in three study mothers between the ages of 20 and 25 years now exclusively breastfeed at 1 month, a 137 percent increase.

Figure 4-6. Percentage of mothers exclusively breastfeeding at 1-month interview by age of mother at birth, WIC IFPS-1 and WIC ITFPS-2



* In the WIC ITFPS-1, age ranged from 14-19 years.

Table B3c-3 in Appendix B3c contains more detail on these data.

Figure 4-7 presents breastfeeding rates within each age group based on the WIC ITFPS-2 data. The figure indicates that despite gains, the youngest cohort exhibits relatively low rates of exclusive breastfeeding at all interview months. In all but two of the eight followup month comparisons with the older groups, the youngest mothers show significantly lower rates of exclusive breastfeeding.

Figure 4-7. Percentage of study mothers exclusively breastfeeding at interview months 1 through 7 by age of mother at birth

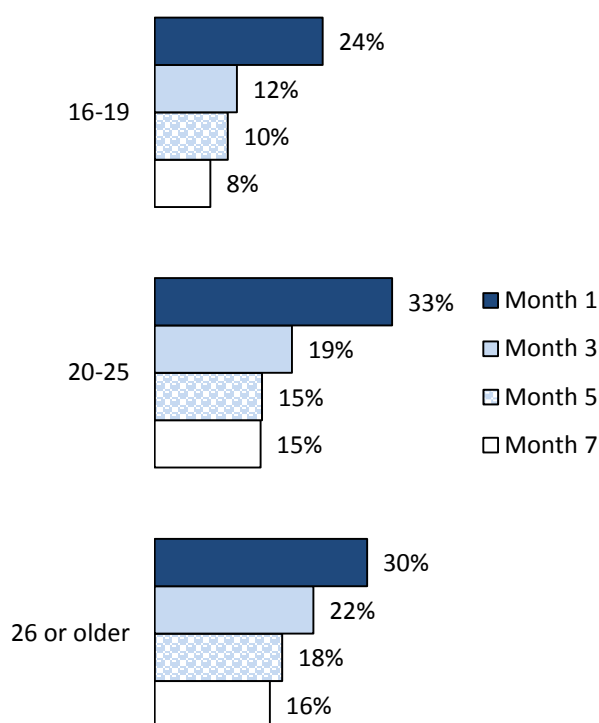


Table B3c-3 in Appendix B3c contains more detail on these data.

Chi-square tests of the association between feeding choice and key socio-demographic variables indicate several significant associations when study mothers are categorized by whether they exclusively breastfeed or not. In all interview months, feeding choice is associated with marital status, participation in other (non-WIC benefit) programs, income poverty, breastfeeding history, age of mother at birth, birth complications, length of hospital stay, nature of breastfeeding support at the hospital, and mother's receipt of nutrition education and skills training from WIC staff. In all but the first interview month, the feeding decision is associated with race, birthweight, and delivery type. However, not all of these associations proved significant in followup testing. Followup testing reveals higher rates of breastfeeding exclusivity for those who: are married; participate in no other programs; have 3 or more months

previous breastfeeding experience; are in the middle or highest income groups; had an uncomplicated birth (vaginal birth, no birth complications, 0-2 nights hospital stay); reported no WIC training on formula or cereal preparation; or only had training on cereal preparation.

4.5 Daily Breastfeeding Practices

4.5.1 Frequency and Intensity

The WIC ITFPS-2 data permit examination of the number of times a mother breastfeeds during a typical day, which is the frequency of breastfeeding. AAP recommends that newborns breastfeed between 8 and 12 times per day. Dietary recall data collected through the AMPM module of the interviews indicate

Key Findings:

- Most women who breastfeed are doing so on demand.
- 59 percent of breastfeeding women are expressing milk at 1 month.
- Women at WIC sites with more supportive breast pump programs are more likely to be expressing milk.

that this recommendation is met by study mothers who identify themselves as exclusively breastfeeding at the 1-month interview. These women are breastfeeding just over 9 times per day on average.⁶² Women who identify themselves as feeding both breastmilk and formula feed breastmilk slightly more than 5 times per day on average. For older babies frequency is slightly lower, with women who identify themselves as exclusively breastfeeding in the 7-month interview reporting an average of just over 7 breastmilk feedings per day, while women who identify themselves as combination feeding in the 7-month interview feed breastmilk about 4 times per day on average. Additional data on the average number of breastfeeds per day by breastfeeding practice each month are reported in Tables C3-3a-r in Appendix C3.

The previous study found that the average number of daily breastfeeds among breastfeeding women varied by race, ethnicity, the age of the mother at birth, parity, and income poverty. In contrast, we examine how the average number of daily breastfeeds vary among those exclusively breastfeeding and those combination feeding separately. Only race and age prove to be significant factors. Among women who combination feed, the average number of breastfeeds is lowest among African Americans at 1 month, and young (16-19 years) mothers at 7 months. Among those exclusively breastfeeding, the older mothers (>25 years) had the lowest average number of breastfeeds at month 1.

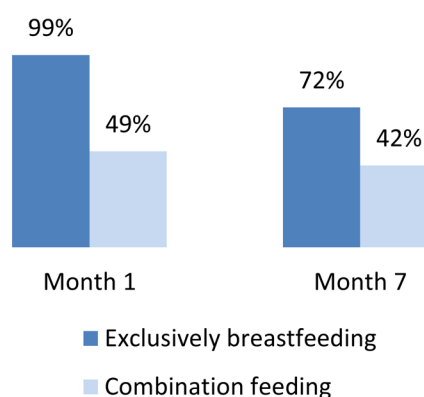
⁶² The WIC IFPS-1 examined average number of feedings per day for all breastfeeding women, finding that the average in month 1 was below that recommended for newborns by the AAP. If we combine exclusive and combination breastfeeding women, the WIC ITFPS-2 data confirm this finding: the overall average is 7.3 feedings per day, only slightly above the WIC IFPS-1 figure of 6.9 but still below the AAP recommendation.

We define intensity of breastfeeding as the percentage of feedings that contain breastmilk only. Using the AMPM data, the WIC ITFPS-2 finds that, as expected, the intensity of breastfeeding declines sharply for exclusively breastfeeding women at 7 months as more mothers begin to add solid foods to their infants' diets. At the 1-month interview, intensity of breastfeeding is 99 percent for exclusively breastfeeding women (for the remaining 1 percent no formula is given but they mix breastmilk with other food items or feed solid foods). For those who identify themselves as exclusively breastfeeding at subsequent interviews, intensity remains over 90 percent at 3- and 5-month interviews. However, at the 7-month interview, intensity falls to 72 percent of feedings as other foods are used more regularly. The change in intensity is not as evident for women who chose to combination feed (both breastmilk and formula). For them, intensity of breastfeeding is 49 percent at the 1-month interview, and 42 percent at the 7-month interview. Figure 4-8 shows the intensity of breastfeeding for the two groups of breastfeeding women at 1 and 7 months.

4.5.2 Feeding Schedules

Table 4-3 displays the percentage distribution of breastfeeding study mothers by feeding schedule at each interview month, comparing current data with that from the previous study. Generally, feeding patterns appear relatively stable between the two studies, with the majority of women continuing to breastfeed whenever the baby cries or seems hungry, although a higher percentage of mothers in WIC ITFPS-2 follow a set schedule at 1 and 5 months than did in WIC IFPS-1.

Figure 4-8. Among breastfeeding mothers, the percent of feedings that are breastmilk only at 1 and 7 months



Tables C3-41a-r in Appendix C3 contain more detail these data.

Table 4-3. Among breastfeeding mothers, the percentage following various feeding schedules at each interview month, WIC ITFPS-2 and WIC IFPS-1

Breastfeeding schedule	Percentage of breastfeeding study mothers			
	Month 1	Month 3	Month 5	Month 7
WIC ITFPS-2				
Set schedule	30.6%	22.1%	25.3%	23.4%
When infant cries or seems hungry	58.9	65.6	63.3	66.0
Mixed schedule	10.5	12.2	11.4	10.5
Unweighted n	2,009	1,120	798	802
Weighted n	273,190	184,341	139,242	115,385
WIC IFPS-1				
Set schedule	23.2	18.8	12	NA
When infant cries or seems hungry	64.5	69.4	70	NA
Mixed schedule	12.2	11.8	17	NA
Unweighted n	198	163	143	NA

Tables C3-2a-r in Appendix C3 contain more detail on the WIC ITFPS-2 data presented.

NA denotes not applicable.

The previous study found a consistent decline each month in the percentage of women feeding according to a set schedule. The consistent decline in the percentages of women feeding on a set schedule is not evident in the WIC ITFPS-2 data. Instead, there is over an 8 percentage point (nearly a 30 percent) decline in the percentages of WIC mothers who breastfeed according to a set schedule between the first and second interview, and then the percentage remains flat, with between 20 and 25 percent of women reporting they feed on a set schedule. The data suggest⁶³ that by month 3 breastfeeding women have chosen the feeding pattern they want to follow and the same pattern holds over subsequent months with the majority feeding their babies when they cry or seem hungry.

Results from chi-square tests of the association between feeding schedule and the key socio-demographic variables used in this study (provided in Appendix C3) indicate that feeding schedule is not consistently associated with any particular variable. There are fleeting instances where an association is evident at a particular month but significance is not sustained across months. The lack of significant associations between feeding schedule and socio-demographic variables in this study is consistent with findings from the previous study.⁶⁴

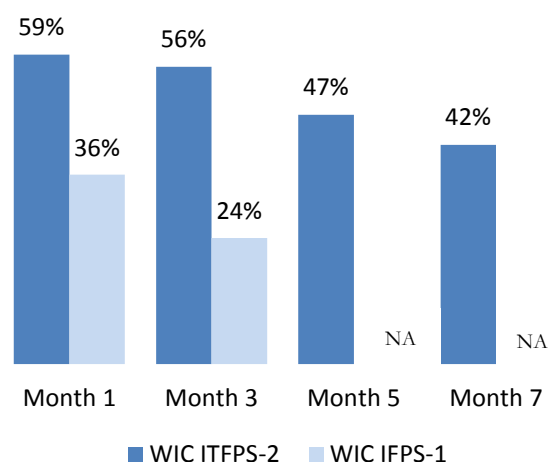
⁶³ Although the data are not longitudinal, the pattern of snapshots over time suggests stable types of feeding schedules.

⁶⁴ Baydar et al., 1997, p129.

4.5.3 Expressing Breastmilk

Figure 4-9 shows the percentage of breastfeeding mothers expressing breastmilk within the past week by interview, comparing data from the WIC IFPS-1 and the WIC ITFPS-2. Data from the previous study are available for months 1 and 3 only, so the bars at month 5 and 7 are intentionally missing. Figure 4-9 makes clear that expressing breastmilk is much more common than it was 20 years ago. Twenty years ago, 36 percent of women were expressing breastmilk within a week of the 1-month interview; now, 59 percent report doing so. This represents a 23 percentage point (64 percent) increase. There is a 32 percentage point (136 percent) increase in rates at 3 months. Currently, over half of breastfeeding study mothers express breastmilk in months 1 and 3. The percentage of women reporting that they express breastmilk is lower at each subsequent interview; nonetheless it remains a popular practice, with 42 percent of study mothers who breastfeed reporting at the 7-month interview that they expressed breastmilk in the past week.

Figure 4-9. Among breastfeeding mothers, the percentage who report expressing milk during the past week, WIC ITFPS-2 and WIC IFPS-1



Tables C3-8a-r in Appendix C3 contains more detail on these data. Bars at 5 and 7 months are intentionally missing because data were not available from WIC IFPS-1 for those months. NA denotes not applicable.

Results from chi-square testing of the association between expressing breastmilk and key socio-demographic variables indicate that the practice is associated with ethnicity, parity, and breastfeeding history in all interview months. Followup testing indicates that non-Hispanic women, mothers with only one child, and mothers with no breastfeeding history all pump more frequently than their counterparts. With the exception of the last interview month, pumping varies with support at the hospital in all other months. Stronger support is associated with higher rates of pumping, which may reflect access to high quality breast pumps. There is also an association between the practice and income poverty: at the 3-, 5-, and 7-month interviews, those in the highest income group are pumping more frequently than those in the lowest income group. Other key socio-demographic variables exhibit sporadic associations at specific interview months. Results are presented in Tables C3-8a-r in Appendix C3. In the previous study, parity and nativity status were associated with

expressing breastmilk in months 1 and 3;⁶⁵ however, the practice was not associated with race/ethnicity.

Given the dramatic change in pumping practices among WIC mothers in the last 20 years, we also examined whether pumping practices are associated with activities at WIC sites. For this analysis, we used a breast pump composite variable that reflects breast pump policies, staff beliefs, and breast pump education offered to mothers at WIC sites.⁶⁶ We examined whether the average percentages of women pumping at WIC sites varied with this composite. Results of the significance tests indicate that the mean percentage of women pumping at a WIC site is positively related to the policies and activities at the site, as measured by the breast pump composite. The average number of women pumping in any given interview month was higher in sites with more liberal breast pump policies and more robust breast pump education.

Women express breastmilk for a variety of reasons. The WIC ITFPS-2 survey asks breastfeeding women who are pumping breastmilk the reasons they do so. Respondents could indicate all reasons that apply. Table 4-4 shows percentage distribution of breastfeeding study mother by their reasons for pumping breastmilk at each interview month. In the first month, the most common reason is to increase milk supply. This motivation is followed closely by the desire to relieve engorgement or swelling and, then, by the need to have an emergency supply of milk. At each point in time, the desire to relieve engorgement or swelling is less prevalent, with less than 50 percent of women indicating this motivation by the 5-month interview. Instead, the desire to allow someone else to feed the baby is dominant at 5 months and remains so at the 7-month interview.

Table 4-4. Among breastfeeding mothers, the percentage distribution of reasons for pumping

Reasons for pumping	Percentage of breastfeeding study mothers who expressed breastmilk within the past week			
	Month 1	Month 3	Month 5	Month 7
Relieve engorgement or swelling	64.4%	58.3%	49.4%	42.4%
Keep milk supply up when baby could not nurse	52.4	57.2	58.9	56.2
Mix with cereal or other food	2.6	6.7	19.3	52.3
Increase your milk supply	70.2	66.5	62.1	51.5
Have an emergency supply of milk	61.2	71.9	68.9	68.0
Allow someone else to feed the baby	50.3	64.6	71.3	71.5
Other reason	11.7	9.4	8.6	7.8
Unweighted n	2,027	1,119	802	804
Weighted n	275,390	184,223	139,761	115,616

Tables C3-9a-r in Appendix C3 contain more detail on these data.

⁶⁵ Father's residence was also associated with the practice in month 3.

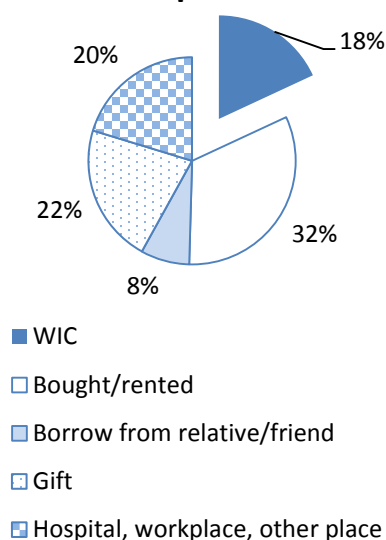
⁶⁶ See Appendix B2 for details on the development of the composite variables.

There are few patterns of significant association between individual reasons for pumping and the key socio-demographic variables used in this study. At the 1-, 3-, and 5-month interviews the desire to mix breastmilk with cereal or other food is significantly associated with ethnicity, with non-Hispanic women citing this reason more frequently than Hispanic women. At interview months 1 and 3, the desire to have someone else feed the baby is significantly associated with delivery type. Followup testing reveals that those who gave birth vaginally cite this reason more frequently than those having Caesarean deliveries. Instances of significant association are scarce in later interviews.

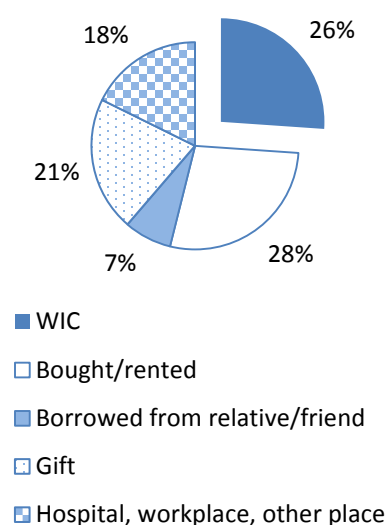
The WIC ITFPS-2 survey collects data at two different points in time on sources for breast pumps. The question about the source of a breast pump is asked to a given individual only once. If a woman is pumping at the time of the 1-month interview, she is asked about the source of the pump. Alternatively, if she was not pumping at 1 month but is by the 3-month interview, she is asked about the source of the pump at that time. Therefore, the survey offers data on sources of breast pumps for those who initiate pumping immediately (early adopters) and those who delay a month or two (later adopters). Figure 4-10 presents the distribution of sources for breast pumps for the two groups of women.

Figure 4-10. Percentage distribution of women who pump breastmilk by source of breast pump, early adopters and later adopters

Sources of pumps for early adopters



Sources of pumps for later adopters



Tables C3-13a-r in Appendix C3 contains more detail on these data.

Early adopters are those who initiate pumping immediately; later adopters are those who delay pumping for a month or two.

Thirty-two percent of early adopters purchased or rented their breast pumps, 22 percent received theirs as gifts, and 18 percent obtained them from WIC. Though the pattern is largely similar for later adopters of the practice, a greater percentage of later adopters obtained their pumps from WIC and a smaller percentage reported purchasing or renting their pumps.

Policies for the provisions of breast pumps vary across the 80 sites used in this study. Some WIC sites provide pumps to all who request them; others prioritize distribution based on whether the infant had a NICU stay or the mother is returning to work. The policy of requiring women to wait until they return to work could explain the shift towards WIC as a source for late adopters of pumping, but this policy is not consistent across sites.

4.6 Information and Support for Feeding Choices

4.6.1 Information Sources

WIC staff offer information on feeding and nutrition to educate and support WIC participants. The WIC ITFPS-2 data permit analysis of whether this information plays a role in caregiver decision-making and whether supports affect feeding practices. The analysis begins by examining a wide array of sources of information, to explore the relative role of WIC

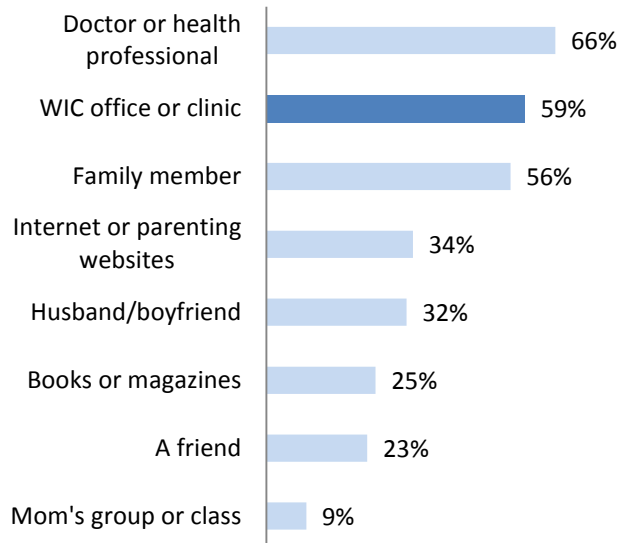
Key Findings:

- At 5-months postpartum, nearly 60 percent of study mothers report that they have turned to WIC as a source for feeding information.
- The enhanced breastfeeding food package is an important factor in the decision to breastfeed.

among these sources. Attention then moves to presenting findings on WIC staff education and credentialing, which serve as proxies for the caliber of information available in a WIC setting. With more than 95 percent of study mothers who initiate breastfeeding reporting that their WIC site was either somewhat or very important in deciding how to feed their infants, the study focuses on the importance of WIC supports, including the importance of food packages for breastfeeding mothers and supports for breastfeeding problems.

Figure 4-11 presents the percentages of study mothers by source of infant/toddler feeding information. The question asks whether respondents have turned to various sources for the information. Data are collected at the 5-month interview. Respondents can mark all sources that apply. Nearly 60 percent of study mothers report that they have turned to their WIC office or clinic for infant/toddler feeding information. WIC sites are second only to doctors and other health professionals as a source of feeding information. Given its prominence, the feeding information and education offered at WIC sites is likely to influence feeding patterns for a majority of participants.

Figure 4-11. Percentage of study mothers by source for infant feeding information



Tables C3-26a-r in Appendix C3 contains more detail on these data.

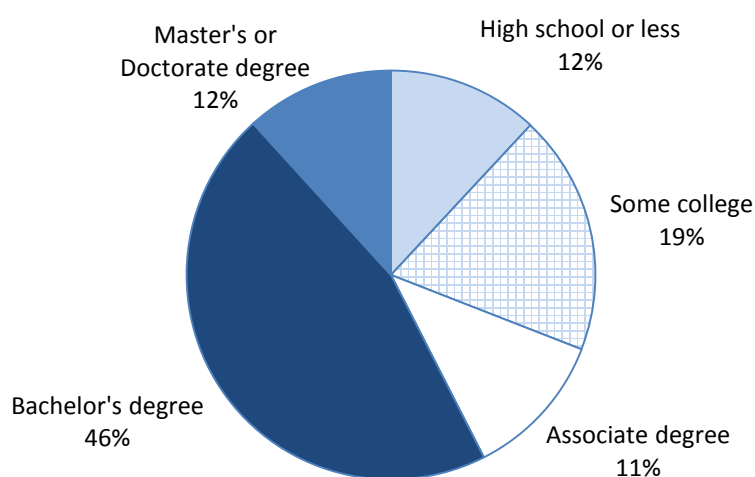
We tested whether each source for feeding information is associated with any of the key socio-demographic variables used in this study. The use of doctors or health professionals as a source of nutrition information is associated with race, as are the use of books or magazines, and the use of the Internet. Though associated in chi-square analyses, followup testing indicates that differences between specific subgroups are not statistically significant in most cases. The exceptions include that Hispanic mothers use books or magazines and friends more frequently than non-Hispanics; and that both mothers categorized in the Other racial category and mothers who are married use the Internet more frequently. As shown in Tables C3-26a-r in Appendix C3, the use of specific sources of information also varies with participation in other (non-WIC) benefit programs, parity, and income poverty. These results suggest that tailoring message presentation to specific groups (e.g., pamphlets for Hispanic mothers) may enhance reception.

4.6.2 WIC Staff Credentials and Knowledge

Staff at the 80 WIC sites participating in this study were surveyed on a variety of topics including staff educational attainment, credentialing, and knowledge of WIC recommendations. Though not weighted to represent all WIC sites, these data provide context for evaluating the quality of feeding

information provided at sites in this study. Among those providing nutrition education and breastfeeding support to WIC participants, 19 percent had some college education, 46 percent had Bachelor's degrees, and 11 percent had Master's degrees. Figure 4-12 depicts the percentage distribution of staff providing nutrition education and support by highest educational attainment. Data shown in the Appendix B3c reveal that about one in four of these staff is credentialed as Certified Lactation Counselors; nearly 20 percent are Registered Dietitians; and nearly 6 percent are Registered Nurses.

Figure 4-12. Percentage distribution of WIC staff providing nutritional education and support by highest educational attainment



The percentage of staff with less than high school education and the percentage with a Doctorate degree were each less than 1. Therefore, these two groups combined with other groups. Table Bc3-4 in Appendix B3c contains more detail on these data.

Among staff providing education and support, knowledge of WIC recommendations is relatively high, with a majority of staff correctly identifying WIC policy for all topics listed in the survey. The policy most often incorrectly identified was which solid foods to introduce first, but still nearly 8 in 10 staff correctly identified an appropriate response. WIC recommendations regarding when to transition to low-fat milk and how long to breastfeed were correctly cited by more than 95 percent of the staff who provide nutritional education and breastfeeding support. Table 4-5 displays the percentage of WIC staff providing nutrition education and breastfeeding support that correctly identified the recommended policy.

Table 4-5. Percentage of WIC staff that provides nutrition education and support correctly identifying WIC recommendations for infant and toddler nutrition

Nutrition Issue	Percentage of WIC staff with knowledge of WIC recommendations	Unweighted n
When to start eating solid food?	90.8%	531
Which solid foods to introduce first?	79.5	531
How long to breastfeed?	95.7	535
How to know when baby is full?	88.8	536
When to wean baby from bottle?	87.5	535
When to transition to whole milk?	94.9	532
When to transition to low-fat milk?	96.8	531

4.6.3 Following Nutrition Guidance

As Table 4-5 indicates, during the first year of life, WIC staff focus on several recommended feeding practices for young infants. These include proper recognition of infant cues, how to breastfeed, how to mix and feed formula, as well as when to introduce complementary foods. The WIC ITFPS-2 collects data on whether study mothers follow recommended feeding practices, including whether they add anything other than breastmilk or formula to infants' bottles and whether they follow dilution guidance for formula.

We aggregated data from the AMPM 24-hour recall to examine whether breastmilk or formula feedings included additions of other foods or liquids. Given the age of the infants, these are most likely additions to a bottle, a feeding practice that WIC does not endorse unless medically recommended. The data indicate that at each interview, the percentage of women choosing to add other food items to formula or breastmilk beverages increases. Figure 4-13 displays the trend. Less than 5 percent of study mothers add food items to formula or breastmilk at 1 month, but by month 7, nearly 30 percent of study mothers are adding other food items to formula or breastmilk.⁶⁷ At both 1 and 7 months, the most frequently added foods are dry instant cereals: rice, oatmeal, and mixed grain.

⁶⁷ We distinguish between formula and breastmilk beverages and solids that contain some formula or breastmilk, as the latter could not be consumed through a bottle.

The findings in Figure 4-13 are based on upon a broader cohort than findings in the WIC IFPS-1, which performed a similar analysis but looked only at formula-feeding women and additions of other foods or liquids to formula beverages only. The previous WIC study reported that 11 percent of formula-feeding study mothers added other foods or liquids to bottles of formula at 1 month and 24 percent did so by 3 months. Tailoring the analysis to this sub-group of women, we find that about 2 percent of formula-feeding mothers add other foods or liquids to formula at 1 month, and nearly 11 percent do so at 3 months. WIC educational efforts appear to have contributed to reducing the prevalence of this undesirable practice by 78 percent at 1 month and 55 percent at 3 months.

Figure 4-13. Percentage of study mothers adding other foods or liquids to formula or breastmilk

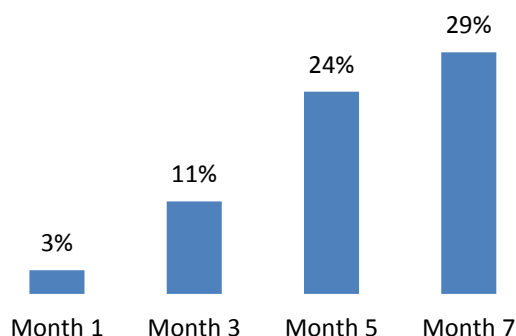


Table B3c-5 in Appendix B3c contains more detail on these data.

In the 3- and 7-month interviews, the WIC ITFPS-2 surveys ask formula-feeding respondents whether they deviate from dilution guidance, another practice that WIC does not support unless medically recommended. If the respondent indicates that she does deviate from dilution guidance, the survey inquires whether a medical provider directed the deviation. As Table 4-6 shows, at each interview month only a small minority of formula-feeding women deviate from dilution guidance. The largest percentage of women, 2 percent, report mixing formula with extra water in the 7-month interview. Because the number of women who deviate from dilution guidance is small, standard errors on these estimates are relatively large; thus, many of the chi-square tests of association between types of deviation of key socio-demographic variables are not significant. Mixing formula with less water is associated with food security and age of the mother at birth in some months, and with birth complications in the first month. Mixing formula with extra water in the first month is associated with delivery type. But, further followup testing did not identify any significant directional differences among the subgroups.

Table 4-6. Among formula-feeding study mothers, the percentage who deviate from formula dilution guidance each interview month

Deviation from dilution guidance	Percentage of formula-feeding study mothers			
	Month 1	Month 3	Month 5	Month 7
Mixed formula with extra water	1.0%	1.5%	1.9%	2.3%
Mixed formula with less water	0.7	1.6	1.0	0.8
Unweighted n ^a	2,363	2,239	2,209	2,641
Weighted n	314,736	354,704	372,520	372,940

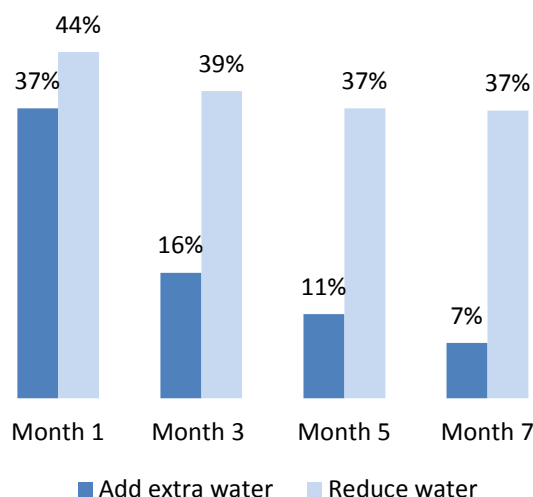
Tables C3-19a-r in Appendix C3 contain more detail on these data.

^an is the number of formula-feeding mothers at each month. Actual n in analysis may be less than the number displayed due to item non-response.

Among the small group of women who deviate from the dilution guidance, a total of 81 percent (37 + 44) report following health provider guidance in month 1. In contrast, by month 7 only 44 percent (37 + 7) say their deviations are directed by a provider. Figure 4-14 displays the percentages of women following health provider guidance to add or subtract water to formula at each interview month. At each interview month, reducing the amount of water indicated is the more common prescription, with a significantly larger percentage each month reporting following this guidance than the percentage reporting adding extra water.

Looking across both possible prescriptions, a majority of study mothers who deviate from dilution guidance are following health care provider guidance in months 1 or 3, but not in months 5 or 7 as the sum of percentages in these interview months is below 50 percent.

Figure 4-14. Among formula-feeding study mothers who deviate from dilution guidance, the percentage who add/subtract water according to a health provider's direction



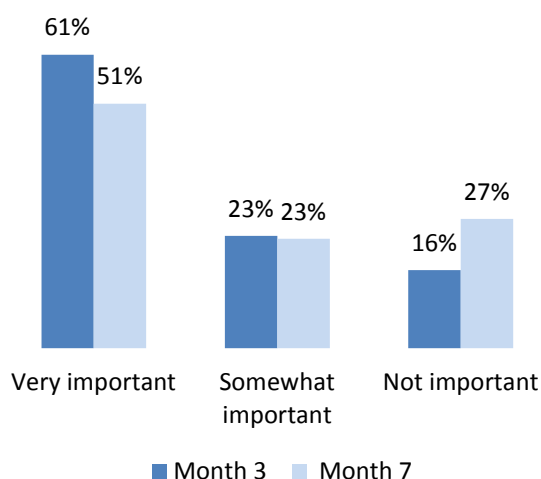
Tables C3-20a-r in Appendix C3 contains more detail on these data.

As the previous table indicated, not many women deviate from dilution guidance, so those who report doing so according to medical provider guidance is a very small subset of the total sample. When examining the data by key socio-demographic variables, cell sizes were often too small to perform tests to evaluate the statistical significance of the association between dilution practices and socio-demographics.

4.6.4 WIC Food Packages

In addition to information and education on infant feeding, WIC clinics provide food packages to support nutritional needs of mothers and infants. For breastfeeding mothers, WIC offers an enhanced food package tailored to the nutritional requirements of mothers who do not accept formula from WIC. In both the 3-month and 7-month interviews, the WIC ITFPS-2 explores the importance of this food package by asking women who are aware of the package how important it was in their decision to breastfeed. At the time of the 3-month interview 91 percent of mothers report being aware of the enhanced food package; at 7-months 63 percent report being aware of the

Figure 4-15. The perceived importance of the enhanced breastfeeding package on the decision to breastfeed, among study mothers aware of the package



Tables C3-36a-r in Appendix C3 contains more detail on these data.

enhanced package. Figure 4-15 shows that among those mothers aware of the package at 3 months, 61 percent indicate that the food package was very important in their feeding decision, while 51 percent of those aware of the package at 7 months hold this position. This 10 percentage point decline is matched by a commensurate increase in the percentage reporting that the food package was not important. These differences between interviews are suggestive of a waning importance of the food package once breastfeeding is firmly established.

Results of chi-square testing find significant association between the perceived importance of the enhanced breastfeeding food package and race, ethnicity, and income poverty at both the 3- and 7-month interviews. In general, followup

tests show that racial and ethnic minorities other than African Americans, and those in the lowest income category, perceive the package to be more important than do their counterparts.

4.6.5 Breastfeeding Problems and Support

WIC staff are specifically trained to address common breastfeeding problems. Table 4-7 presents the percentage of breastfeeding study mothers reporting breastfeeding problems at the 1-, 3-, and 5-month interviews. The WIC IFPS-1 data are included to examine change over time. First, as found

in the previous study, significant percentages of women experience at least one breastfeeding problem. Second, looking at specific problems, latching on (only asked at month 1), cracked nipples, breasts feeling too full, and the perception of not enough milk for the infant are prevalent especially in the early months. Though reports of cracked nipples are much less frequent in later interviews, reports that breastmilk is not enough milk for the infant are relatively consistent at each interview, with 26 percent of women reporting this problem at month 1, and 23 percent of the women reporting it at month 5.

Table 4-7. Among breastfeeding mothers, the percentage who reported experiencing at least one breastfeeding problem in the past month, WIC ITFPS-2 and WIC IFPS-1

Breastfeeding problems	Percentage of breastfeeding study mothers					
	Month 1		Month 3		Month 5	
	WIC ITFPS-2	WIC IFPS-1	WIC ITFPS-2	WIC IFPS-1	WIC ITFPS-2	WIC IFPS-1
Latching on ^a	40.2%	NA	NA	NA	NA	NA
Choking	13.8	20	15.6	19	8.8	8
Cracked nipples	55.9	17	20.6	4	8.5	3
Breast infection	2.0	2	2.3	2	0.5	0
Breasts too full	45.9	12	35.2	6	16.3	2
Not enough milk for the infant	25.5	34	25.4	25	23.1	15
Other problem	3.2	10	3.7	4	3.2	2
Unweighted n ^b	2,027	198	1,119	163	801	143
Weighted n	275,390	NA	184,223	NA	139,564	NA

Tables C3-30 and C3-30a-r in Appendix C3 contain more detail on the WIC ITFPS-2 data.

^a This question is only asked at the 1-month interview.

^b n is the number of respondents to answer the last question shown in the table at each month. n may differ slightly from 2027 (Month 1)/1119 (Month 3)/801 (Month 5) due to item nonresponse.

NA denotes not applicable.

Comparing data between studies, a notably larger percentage of women currently report cracked nipples as a problem than did in the previous study (56 percent vs. 17 percent). Also more frequently reported in the current study is the problem of breasts being too full (46 percent vs. 12 percent).

In the first month, several problems vary significantly with ethnicity. These include latching on, breast infection, not enough milk to satisfy the baby, and other not-listed problems. However, this association is not seen in later interviews. There are only a few other significant associations between

breastfeeding problems and the key socio-demographics in later interviews. All significant associations are indicated in Tables C3-30a-r in Appendix C3.

When encountering breastfeeding problems, a WIC participant may contact her WIC site for support. Table 4-8 presents the percentage of study mothers who experienced at least one breastfeeding problem in the past month by source of support. For those breastfeeding mothers experiencing breastfeeding problems within the last month, their WIC site is among the top three sources of support at each interview month. At the 3- and 5-month interviews, it is second only to friends and relatives as a source of support.

Table 4-8. Among breastfeeding mothers, the percentage reporting breastfeeding problems in the past month who received help by source of support at each interview month

Source of help	Percentage of breastfeeding study mothers who reported at least one breastfeeding problem		
	Month 1	Month 3	Month 5
WIC office or clinic	45.7%	54.7%	51.6%
Doctor or nurse	48.7	48.7	34.8
Friends or relatives	62.7	65.7	58.9
Support people outside of WIC	25.4	35.1	25.1
Someone else	2.4	3.0	4.3
Unweighted n ^a	1,751	728	359
Weighted n	236,211	121,523	62,667

Tables C3-32a-r in Appendix C3 contain more detail on these data.

^a n is the number of respondents to the last question shown in the table. For some questions, actual n is slightly different from the number displayed due to item nonresponse.

The analysis looks more closely at sources of support for those who exclusively breastfeed and those who combination feed. Table 4-9 presents the percentage distribution of sources of support by breastfeeding practice.⁶⁸ Subgroup comparisons of women receiving support from WIC indicate that as of the 1-month interview a greater percentage of women who combination feed receive support for their breastfeeding problems from WIC than do exclusively breastfeeding women. During this time, the majority of exclusively breastfeeding women either finds support elsewhere or does not obtain support for their breastfeeding problems. In subsequent interviews, the differences in percentages of women receiving help from WIC are not statistically significant.

⁶⁸ Because the data are snapshots of those women reporting problems at each month, the data should not be interpreted as longitudinal patterns behaviors of the same groups of women.

Table 4-9. Among breastfeeding mothers experiencing problems, the percentage of mothers receiving education/support (WIC vs. elsewhere)

Source of support	Percentage of breastfeeding study mothers who experience breastfeeding problems					
	Month 1		Month 3		Month 5	
	Exclusively breastfeeding	Combination feeding	Exclusively breastfeeding	Combination feeding	Exclusively breastfeeding	Combination feeding
WIC	40.9%	50.2%	54.0%	55.2%	48.1%	53.7%
Elsewhere	39.9	34.1	31.3	29.4	27.2	26.7
No support	19.2	15.7	14.7	15.5	24.7	19.6
Unweighted n	864	884	307	419	130	228
Weighted n	113,786	122,033	48,624	72,697	21,806	40,709

Tables C3-35a-r in Appendix C3 contain more detail on these data.

4.6.6 Breastfeeding Barriers

Studies have shown that breastfeeding women face barriers. One primary barrier to continuing to breastfeed is employment. Figure 4-16 shows the percentage of breastfeeding study mothers by employment status at 3 and 7 months.⁶⁹ Slightly less than 30 percent of breastfeeding study mothers are working at the 3-month interview, and nearly 35 percent are working at the 7-month interview. At the 7-month interview, nearly one in five breastfeeding mothers is working part-time and about one in six is working full-time.

⁶⁹ To compare these data with the distribution of all study mothers by employment status see Table B3c-5 in Appendix B3c.

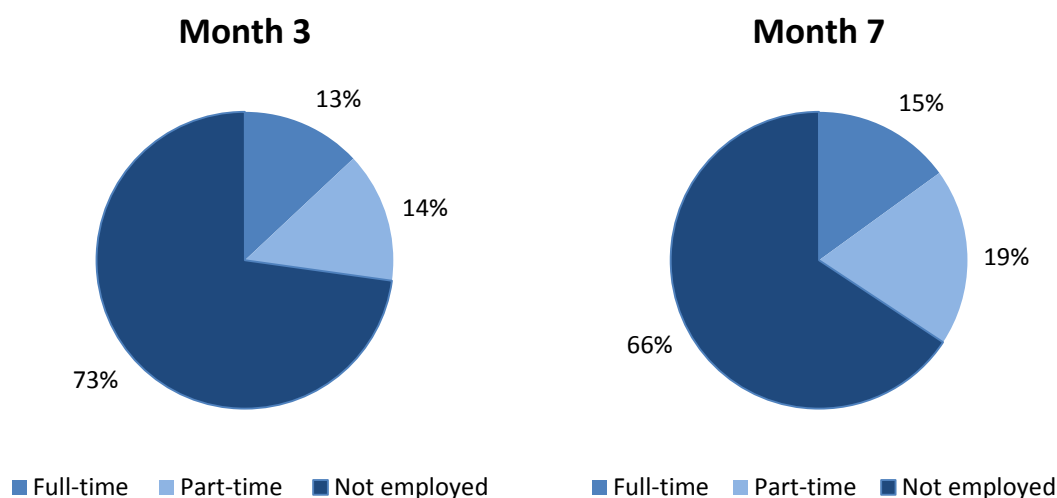
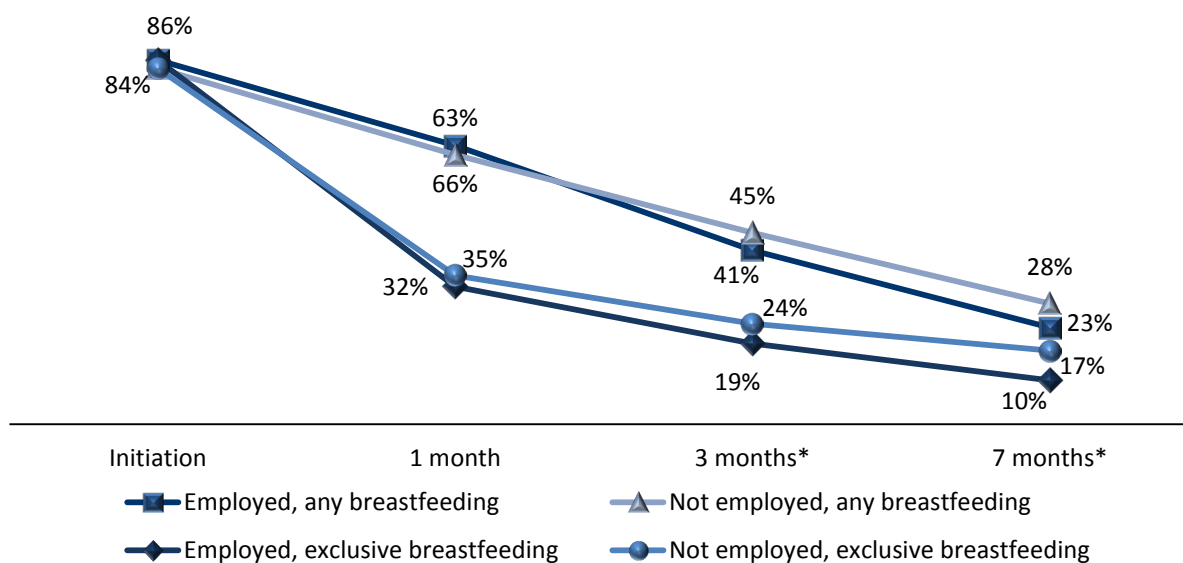
Figure 4-16. Among breastfeeding mothers, distribution of employment status

Table B3c-6 in Appendix B3c contains more detail on these data.

Next, we examine whether employment status at 7 months is related to feeding decisions longitudinally from initiation through 7 months. If women knew that they were planning to return to work and anticipated that this would be a barrier to breastfeeding, they may not have initiated breastfeeding at all, or may have stopped sooner as compared to those who were not returning to work. Figure 4-17 shows the percentages of women breastfeeding at each time period, by employment status at 7 months. Any breastfeeding includes both exclusive and combination feeding, whereas exclusive breastfeeding includes those feeding only breastmilk. At initiation and 1 month, women who were employed at 7 months were breastfeeding at rates that were not statistically significantly different from those of women who were not employed at 7 months. Only at 7 months was the employed group doing any breastfeeding at a significantly lower rate than those who were not employed, suggesting that employment by 7 months was not a barrier to earlier breastfeeding. Looking more closely at exclusive breastfeeding, however, yields additional information. Women who were employed at 7 months were breastfeeding exclusively at a significantly lower rate both at 3 months and at 7 months than those who were not employed. Employment at 7 months, then, is associated with a shorter period of exclusivity.

Figure 4-17. Percentage of study mothers breastfeeding, by employment status at 7 months

* Statistically significantly lower rates of any or exclusive breastfeeding for employed women at 7 months, and significantly lower rates of any breastfeeding for employed women at 3 months.

We also explore whether work is a barrier to continuing to breastfeed. For breastfeeding women the survey inquired about perceived barriers to continuing breastfeeding, including the need to return to work or school. Table 4-10 presents the percentage of breastfeeding study mothers who face breastfeeding barriers by type of barrier each interview month. Respondents could endorse all that apply. No one barrier affects a very large percentage of the mothers. In the 1-month interview feeling tied down by breastfeeding was cited by the largest percentage of women, about 1 in 10, as a barrier. At this early stage, the need to return to work or school is only cited a barrier for 2 percent of the women. By months 3 and 5 the need to return to work is dominant among the options presented; nonetheless, only 12 to 13 percent of breastfeeding mothers cite work or school as a barrier to continuing breastfeeding.

Table 4-10. Among breastfeeding study mothers, the percentage encountering barriers by type each interview month

Breastfeeding barrier	Percentage of breastfeeding study mothers		
	Month 1	Month 3	Month 5
Had to return to work or school	2.1%	12.5%	11.5%
Breastfeeding took too much out of me	8.3	8.6	4.2
Not enough time to breastfeed	5.1	10.3	0.0
Felt tied down by breastfeeding	10.8	12.0	8.0
Husband/boyfriend did not support breastfeeding	1.0	0.0	1.0
Unweighted n	2,027	1,119	801
Weighted n	275,390	184,223	139,564

Table B3c-7 in Appendix B3c contains more detail on these data.

The survey collected data on the best perceived solution to barriers which included doing nothing, seeking support from a friend or relative, mixing breastfeeding with formula feeding, seeking support from a health professional, making arrangements with work or school, ceasing to breastfeed, and catch-all category for other, unlisted resolutions. At each interview, only 2-3 percent of breastfeeding women experiencing a barrier cited ceasing to breastfeed as the perceived best resolution to the barrier. At all interview months, the most cited resolution was the catch-all other solution. The second most-frequently cited option was to just keep breastfeeding. In Tables C3-34a through C3-34r in Appendix C3, we present all the data.

4.7 Formula-Feeding Practices and Formula Supplementation

At the time of hospital discharge, 60 percent of mothers are feeding their babies formula alone or in combination with breastfeeding. By the 7-month interview, the percentage has risen to 84 percent. As formula is an important part of many infants' diets, we examine formula feeding practices in detail in this section.

Key Findings:

- Half of breastfeeding mothers report regular supplementation with formula within the first 2 weeks postpartum.
- The most frequently cited reasons for formula use are that breastmilk alone did not satisfy the baby or the mother felt she did not have enough breastmilk.

4.7.1 Formula-Feeding Practices

Study participants who use formula, either exclusively or in combination with breastmilk, feed their infants formula just over six times per day, on average, according to 24-hour dietary recall data collected as part of the 1-month interview. The average number of feedings involving formula is lower with each subsequent interview. At the 7-month interview caregivers feed formula, on average, just under five times per day as many infants have begun solid foods.

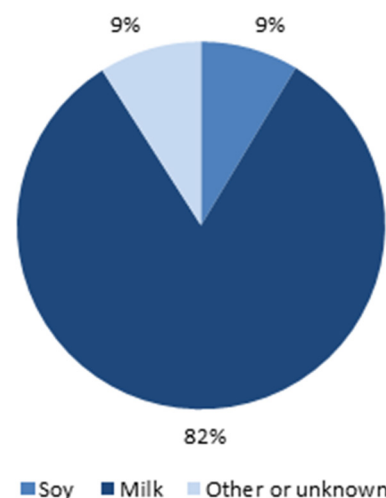
As a percentage of total formula-feedings on a typical day, Enfamil is the most frequently used brand of formula regardless of interview month.⁷⁰ Each interview month about 50 percent of formula-feedings by study mothers involve Enfamil. Similac and Good Start are the other two products that round out the top three brands. In most cases, however, WIC State Agencies must have a sole source rebate contract in place with a formula company, so WIC participants get the rebate formula brand. Thus, results presented likely reflect the contractual arrangements of states participating in our study and may only approximate the national distribution, as the sample was not designed to support estimates which are determined at the state level.

Each interview month, more than 80 percent of formula feedings in a typical day is milk-based and less than 10 percent is soy-based.

Figure 4-18 uses the 7-month data to exemplify the general pattern of the distribution across formula-feedings seen each month.

Most study participants obtain the formula they use from WIC. Table 4-11 presents the percentage distribution of study mothers by formula feeding practice and source of formula through the 7-month interview. In months 3, 5, and 7, between 55 and 60 percent of study mothers who use formula get their formula solely from WIC regardless of feeding practice.

Figure 4-18. Percentage of formula feedings by formula base, month 7



Tables C3-16a-r in Appendix C3 contain more detail on these data.

⁷⁰ Our approach to analyzing formula focuses on consumption. This differs from the WIC IFPS-1 approach that focused on the number of mothers using the formula brand. We analyze the percentage of *formula feedings* by brand while the WIC IFPS-1 looked at the percentage of *women* using various brands. The previous study found that the greatest percentage of women used Similac which was the dominant contractual brand at the time.

Generally, a larger percentage of exclusively formula-feeding mothers are obtaining formula from WIC as compared to combination-feeding mothers, and these differences are statistically significant at both months 1 and 5. At the 1-month interview, notably, a much smaller percentage of women who are combination feeding (39 percent) get their formula from WIC than those exclusively formula feeding (61 percent). This likely reflects policies that reduce the distribution of formula to women who combination feed to promote breastfeeding.

Table 4-11. The percentage distribution of formula-feeding study mothers by formula feeding practice and source by interview month

Formula feeding practice and source	Percentage of formula-feeding study mothers			
	Month 1	Month 3	Month 5	Month 7
Exclusively formula feeding mothers				
WIC	60.6%	62.5%	61.1%	53.9%
Somewhere else	22.9	11.5	11.2	11.0
Both WIC and somewhere else	16.5	26.0	27.7	35.1
Unweighted n	1,367	1,667	1,811	2,283
Weighted n	176,238	257,723	302,738	321,704
Combination feeding mothers				
WIC	38.7	60.4	54.4	54.9
Somewhere else	46.1	21.1	24.4	24.8
Both WIC and somewhere else	15.3	18.4	21.2	20.3
Unweighted n	994	571	395	358
Weighted n	138,372	96,900	69,581	51,236

Tables C3-17a-r in Appendix C contains more detail on these data.

Because the study tracks mothers and their babies over a long time period, the WIC ITFPS-2 provides insight on the feeding practices of study participants who have left WIC. Table 4-12 shows the percentages of WIC women by their current WIC participation status and formula-feeding practice each interview month. Analysis reveals that formula-feeding practices vary by WIC participation status. In interview months 3, 5, and 7, a significantly higher percentage study participants currently on WIC exclusively formula feed than those who have left WIC. This finding likely reflects the fact that monetary value of the food package that the exclusive fully formula-feeding mother/infant pair receives from WIC is greater than value of food package that the fully breastfeeding mother/infant pair receives, due to the monetary value of formula in the fully formula-feeding package. Therefore, women who have chosen to use formula may be more motivated to stay on WIC. At any given interview, differences between those currently on/off WIC among those choosing to combination feed are not significant.

Table 4-12. Percentage of mothers by formula feeding practice and WIC participation status each interview month

Formula-feeding practice	Percentage of study mothers by interview month and current WIC participation status							
	Month 1		Month 3		Month 5		Month 7 ^a	
	Currently on WIC	Currently off WIC	Currently on WIC	Currently off WIC	Currently on WIC	Currently off WIC	Currently on WIC	Currently off WIC
Exclusive formula feeding	39.3%	30.6%	59.0%	39.7%	69.2%	49.4%	73.4%	57.8%
Combination feeding	30.8	24.9	22.0	19.6	15.5	22.4	11.3	17.5
Exclusive breastfeeding – no formula	29.9	44.5	19.0	40.7	15.3	28.2	14.1	24.0
Unweighted n	3,257	134	2,690	96	2,504	111	2,979	153
Weighted n	435,883	15,341	427,019	15,036	424,362	18,391	420,537	21,913

Table B3c-8 in Appendix B3c contains more detail on these data.

^a At Month 7, a small number of mothers reported feeding neither breastmilk nor formula; thus column percentages do not sum to 100 percent.

Differences between study participants currently on WIC and those currently off WIC are statistically significant for exclusive formula feeding in interview months 3, 5, and 7.

4.7.2 Formula Supplementation

Breastfeeding study mothers use formula for a variety of reasons. For the purposes of our analysis, the occasional use of formula does not constitute supplementation. Formula supplementation is defined as daily use of formula in conjunction with breastmilk. The combination need not occur at the same feeding session. The use of formula has been found to undermine breastfeeding duration, and few women return to exclusive breastfeeding once formula supplementation occurs.

The WIC ITFPS-2 asks breastfeeding mothers about their reasons for formula supplementation until the first interview in which indicate that they have completely stopped breastfeeding. Table 4-13 presents the distribution of breastfeeding study mothers by the reason(s) they choose to use formula at each interview month.⁷¹ The most frequently cited reasons for formula use are that breastmilk alone did not satisfy the baby or they did not have enough breastmilk. At each interview month, between 55 and 60 percent of respondents indicated these reasons. Closely following these

⁷¹ Because these data are cross-sectional snapshots of each month, and the group of study mothers feeding formula may change over time, no longitudinal patterns should be inferred from the data.

two reasons is the desire for the baby to have both formula and breastmilk, which may represent a desire for flexibility in feeding options. Experiencing trouble with the baby latching onto the breast motivates nearly 45 percent of respondents to use formula at 1 month, but at 5 months only 17 percent of women indicate this as a motivation. The desire for someone else to feed the baby is more frequently reported in the 5- and 7-month interviews, with approximately one in four women citing this reason.

Table 4-13. Among breastfeeding study mothers who use formula, the reason(s) for formula use each interview month

Reasons for formula use	Percentage of study mothers			
	Month 1	Month 3	Month 5	Month 7
My baby had trouble sucking or latching on to the breast	44.6%	31.6%	17.2%	NA
My baby lost interest in nursing or began to stop nursing by him or herself	19.2	20.1	22.6	35.0
Breastmilk alone did not satisfy my baby	60.8	61.5	55.3	57.6
I thought that my baby was not gaining enough weight	24.1	20.4	16.7	15.4
I didn't have enough breastmilk	55.6	59.9	56.6	59.5
Breastfeeding was too painful	24.1	13.4	7.0	10.5
I wanted my baby to have both formula and breastmilk	54.2	57.1	51.0	54.8
I chose not to breastfeed	32.5	18.2	11.6	10.5
My baby was sick and could not breastfeed	4.7	6.6	3.5	3.0
I was sick or had to take medicine	12.7	13.7	13.7	9.6
Breastfeeding seemed too inconvenient	10.2	9.6	5.0	5.7
I could not or did not want to pump	15.5	13.0	10.3	11.2
I wanted or needed someone else to feed my baby	13.0	19.5	24.1	24.5
For another reason	11.8	15.4	15.3	15.4
Unweighted n	2,355	1,279	661	678
Weighted n	313,606	210,578	117,190	98,341

Tables C3-14a-r in Appendix C3 contain more detail on these data.

NA denotes not applicable.

A few of the reasons for formula use vary significantly by key socio-demographics, but the association is not significant at all interview months. For example, the concern about not having enough breastmilk varies significantly by race at months 1 and 3, but not at months 5 and 7. Tables C3-14a-r in Appendix C3 detail all the significant associations with the socio-demographic variables used in this study.

We also explore the child age at which daily formula supplementation begins, and factors associated with that timing. Because the timespan over which women begin using formula on a daily basis is

lengthy, the analysis examines the median number of days to formula supplementation.⁷² Use of the median also parallels the approach taken in the WIC IFPS-1. The median time at which the typical WIC ITFPS-2 breastfeeding mother begins formula supplementation is 14-days postpartum, which is similar to the median reported in the WIC IFPS-1, 16 days.⁷³

Paralleling the analysis approach used in the WIC IFPS-1, we explore whether the median elapsed time until initiation of formula supplementation differs by key socio-demographic variables. This bivariate approach uses followup tests to determine whether medians differ significantly between subgroups of women who left the hospital breastfeeding.⁷⁴ We find that median elapsed time at formula supplementation differs with ethnicity and nativity status, with non-Hispanic or U.S.-born women delaying formula supplementation longer than their Hispanic or non-native peers. Unlike the previous WIC study, we do not find significant differences in medians by race or age of mother. The median elapsed time until supplementation is higher if: the mother has more than a high school education (compared to those with either 9th grade or less or those with 12th grade only); she does not participate in other benefits programs; she lives with very low food security (compared to those with high/marginal food security); either the mother/infant experienced birth complications; the mother gave birth vaginally or had a shorter hospital stay; or if she did not receive training from WIC staff on formula preparation.

Because a host of variables simultaneously influence the decision to introduce formula, we use survival analysis to examine the unique individual effects of factors that influence the risk of earlier formula supplementation.⁷⁵ This multivariate analysis evaluates the risk of formula supplementation at any time through 7 months; we restrict the analysis to women who left the hospital breastfeeding.

To evaluate the most appropriate variables to include in the survival analysis, we begin by examining the influence of all the key socio-demographic variables used in this study. For ease of interpretation we collapsed categories for parity, and for education level: for this analysis, parity is those with less/more than two children, and education is those with less/more than a high school education.

⁷² The median case is the one at the 50th percentile. We do not use the mean (arithmetic average) because it is influenced by extreme values; thus, the average women may not represent typical behavior.

⁷³ WIC IFPS-1 researchers only mention breastfeeding women as their reference group, while we used women who left the hospital breastfeeding. Also, values for women who have not yet started formula supplementation at 7 months are set to a date after their 7-month interview in order to include them in our calculations.

⁷⁴ Socio-demographic variables that did not exhibit significant differences in medians included race, income poverty, parity, maternal marital status, mother's age at child's birth, inter-partum period, nature/intensity of breastfeeding support at the hospital, infant's birth weight, food package prescription, and use of non-maternal child care.

⁷⁵ Women who have not begun formula supplementation by the 7-month interview effectively have censored data.

To enrich the context in which the supplementation decision is made, we examined the effects of several additional variables, including early support for breastfeeding from various sources, breastfeeding problems in the first 5 months, and two site-level composite measures reflecting WIC staff education and breastfeeding support activities. We use the Akaike Information Criterion (AIC), a measure of the goodness of fit of the model, to determine which versions of the survival analyses were most informative. When comparing different potential models, those with lower AIC indicated less information loss, allowing us to select the model containing the variables that best explain the data. The final survival analysis model is similar to that put forward in the WIC IFPS-1, as many hypothesized predictors added to the model for WIC ITFPS-2 did not prove to be significant.

Table 4-14 summarizes the results of the survival analysis. Increased risk of earlier supplementation is uniquely associated with race, ethnicity, nativity status, maternal age, length of one's hospital stay, education, and employment status. Though the median age of the infant at time of formula supplementation did not differ significantly by race in the bivariate analysis, race is a significant factor affecting risk of earlier formula supplementation in the multivariate survival analysis.

Table 4-14. Survival analysis estimates of the relative risk of earlier formula supplementation

Socio-demographic variable	Effect on risk of earlier formula supplementation
Race: African American vs. White	Higher risk for African American mothers
Race: Other vs. White	No effect
Ethnicity: Hispanic vs. non-Hispanic	Higher risk for Hispanic mothers
Nativity status: not born in U.S. vs. born in U.S.	Higher risk for mothers not born in the U.S.
Age at birth: 16-19 years vs. 26+	Higher risk for younger mothers
Age at birth: 20-25 years vs. 26+	No effect
Parity: Second or subsequent born vs. first born	No effect
Reported breastfeeding problems	No effect
Encouraged by infant's father	No effect
Encouraged by respondent's mother	No effect
Some breastfeeding history vs. no history	No effect
Hospital stay: 3 or more nights vs. 2 or less	Higher risk for mothers with longer hospital stays
Not aware vs. aware of enhanced food package	No effect
Education level: More than high school vs. high school or less	Higher risk for mothers with less than high school education
Employed at 7 months	Higher risk for employed mothers

For those study mothers who left the hospital breastfeeding but were not currently breastfeeding at any interview prior to the 7 month, we do not have information on breastfeeding problems. We created a "not applicable" category for breastfeeding problems of these women. This group was significantly more likely to initiate formula supplementation. Similarly for the women who were not on WIC by the 7-month interview and we did not have data from their 3-month interview, we created a not applicable category for awareness of the enhanced WIC breastfeeding package. Analysis results for this group were not significant.

Table B3c-9 in Appendix B3c contains more information on the survival analysis results.

Breastfeeding African American women are 41 percent more likely to initiate formula use at any point in time than their White counterparts.⁷⁶ Although Hispanic mothers and mothers born outside the United States more often choose to breastfeed, these two socio-demographic groups have higher risk of earlier formula supplementation. Hispanic mothers who left the hospital breastfeeding are 33 percent more likely to begin formula supplementation at any point in time than non-Hispanic study mothers, and non-native mothers are 31 percent more likely than native-born study mothers to do so. These findings differ from those in the previous WIC study which found that ethnicity and nativity status did not significantly influence the timing of formula supplementation. The current finding may reflect acculturation, as larger groups of Hispanic and foreign-born women seek to balance current American culture with cultures that have traditionally relied more heavily on exclusive breastfeeding. Age is another significant factor affecting the timing of formula supplementation, with the youngest cohort (16-19 years old) at higher risk to initiate formula supplementation earlier than the oldest group. A longer hospital stay also increases the risk of earlier formula supplementation (by 17 percent) while more education lessens the risk of earlier supplementation (by 15 percent). Finally, those employed at 7-months postpartum have higher risk of earlier formula supplementation than their unemployed counterparts.

The previous study found that use of non-maternal childcare had a large effect on the risk of earlier formula supplementation. However, when we include employment status at 7 months in the model, childcare status is not significant. As these two variables are highly correlated, we include only employment status. Though previous breastfeeding history is associated with breastfeeding initiation, unlike WIC IFPS-1, we find it is not significantly associated with formula supplementation. Finally, encouragement from the infant's father and grandmother and education levels are influential in the decision to initiate breastfeeding, but they are not associated with the risk of earlier formula supplementation. In all the models explored, WIC site-level measures of education and breastfeeding support activities offered were not significant so they were excluded from the final version of the model.

⁷⁶ This finding likely reflects cultural differences, including differences in perceived benefits of breastfeeding which we could not directly include in this model because we only have data for perceived benefits on prenatal women.

4.8 Conclusion

Since the WIC IFPS-1 20 years ago, study mothers are much more likely to breastfeed through 7 months. There has been a notable increase in exclusive breastfeeding, especially among African American mothers and the youngest study mothers, although rates of exclusive breastfeeding in these subgroups are still low relative to other subgroups. However, it is not clear whether gains are attributable to WIC-specific efforts or largely reflect the national trend toward breastfeeding. WIC sites are an important source of feeding information for participants, and among those who are aware of the enhanced breastfeeding food package, it is important to their feeding decision. Nonetheless, among women who leave the hospital breastfeeding, formula supplementation typically begins early, within the first 2 weeks of life. For a majority of breastfeeding study mothers, paid employment is perceived motivation for formula supplementation. Variables affecting risk of earlier formula supplementation include race, ethnicity, nativity status, maternal age, length of hospital stay, education, and employment status.

Feeding Patterns of Older Infants

5.1 Overview

This chapter focuses on feeding practices in later infancy, including continuation of breastfeeding, breastfeeding cessation, and introduction of complementary foods. The chapter also addresses changes the caregivers have made based on WIC education they received. Although the timeframe addressed in this chapter runs from 1 through 13 months, the emphasis is on the latter half of the infant year. Topics addressed in this chapter⁷⁷ include the following:

- What are the extended breastfeeding practices of study mothers?

*Examples of research questions addressed:*⁷⁸

- What is the participant's practice on breastfeeding and formula feeding her infant?
- What are the non-program and program factors associated with successful breastfeeding 6 or more months?
- What is the percent of combination feedings comparing human milk, formula, and/or foods?

- What characteristics and experiences are associated with breastfeeding cessation?

Examples of research questions addressed:

- What are the reasons why mothers stop breastfeeding during the first few weeks of their infants' lives? How often do these occur? Which pose the greatest risk to breastfeeding success and duration?
- What is the distribution of reasons for mothers coming into WIC clinics at 4-6 months and in some cases stopping breastfeeding?

⁷⁷ Some additional topics relevant to infant breastfeeding practices and cessation are addressed through data tables in Appendix C4.

⁷⁸ A complete list of research questions appears in Appendix A.

- What are the practices associated with introduction of complementary foods?

Examples of research questions addressed:

- Is the caregiver supplementing with food and/or other beverages beside formal and breastmilk?
- What are the non-program and program factors that contribute to the likelihood of initiating baby foods and cereals?

5.2 Background

Breastfeeding Practices in Older Infants (Ages 7-13 Months). The American Academy of Pediatrics (AAP) recommends continued breastfeeding of older infants, as breastmilk is an important source of nutrition for infants and can optimize child growth and development (AAP, 2012a). Because of the important role of breastmilk in the infant diet, the Healthy People 2020 benchmark for breastfeeding duration is 61 percent of mothers still breastfeeding at 6 months, and 34 percent still breastfeeding at 12 months (Centers for Disease Control and Prevention (CDC), 2016a).

Pregnant women in the United States typically expect to be doing at least some breastfeeding for the majority of the first year, with younger mothers (18-24 years old) planning to breastfeed on average for 8.5 months, and older mothers (30-34 years old) planning to breastfeed on average for 10 months (CDC, 2016b). Although 79 percent of infants born in the United States are ever breastfed, only 49 percent of mothers continue to breastfeed their infants through 6 months of age, and only 27 percent are still breastfeeding their infants until 12 months of age (CDC, 2014), suggesting that intentions and actual breastfeeding duration may be diverging.

Breastfeeding practices in older infants differ across a variety of socio-demographic characteristics. Data from the National Immunization Survey (CDC, 2015) has shown that breastfeeding duration at 12 months is lower among African American infants compared with White, Hispanic, and Asian infants. Breastfeeding at 12 months is higher among women who are more educated, older, married, and have higher income. Additionally, women participating in WIC have lower breastfeeding rates at 12 months than women who are eligible for WIC but not participating (20 percent vs. 33 percent). Overweight and obese women also tend to discontinue earlier than mothers of normal weight (Amir & Donath, 2007; Oddy et al., 2006; Turcksin, Bel, Galjaard, & Devlieger, 2014; Wojcicki, 2011).

The authorizing legislation for WIC provides a strong basis for the role of WIC in breastfeeding promotion and support. WIC State and local agencies are required by WIC Program regulations to create policies and procedures to ensure that (1) breastfed infants receive a food package consistent with their nutritional needs; and (2) breastfeeding support and assistance is provided throughout the prenatal and postpartum period, particularly when the mother is most likely to need assistance.

WIC promotes breastfeeding in a number of ways. Breastfeeding mothers are eligible to participate in WIC for up to 1-year postpartum, a longer time period than non-breastfeeding mothers. Breastfeeding mothers are also favored in the priority system for WIC, which means that if demand for WIC benefits exceeds available resources, breastfeeding women are among the first to be considered. Mothers who exclusively breastfeed their infants receive an enhanced food package for themselves and breastfed infants receive an enhanced food package from 6-12 months. The enhanced food packages for breastfeeding mothers and their infants provide a greater variety and quantity of food to support their nutritional needs.

Although breastfeeding support activities vary from site to site, WIC supports breastfeeding with a variety of resources onsite or through referral. All sites offer breastfeeding information through anticipatory guidance, counseling, and providing breastfeeding education and materials to WIC mothers. Many sites have breastfeeding peer counselors who provide one-on-one breastfeeding support. Furthermore, sites provide breastfeeding classes and support groups for prenatal and breastfeeding participants. WIC breastfeeding mothers may have access to breastfeeding aids such as breast pumps, and to lactation specialists either onsite or via referral to partner organizations or breastfeeding hotlines. As noted in earlier chapters of this report, *Loving Support Makes Breastfeeding Work* is the U.S. Department of Agriculture's national breastfeeding promotion and support campaign that serves as the foundation for all breastfeeding education, counseling, and promotion efforts in the WIC program. Campaign materials include consumer research, extensive media campaigns, and breastfeeding resources for training WIC staff and educating participants, as well as technical assistance to WIC State and local agency professionals in promoting and supporting breastfeeding in their programs and communities.

Introduction of Complementary Foods. Currently, there are no official national dietary guidelines for the period of birth to 24 months. According to the AAP, infants become developmentally ready for complementary foods between 4-7 months of age, although typically they are ready by 6 months (Kleinman & Greer, 2013). Consequently, the AAP recommends that infants be exclusively breastfed for about the first 6 months of life and that breastfeeding continue, with appropriate

complementary foods, through the infant's first year or longer as mutually desired by the mother and infant (AAP, 2012b).

When infants are developmentally ready for complementary foods, by tradition, single-grain cereals are often introduced first. The AAP does not endorse a specific ordering of introduction for complementary foods, although they cite infant cereals fortified with iron and zinc, and baby food meats, as excellent first foods, particularly for breastfed infants (Kleinman & Greer, 2013).

Furthermore, they recommend that introduction of cow's milk should be delayed until 1 year of age, and that babies younger than 6 months should not be given juice. Once juice is introduced, AAP recommends giving only 100 percent fruit juice, and offering it in a cup rather than in a bottle (AAP, 2015). Other nutrition and feeding resources address consumption of nutrient-poor foods with high levels of fat/saturated fat; sugar; and/or salt (e.g., cakes, cookies, candy, and potato chips), explicitly recommending that they should be avoided or limited (National Health and Medical Research Council, 2012).

The WIC infant food packages and accompanying education on the introduction of complementary foods are aligned with AAP recommendations (Special Supplemental Nutrition Program for Women, Infants, and Children (U.S.), Commodity Supplemental Food Program (U.S.), 2009). Fully breastfeeding mothers of infants, ages birth to 6 months old, receive additional foods for themselves and no infant formula is given to the infant. Partial and non-breastfeeding mothers of infants, birth to 6 months old, receive comparatively less food for themselves and infant formula for the infant. At 6 months, all infants receive single-grain infant cereals and jarred infant food fruits and vegetables. Infants who are fully breastfed receive additional jarred fruits and vegetables and also receive jarred infant food meats as a source of iron and zinc.

After the first birthday, WIC provides toddlers with milk, 100 percent juice, breakfast cereal, cheese, eggs, whole wheat bread (whole grain substitutions are allowed), beans, peanut butter, and a WIC cash value voucher for fruits and vegetables.

5.3 Sample and Analysis Approach

The analyses in this chapter examine breastfeeding continuation, cessation, and introduction of complementary foods and beverages, especially among older infants, through 13 months of age. The

chapter concludes with an exploration of reported dietary changes WIC participants have made based on information they obtain from WIC.

5.3.1 Sample

Table 5-1 shows the number of respondents to the 9-, 11-, and 13-month interviews, as well as the number of respondents in the core sample who completed all seven post-birth interviews through 13 months (this latter group is referred to as the longitudinal cohort). As the table shows, the number of study mothers who participated in the interviews varies by month. Additionally, the 1,851 study mothers in the longitudinal cohort are a subset of all the women participating in the study. Therefore, although there is substantial overlap between the women in the longitudinal cohort and the women who responded to a given interview, each of these groups is a separate subsample of study participants. As such, estimates based on the longitudinal cohort will differ slightly from those based only on the responses to a given interview.

Table 5-1. Number of respondents by interview month

Sample structure	9-Month Interview	11-Month Interview	13-Month Interview	Longitudinal cohort
Core prenatal sample	2,140	2,044	1,956	1,635
Core postnatal sample	311	278	283	216
Supplemental prenatal sample	-	-	462	-
Supplemental postnatal sample	-	-	106	-
Total	2,451	2,322	2,807	1,851

Supplemental sample members received only select interviews.

5.3.2 Analysis

The analyses in this chapter examine breastfeeding continuation and breastfeeding cessation, as well as introduction of complementary foods, through 13 months. Analyses explore whether socio-demographic characteristics and support from WIC are associated with these feeding practices. Socio-demographic characteristics were typically measured at the time of the first interview. This chapter addresses a variety of breastfeeding patterns. Breastfeeding status at each interview is determined based on the caregiver indicating that the infant is currently being fed breastmilk, formula, both, or later in infancy, neither. Infants are considered breastfed if they are receiving any breastmilk. Differentiating this status further, infants are *exclusively breastfed* if they are receiving

breastmilk and not formula, although they also may be fed complementary foods or beverages. Infants are ***combination fed*** if they are receiving both breastmilk and formula, and again they may also be fed complementary foods or beverages. Within the group of women who are breastfeeding, either exclusively or in combination, analyses examine ***duration of breastfeeding***, or the number of days, weeks, or months during which the infant is fed breastmilk, and an associated concept, ***cessation of breastfeeding***, or the infant age at which all breastfeeding stops.

When available, data are presented from WIC IFPS-1 and other relevant studies alongside current findings to examine differences and similarities between studies. As in previous chapters, analyses include bivariate analysis to examine whether an outcome of interest varies by subgroup, and followup tests between pairs of subgroups to determine which subgroups are statistically significantly different from each other. Appendix C4 presents each variable of interest crossed by a series of socio-demographic variables. Using survival analysis, a multivariate analysis technique, the analyses also explore factors that influence breastfeeding cessation and introduction of complementary foods. These multivariate models permit the examination of the unique effects of individual variables on likelihood of earlier breastfeeding cessation, and separately on likelihood of earlier introduction of complementary foods, apart from the effects of other variables.

5.4 Breastfeeding Patterns Among Older Infants

WIC encourages and supports breastfeeding throughout the infant's first year. Consequently, it is important to describe and understand the choices WIC ITFPS-2 mothers make about feeding, especially during later infancy. Table 5-2 summarizes breastfeeding and formula feeding choices at each interview through 13 months. Combining exclusive and combination breastfeeding rates, data

demonstrate that about 22 (13.7 + 8.4) percent of study mothers report breastfeeding their infants at 9 months. By 11 months, the breastfeeding rate drops to approximately 20 (13.0 + 6.8) percent and by 13 months it is down to 16 (14.1+2.0) percent. The drop in the percentage of infants consuming either breastmilk or formula at 13 months is consistent with the expectation that many infants transition to a toddler diet by this time.

Key Findings:

Breastfeeding rates in later infancy are substantially higher than they were for WIC IFPS-1.

- 22 percent of WIC ITFPS-2 study mothers are still breastfeeding at 9 months; 20 percent at 11 months, and 16 percent at 13 months.
- These rates have more than doubled since WIC IFPS-1.

These first year breastfeeding rates are consistent with the findings from other studies. Other studies typically measure breastfeeding rates at 12 months rather than at 11 and 13 months. Interpolating between months 11 and 13, the WIC ITFPS-2 12-month estimate is approximately 18 percent. A 12-month breastfeeding rate of 18 percent is consistent with estimates based on the National Immunization Survey (NIS) data. Using the 2012 NIS cohort, CDC reports that 19 percent of NIS mothers who received WIC were breastfeeding their infants at 12 months. Since 2009, increases in the breastfeeding rate among NIS WIC mothers have been modest, less than 1 percent per year according to published NIS data. Extending the growth rate between 2009 and 2012 in a linear estimate out to 2014 yields a 12-month, NIS-based estimate of less than 20 percent of women on WIC breastfeeding in 2014.

Table 5-2. Percentage of study mothers by feeding choice at each interview month

Interview month	Percent of study mothers by feeding decision ^a				Unweighted n	Weighted n
	Only breastmilk ^b	Only formula ^c	Both breastmilk and formula	Neither breastmilk nor formula		
Month 1	30.3%	39.0%	30.7%	NA	3,394	451,456
Month 3	19.8	58.3	21.9	NA	2,788	442,248
Month 5	15.9	68.4	15.7	NA	2,615	442,754
Month 7	14.5	72.7	11.6	1.2	3,134	442,719
Month 9	13.7	75.7	8.4	2.1	2,451	442,681
Month 11	13.0	75.1	6.8	5.1	2,322	442,681
Month 13	14.1	20.0	2.0	63.9	2,807	442,574

^a Infants may be eating other complementary foods.

^b Infants may be eating other complementary foods but not formula.

^c Infants may be eating other complementary foods but not breastmilk.

NA denotes not applicable. This response option was not offered prior to the 7-month interview.

For more information on these data see Tables C4-16a-t in Appendix C4.

Data also show that extended breastfeeding rates in the first year are consistently higher than was reported 25 years ago in the WIC IFPS-1. Specifically, the current estimate of 18 percent of mothers still breastfeeding at 12 months is higher than the 7 percent estimated 12-month rate reported in WIC IFPS-1. This suggests that the focus on encouraging breastfeeding through WIC as well as national, state, and local breastfeeding initiatives has not only increased initial breastfeeding rates, but also has changed long-term breastfeeding behaviors.

Finally, it should be noted that most infants begin eating complementary foods, such as infant cereal or pureed fruits or vegetables, by 6 months. Starting complementary foods by 6 months occurs irrespective of whether they are being breastfed, formula fed, or getting a combination of both. Children also may be consuming complementary foods in addition to breastmilk or formula.

5.4.1 Characteristics of Breastfeeding Mothers by Month

Table 5-3 highlights the characteristic of breastfeeding mothers at select time points in the first year. Examining characteristics of those women who are still breastfeeding at 1 month, at 7 months, and 13 months, reveals that more than two-thirds of breastfeeding mothers at each interview have additional children in the household. This percentage is relatively stable at each month, suggesting that the presence of additional children does not deter longer-term breastfeeding. The data also indicate that having the father of the baby live in the home may be an important predictor of duration. Analyses show that at each subsequent interview mothers who continue to breastfeed are increasingly those who also report that the father lives in the home. Nearly 60 percent of breastfeeding mothers use a breast pump in the first month,⁷⁹ but the percentage falls to less than 15 percent by 13 months. This dramatic change is consistent with the infant receiving the majority of his or her nutrition from other foods by this age.

Table 5-3. Select characteristics of breastfeeding mothers at 1, 7, and 13 months

Characteristics/circumstances	Percentage of breastfeeding mothers		
	1-Month Interview	7-Month Interview	13-Month Interview
Pumped breastmilk ^a	58.7%	41.6%	14.5%
Has previous breastfeeding experience ^b	53.9	56.7	59.7
Has additional children in household ^b	67.4	68.0	69.3
Lives with father of infant ^c	60.7	69.6	75.8
Unweighted n ^d	2,027	804	419
Weighted n	275,390	115,616	71,085

^a Data are refreshed at each interview.

^b Data are collected at enrollment and constant across interviews.

^c Data are collected at enrollment and refreshed at 13 months.

^d n is the number of breastfeeding mothers at each interview.

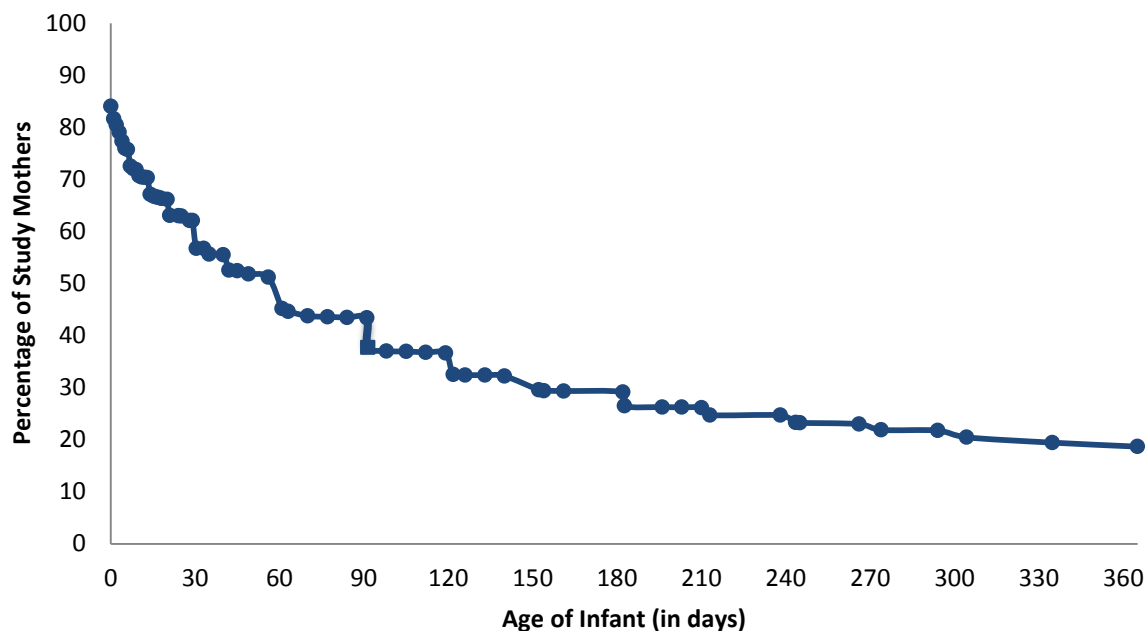
For more information on these data see Tables C4-14a-t in Appendix C4.

⁷⁹ Data on reasons for expressing milk, and characteristics of women who express milk, were presented in Chapter 4.

5.4.2 Continuation of Breastfeeding

Although it is possible to infer how some behaviors change over time by examining the interview responses by month, it is far more robust to trace the behaviors of the same women over time. In this section, analyses explore the continuation of breastfeeding using the longitudinal cohort. This analysis shows the behaviors of the same women over time. Figure 5-1 displays the percentage of study mothers in the longitudinal cohort that were breastfeeding by age of the infant from birth through 1 year. About 84 percent of these study mothers initiate breastfeeding at birth.⁸⁰ By 3 months (90 days), 43 percent of the longitudinal cohort is still breastfeeding, and at 5 months (150 days) about 30 percent of that cohort is still breastfeeding. These rates are very similar to the cross-sectional estimates shown in Table 5-2.

Figure 5-1. Percentage of breastfeeding study mothers by infant age (in days)^a



^a Note that these percentages are for the longitudinal cohort and may differ slightly from the cross-sectional statistics at each age.

These current WIC ITFPS-2 percentages are consistently higher than those found by WIC IFPS-1 researchers in the 1990s. They reported that 56 percent of WIC mothers initiated breastfeeding; 21 percent breastfed beyond 90 days of age, as compared to the current estimate of 43 percent. Similarly, the previous study reported that about 16 percent of the women were still breastfeeding at

⁸⁰ Use of the longitudinal weight accounts for the 1 percentage point difference in initiation rates reported in Chapter 2.

150 days, whereas the current study estimate is nearly twice that rate. Despite the notable increase in the percentage of breastfeeding mothers since WIC IFPS-1, the 29 percent breastfeeding rate at 6 months is still substantially lower than the Healthy People 2020 goal of about 61 percent.

Socio-Demographic Factors. One question of interest is whether socio-demographic factors are associated with breastfeeding duration. To address this question, analyses explore median breastfeeding duration by socio-demographic characteristics. Median duration of breastfeeding is defined as the time point at which half the women have shorter durations and half have longer durations. The median is preferable to the mean duration because it is less affected by outliers, and as such it is a better measure of central tendency when there is wide dispersion in the variable of interest.

Table 5-4 presents median breastfeeding duration by select socio-demographic subgroups. Although African American mothers appear to have the shortest breastfeeding duration within the racial subgroups, that difference is not statistically significant. The median breastfeeding duration is significantly longer for the oldest group of mothers as compared to the two younger groups. Compared to U.S.-born mothers, foreign-born mothers have a median breastfeeding duration that is about twice as long, and this difference is statistically significant. The findings echo the results from the previous WIC study, WIC IFPS-1. One finding that stands in contrast to the previous study's findings is with regard to marital status. In WIC ITFPS-2 the difference in duration by marital status is large, with those who are married having significantly longer durations than unmarried mothers. WIC IFPS-1 did not explore breastfeeding duration by marital status directly, but did examine sub-groups by the father's presence in the home, and found that differences were small. Because father's residency status and marital status are highly correlated, it is possible to infer that the positive association between marital status and duration is a change since the WIC IFPS-1. Finally, mothers with three or more children as compared to those on their first child, and mothers in the highest income group as compared to those in the lowest income group, breastfeed significantly longer.

Table 5-4. Median breastfeeding duration^a (in days) by select socio-demographic factors

Socio-demographic characteristic	Median breastfeeding duration (in days)	Unweighted n	Weighted n
Race of mother/caregiver			
African American	59.2 days	347	71,510
White	91.1	923	217,272
Other	84.4	271	81,592
Ethnicity of mother/caregiver			
Hispanic	91.1	676	187,066
Non-Hispanic	91.0	865	183,308
Caregiver age at birth^b			
16-19 years	39.4	160	42,145
20-25 years	60.2	586	143,869
26 years or older	119.9	795	184,359
Nativity status^b			
Born in the U.S.	59.5	1,053	243,393
Not born in the U.S.	121.0	488	126,981
Caregiver marital status^b			
Married	145.3	557	139,828
Not married	59.0	984	230,546
Parity^b			
First born	66.1	632	157,350
Second born	91.0	442	104,495
Third or subsequent born	95.6	467	108,530
Income poverty^b			
75% of poverty guideline or less	62.6	935	225,126
Above 75% but below 130% of poverty guideline	89.0	443	102,591
Above 130% of poverty guideline	152.6	163	42,656

^a Infant age at which 50 percent of mothers are still breastfeeding.

^b At least one subgroup difference is statistically significant for median duration.

For more information on these data see Tables C4-15a-t in Appendix C4.

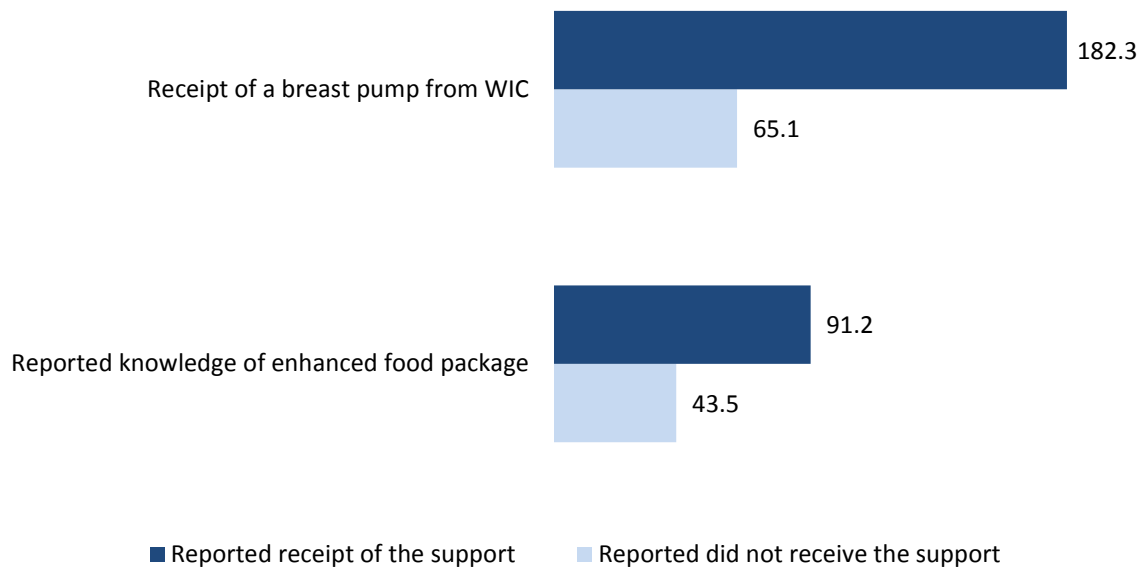
WIC Program Factors. WIC sites offer several breastfeeding supports that are intended to encourage longer breastfeeding. To assess the association between receiving breastfeeding support and duration, data examine differences in median breastfeeding duration by the mother's self-reported receipt of each support service. Six different supports are analyzed, including: knowledge of the enhanced food package;⁸¹ receipt from WIC of information on breastfeeding; receipt from WIC of advice to breastfeed; a call from WIC staff shortly after birth to encourage breastfeeding; receipt of a breast pump from WIC; and receipt of the extended food package for breastfeeding mothers.⁸² Figure 5-2 displays the median durations that are statistically significantly different, by type of support received. Both receiving a breast pump from WIC and having knowledge of the enhanced

⁸¹ Women who breastfeed exclusively receive enhanced food packages during the first 6 months as compared to postpartum non-breastfeeding women, or partially breastfeeding women.

⁸² Receipt of the extended breastfeeding package is conditional on breastfeeding more than minimally at 6 months.

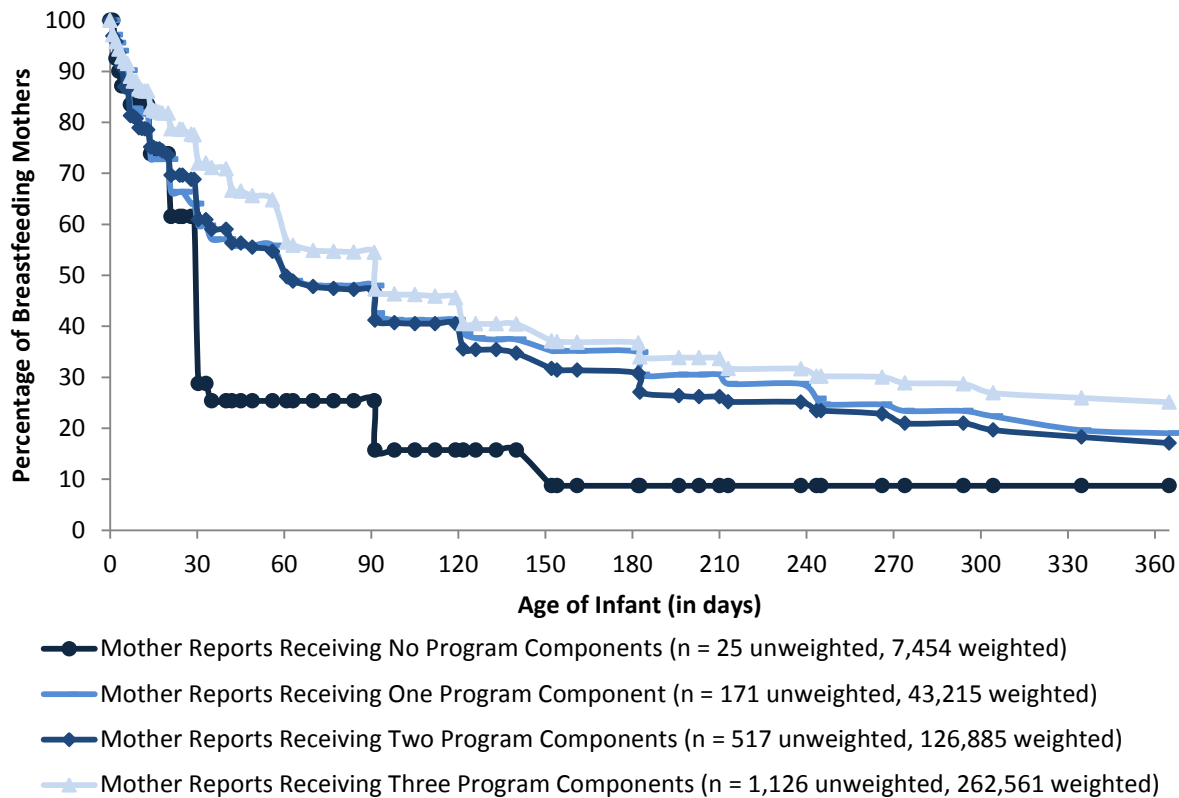
food package for breastfeeding mothers were associated with a longer median duration of breastfeeding.

Figure 5-2. Median breastfeeding duration (in days) by WIC supports for breastfeeding mothers



The previous study, WIC IFPS-1, highlighted the positive correlation between the *number* of breastfeeding supports received from WIC and the percentage of WIC mothers who were breastfeeding at any point in time between birth and 1 year. The study examined three supports: receipt of information from WIC about breastfeeding; receipt from WIC of advice to breastfeed; and receipt of information about food packages, which is measured by the proxy of one's knowledge of the enhanced breastfeeding food package. The current study examines the same supports; however, the positive relationship between the number of these supports received—a measure of WIC dose—and breastfeeding duration is not particularly large in magnitude (see Figure 5-3). Although there is a large difference in breastfeeding duration between women who report receiving none of the supports and women who report receiving at least one support, there are only 25 (unweighted) women in the former category, so it is too small to analyze. More broadly, all but 33 (unweighted) women received breastfeeding information, so there is virtually no variation in the receipt of services variable. Overall, this reflects that most breastfeeding study mothers reported receiving multiple types of breastfeeding support from WIC.

Figure 5-3. Percentage of study mothers still breastfeeding by infant age and reported receipt of none, one, two, or three WIC program components that support breastfeeding



5.5 Factors Associated with Breastfeeding Cessation

Using the longitudinal cohort, analyses examine breastfeeding cessation among study mothers. One-quarter of breastfeeding mothers have stopped breastfeeding by the time their infants are 22 days old. Fifty percent of breastfeeding mothers have ceased by 3 months (91 days). Three-quarters of breastfeeding mothers have ceased prior to 10 months (300 days).

Key Findings:

- Less than a third of breastfeeding mothers are meeting their personal breastfeeding goals.
- Top reasons for stopping include infant difficulties with sucking or latching on, milk supply, failure of breastmilk to satisfy, and infant loss of interest in breastfeeding.

Comparing current findings with those from the previous WIC study's longitudinal sample highlights increases in duration since the 1990s. Table 5-5 shows when 25, 50, and 75 percent of

study mothers stop breastfeeding. Previously, 25 percent of WIC mothers stopped breastfeeding within less than 2 weeks of initiation, versus the current estimate of 22 days. Previously, one-half of WIC mothers had ceased breastfeeding by 57 days while the current estimates are over a month longer. Similarly, the previous study estimated that 75 percent of breastfeeding mothers had ceased breastfeeding by the time their infants were about 6.5 months old (199 days). The current estimate of 300 days indicates an increase of over 3 months.

Table 5-5. Comparison of breastfeeding cessation rates, WIC ITFPS-2 and WIC IFPS-1

Percentage of mothers who have stopped breastfeeding	Age of infant (in days)	
	WIC ITFPS-2	WIC IFPS-1
25%	22.3 days	13 days
50%	91.1	57
75%	300.0	199
Unweighted n	1,549	463
Weighted n	372,084	NR

More information on these data can be found in Tables 15a-t in Appendix C4.

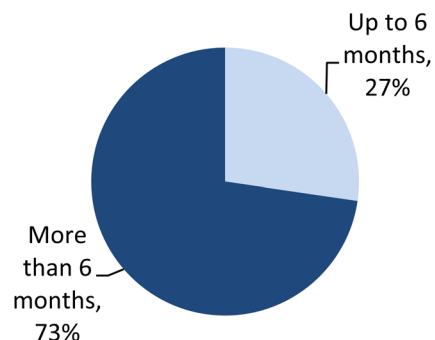
NR indicates data are not reported.

5.5.1 Actual and Intended Breastfeeding Duration

Despite the increases in duration, approximately 70 percent of study mothers who are breastfeeding at 1-month do not achieve the breastfeeding goals they reported at that interview. That is, they breastfeed for shorter durations than their stated intentions. The divergence between intended and actual breastfeeding duration by the majority of study mothers raises several questions, including whether women are setting realistic goals, and whether they may be unprepared for challenges associated with breastfeeding.

Figure 5-4 shows the percentage distribution of breastfeeding mothers by the length of their stated breastfeeding goals at the time of the 1-month interview.⁸³ Seventy-three percent of women who are breastfeeding at their 1-month interview indicate that they intend to breastfeed more than 6 months.

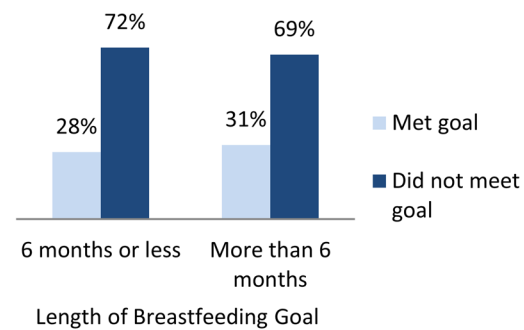
Figure 5-4. Percentage distribution of breastfeeding mothers by expected duration at 1-month interview



⁸³ Unlike the Infant Feeding Intentions scale included at the prenatal interview, this question asked all study mothers who were breastfeeding at the 1-month interview to provide a child age at which they expected to stop breastfeeding completely.

Looking more closely at whether women are achieving their breastfeeding goals, it is evident that successful completion of goals that are less than a year in length does not vary much with anticipated duration. Figure 5-5 shows the percentage of women who achieved their personal goals of less than 6 months, and those who achieved personal goals of more than 6 months. Findings are very consistent: less than a third of women achieve the breastfeeding goals they stated at the time of the 1-month interview. The small group of women with personal goals of 13 months or longer were ultimately most successful, with 51 percent still breastfeeding at the time of the 13-month interview.

Figure 5-5. Percentage of breastfeeding mothers who met their personal breastfeeding goals, by length of goal



Clearly, many study women anticipate breastfeeding for substantial durations, but do not reach their goals. It therefore becomes important to explore reasons for breastfeeding cessation.

5.5.2 Reasons for Breastfeeding Cessation

To help elucidate reasons for breastfeeding cessation, at the first interview (between 1-13 months) when study mothers reported that they were no longer breastfeeding they were asked to indicate both the timing of cessation, and the reasons they stopped breastfeeding. Response options for reasons included: “my baby had trouble sucking or latching on”; “my baby began to bite”; “my baby lost interest in breastfeeding”; “breastmilk did not satisfy my baby”; “I thought my baby was not gaining enough weight”; “I didn’t have enough milk”; “breastfeeding was too painful”; “I was sick and had to take medicine”; “breastfeeding was too inconvenient”; “I wanted or needed someone else to feed my baby”; and other individually specified reasons. Mothers could indicate all reasons that applied. Table 5-6 presents information on the frequency of the top three reasons mothers said that they ceased breastfeeding.

Table 5-6. Frequency of the top three most common reasons mothers stop breastfeeding

Reason stopped breastfeeding	Percentage of breastfeeding mothers who stopped breastfeeding			
	Within the first 2 weeks	Within the first 8 weeks	Between 2 and 3 months	Between 4 and 6 months
Baby had trouble sucking or latching on ^a	53.3%	46.7%	NA	NA
Didn't have enough milk	46.0	53.0	56.4	55.9
Breastmilk alone did not satisfy baby	40.1	45.5	56.6	49.7
Baby lost interest in nursing	Not top three	Not top three	34.7	46.7
Unweighted n	319 ^b	625 ^c	256 ^d	176 ^e
Weighted n	74,513	144,721	64,309	44,667

For more information on these data see Tables C4-10a-t in Appendix C4.

^a This item only appeared as a reason through the 3-month interview, so women who reported breastfeeding cessation after the time of that interview did not hear this as a reason for cessation.

^b n is the number of mothers who ceased breastfeeding within the first 2 weeks (i.e., infant age ≤ 14 days).

^c n is the number of mothers who ceased breastfeeding within the first 8 weeks (i.e., infant age ≤ 56 days).

^d n is the number of mothers who ceased breastfeeding between 2-3 months (i.e., 56 < infant age ≤ 120 days).

^e n is the number of mothers who ceased breastfeeding between 4-6 months (i.e., 120 < infant age ≤ 183 days).

NA denotes not applicable.

Trouble sucking or latching on to the breast is a primary reason for breastfeeding cessation prior to 8 weeks. In the subsequent months, lack of milk, failure of breastmilk to satisfy, and loss of interest in breastfeeding are the three primary reasons for stopping through 6 months. Based on analyses presented in Tables C4-10a-t in Appendix C4, the top three reasons for stopping breastfeeding exhibit very few significant associations with key socio-demographic variables, indicating that the top reasons are the same for most women regardless of circumstance or characteristics.

Many WIC sites have trained lactation specialists onsite or available through referrals to help mitigate trouble sucking or latching on to the breast, but the problem appears to persist for some mothers wishing to breastfeed. WIC also provides education on evaluating milk supply, and understanding satiation cues of young infants, but study mothers were still citing these issues as deterrents to continued breastfeeding. Additional information on these topics may be helpful to a large percentage of breastfeeding mothers. Because the infant's loss of interest in breastfeeding is also frequently cited as motivation for stopping, strategies to re-engage infants who seem to lose interest prior to 6 months of age may also help more mothers achieve their breastfeeding goals.

5.5.3 Model of Likelihood of Breastfeeding Cessation Over Time

Multivariate analysis allows for an examination of the unique effects of each variable on an outcome of interest, apart from the influence of other contributors to the outcome. Analyses examine how multiple variables may simultaneously impact the likelihood of breastfeeding cessation using survival analysis. One of the benefits of employing survival analysis is that the method appropriately accounts for missing data that occurs when some women are still breastfeeding at the end of the time window examined. In an approach similar to that used in WIC IFPS-1, this study uses multivariate survival analysis to analyze the influences of different variables on likelihood of breastfeeding cessation. These models allow identification of those characteristics or experiences that increase the risk, at any time through 13 months, that mothers within a particular subgroup would stop breastfeeding.⁸⁴

In the previous study, multivariate survival models indicated several factors affected breastfeeding cessation. These included maternal age, nativity status, reported problems with breastmilk, breastfeeding experience, perceived benefits of breastfeeding, current use of formula, and the number of WIC program services received—the receipt of information about the breastfeeding packages measured by the proxy regarding knowledge of the enhanced breastfeeding package, receipt of breastfeeding information from WIC, and receipt of advice to breastfeed from WIC. Reported problems with breastmilk and current use of formula increased the likelihood of ceasing to breastfeed, while the others decreased the likelihood.

The WIC ITFPS-2 study team initially explored these same factors put forward in the WIC IFPS-1 but found that only three variables—maternal age, nativity status, and any combination feeding (i.e., feeding both breastmilk and formula) predict risk of earlier breastfeeding cessation. For two of the variables, WIC ITFPS-2 findings are similar to WIC IFPS-1: U.S.-born mothers are at higher risk for earlier breastfeeding cessation than are mothers born outside the United States; and, younger mothers are at higher risk for earlier breastfeeding cessation than are older mothers. In contrast to WIC IFPS-1, WIC ITFPS-2 analyses show that mothers who combination feed at any point during the 13 months are less at risk for earlier breastfeeding cessation than their exclusively breastfeeding counterparts. Additionally, the number of WIC services received is not significant in any of the models tested with current data.

⁸⁴ The hazard model calculates risk at each time point conditional upon not having stopped at a previous time point, thus considering at each time only those mothers who are still breastfeeding.

Building on the previous model,⁸⁵ the study team added new variables to explore the influence of a wider variety of WIC supports on the risk of breastfeeding cessation at any point in time. Table 5-7 summarizes the influence of this new model's variables on the risk of earlier breastfeeding cessation. Consistent with previous work, U.S.-born mothers have a higher risk of earlier cessation than their foreign-born counterparts. Unmarried women, younger women, women who also fed formula, and women who had not been encouraged by their infant's doctor all had higher risk of earlier breastfeeding cessation. Women with the lowest income, as compared to those with the highest income, had higher risk of earlier cessation. The WIC support services analyzed in the previous study continued not to be statistically significant in these expanded models, so they were dropped from further analysis. As receipt of these supports failed to be significant in the analysis of median durations, it is not surprising that they are not significant in the model. Additionally, the lack of significance of WIC breastfeeding information on the time until cessation can be further explained by the limited variation in this variable as all but 33 (unweighted) women received WIC breastfeeding information. Analyses did indicate that women who did not receive a breast pump from WIC⁸⁶ were at higher risk for earlier cessation. The women were not asked directly, however, if they stopped breastfeeding due to not receiving a breast pump from WIC. The findings are based on a model that predicted the unique effects of individual variables (e.g., receipt of breast pumps from WIC) on the likelihood of earlier breastfeeding cessation.⁸⁷ Women who leave WIC at some point during these first 13 months were at lower risk for earlier cessation. This may reflect women who are breastfeeding successfully and therefore do not feel they need the ongoing support WIC could provide.

⁸⁵ In this version of the model, breastfeeding problems are excluded because this question does not get asked to women who cease breastfeeding prior to 1 month.

⁸⁶ Although women indicated they did not receive a breast pump from WIC, they were not asked if they requested a breast pump from WIC.

⁸⁷ The model was based on data collected between the 1- and 13-month interviews from women who indicated they had breastfed their infant. The women were asked the source of the breast pump with response options including: WIC loaned it to you or paid for it, you bought it or rented it, you borrowed from a friend or relative, it was a gift, or you use one provided by a hospital, your place of work, or someplace else. The receipt of a breast pump from WIC showed an impact on breastfeeding cessation as compared to either receiving a breast pump from somewhere else or not receiving one at all. Women were not asked if they requested a breast pump from WIC and did not receive it.

Table 5-7. Survival analysis estimates of relative risk of earlier breastfeeding cessation

Socio-demographic and WIC variables	Effect on risk of earlier breastfeeding cessation ^a
Race	No effect
Ethnicity	No effect
Parity	No effect
Nativity status	Higher risk for mothers born in U.S.
Maternal age at birth	Higher risk for younger mothers
Marital status	Higher risk for unmarried mothers
Income poverty	Higher risk for lowest income (compared to highest)
Breastfeeding experience	No effect
Encouraged to breastfeed by a relative ^b	No effect
Encouraged to breastfeed by infant's doctor	Higher risk for mother who weren't encouraged
Ever used regular non-parental childcare	No effect
Combination feeding	Higher risk for mothers who did not combination feed
Breast pump from WIC	Higher risk for mothers who did not receive breast pump
Ever off WIC within first 13 months	Higher risk for women who were continuously on WIC

^a The Cox-proportional hazard model measures the effect the variables have on the likelihood of stopping breastfeeding over the course of the first year.

^b Included infant's father, respondent's mother, and other relatives.

See Appendix B3d, Table B3d-1, for more detail.

5.6 Initiation of Complementary Foods

When the infant is developmentally ready, infant cereals, as well as strained or pureed fruits, vegetables, and protein-rich foods such as meats, are appropriate complementary foods (Special Supplemental Nutrition Program for Women, Infants, and Children (U.S.), Commodity Supplemental Food Program (U.S.), 2009). WIC educational

materials emphasize avoiding the following foods in the first year: cow's milk; sugar-sweetened beverages; salty snacks such as chips, pretzels, or salted crackers; and sweet foods such as cakes, cookies, or candy. Fruit juice is not recommended before 6 months of age, and not provided in the WIC food package for infants. Interviews asked the study mothers about the timing of introduction of these foods and beverages so practices can be evaluated for consistency with current feeding recommendations.

Key Findings:

- The majority of study mothers are delaying introduction of complementary foods until 4 to 6 months.
- This is an improvement over the patterns reported in WIC IFPS-1, in which more than half of mothers introduced complementary foods inappropriately early.

5.6.1 Timing of Introduction of Complementary Foods

Table 5-8 presents the findings on the order in which WIC ITFPS-2 study mothers introduce these four complementary foods. Most mothers (82 percent) initiate infant cereals first, fruits second (69 percent), vegetables third (70 percent), and meats fourth (88 percent). Thirteen percent of mothers initiate fruits third and 23 percent of mothers initiate vegetables second.

Table 5-8. Percentage of mothers initiating cereals, fruits, vegetables and meats as first, second, third, or fourth type of complementary food

Order of initiation	Percentage of study mothers			
	Type of food introduced			
	Cereals	Fruits	Vegetables	Meats
First	82.3%	16.7%	4.5%	0.7%
Second	7.2	68.5	22.6	2.6
Third	8.1	13.0	70.0	9.0
Fourth	2.0	1.9	2.6	87.6
Unweighted n	1,686	1,756	1,750	1,652
Weighted n	404,483	421,113	420,254	397,305

Few mothers (20 percent) introduced any of these foods prior to 4 months of age (122 days). Figure 5-6 displays the percentages of study mothers who have not yet initiated cereals, fruits, vegetables, and meats by infant age. The figure highlights that the timing of the introduction of specific foods follows a stepwise pattern. Specifically, the data reveal relatively large percentages of women introducing a given food at a specific time. For example, around 4 months (122 days) there is a notable drop in the percentage of women who have not yet introduced infant cereals, fruits, or vegetables. Another large drop is evident around 6 months (183 days). Finally, although the introduction of meats also follows a stepwise pattern, the steps continue well past 183 days of age, as at that point, 66 percent of study mothers have not yet introduced this food. The stair steps suggest that large groups of women introduce new foods at the same time points. It should be noted that the tightness of this pattern may be due to people rounding months when recalling when they introduced a new food.⁸⁸

This pattern for the introduction of complementary foods differs from the findings presented in WIC IFPS-1. In WIC IFPS-1, researchers found that introduction of complementary foods began very early, with 27 percent of study infants starting cereal prior to 2 months, and 62 percent starting

⁸⁸ This stair step pattern was not evident in the WIC IFPS-1 curves due to their use of a life table analytic method, which resulted in a smoothed curve, whereas for WIC ITFPS-2 weighted proportions are shown based on survey responses.

cereal prior to 4 months. Large percentage of infants also began fruits (42 percent) and vegetables (29 percent) prior to 4 months.

Figure 5-6. Percentage of study mothers who have not yet initiated cereals, fruits, vegetables, and meats by infant age

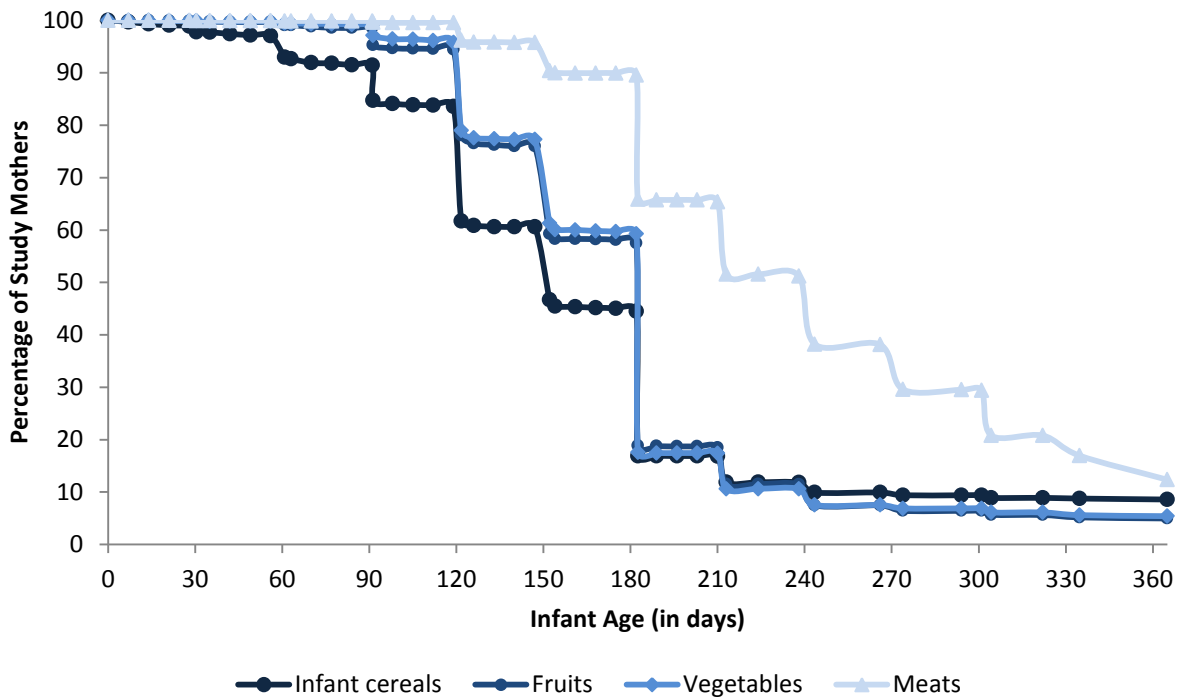
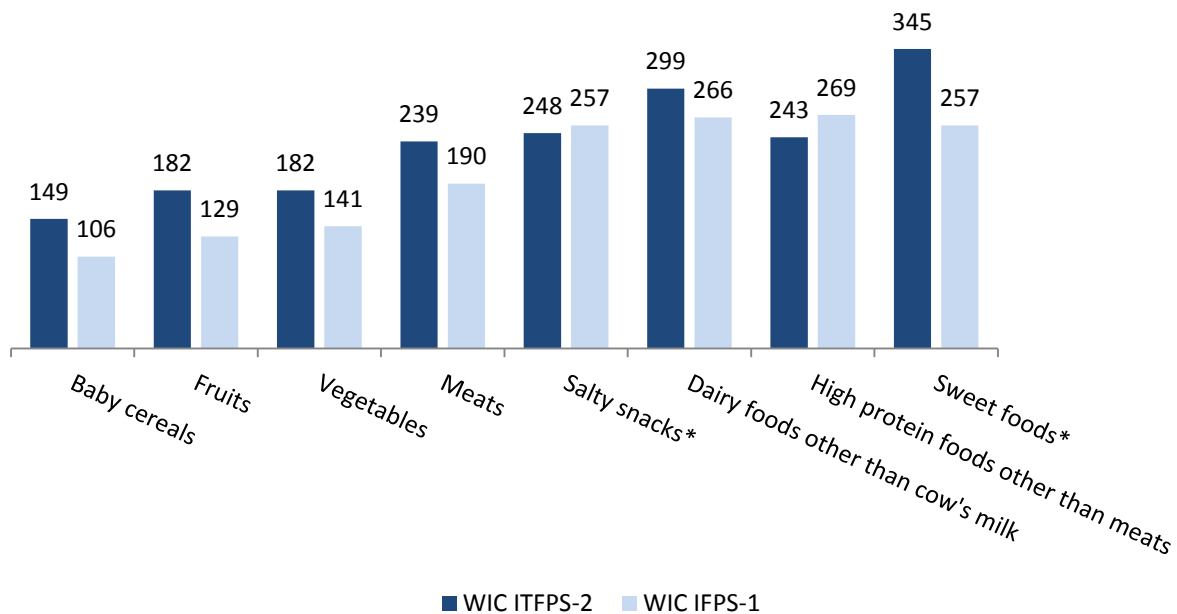


Figure 5-7 displays the median age of the infant at which mothers introduce complementary foods, comparing WIC ITFPS-2 with WIC IFPS-1 findings. An expanded list of foods is presented that includes dairy foods other than cow's milk; high-protein foods other than meats; salty snacks such as chips, pretzels, and salted crackers; and sweet foods such as cakes, candy, and cookies.

Baby cereals are introduced earliest. The median age at which infants have eaten cereal is about 140 days (4.5 months). The median age at which infants have eaten fruits and vegetables is 183 days (6 months). The median age for having eaten meats is 239 days, when the baby is just shy of 8 months old. High-protein foods other than meats, which include beans, eggs, and peanut butter, are introduced to the majority shortly thereafter (243 days). The introduction of salty snacks and dairy foods other than cow's milk (e.g., cheese, yogurt, goat's milk) quickly follows with median days of 248 and 299, respectively. Finally, the median introduction time for sweet foods is 345 days, when the child is approximately 11 months old.

Figure 5-7. Median age (in days) when study mothers have introduced specific complementary foods, WIC ITFPS-2 and WIC IFPS-1



* WIC IFPS-1 collapsed sweet foods and salty snacks into one category.

For more information on these data see Tables C4-17a-t in Appendix C4.

Comparing current data with those reported in the previous study highlights the general shift toward delaying complementary foods. WIC IFPS-1 researchers found the median introduction time for cereals was 106 days, which is 43 days earlier than current data indicate. Similarly, WIC IFPS-1 found the median introduction time for fruits was 129 days, which is 53 days earlier than current data; for vegetables it was 141 days or 41 days earlier; and for meats it was 190 days or 49 days earlier. In the previous study, salty snacks and sweet foods were reported as a single category, so the comparison between the two studies is not ideal. Nonetheless, it does appear that there has been a substantial shift toward delaying the introduction of sweet foods. Other than salty snacks, the only foods that are now introduced earlier are high-protein foods other than meats, which are now introduced by 243 days of age, 26 days earlier, but well after 6 months.

Table 5-9 presents the median age of introduction of specific complementary foods by select socio-demographic characteristics.⁸⁹ Although there are many small subgroup differences, the focus here is on statistically significant median differences of a month or more. There are some racial differences, with African American mothers introducing cereal a month or more earlier, and high protein non-meat foods a month or more later, than the White or Other racial groups. Some ethnicity differences are also large in magnitude, with non-Hispanic mothers introducing cereals 2 months earlier than their counterparts. Hispanic mothers, however, are introducing high protein non-meat foods (such as beans, eggs, or peanut butter) a month earlier than non-Hispanic mothers. Nativity status is associated with the timing of introduction of several foods. U.S.-born women are introducing cereal, salty snacks, and sweet foods a month or more earlier than those born outside the U.S. Foreign-born women, however, are introducing high protein non-meat foods more than a month earlier than their counterparts. Marital status is associated with one large difference, with unmarried mothers introducing cereal a month earlier. Finally, the lowest income group introduces dairy foods other than cow's milk a month later than the middle income poverty group.

Our findings differ in several ways from those found in the previous study. Across all WIC ITFPS-2 subgroups none have median introduction times for any foods prior to 4 months, which was not the case in WIC IFPS-1. The most notable changes within specific socio-demographic groups are with regard to race and nativity status. In WIC IFPS-1, White mothers initiated cereal, fruits, and vegetables earlier than other racial/ethnic groups, including a median introduction time for cereals of 89 days, well before the 4-month milestone. In WIC ITFPS-2, the median introduction of cereals among White mothers was nearly 2 months later. In WIC ITFPS-2, data also indicate that mothers born outside the United States are now introducing salty snacks and sweet foods up to 6 months later than previously, and in a turnabout from WIC IFPS-1, now introducing them later than U.S.-born mothers.

⁸⁹ Data on timing of introduction of many foods are tightly clustered around the median. Medians are not sensitive to small shifts in the underlying data, and the clustering results in standard errors that are very small. Consequently, differences that are very small in magnitude may be statistically significant. They are not, however, meaningful differences from a practical or policy perspective, so these statistically significant but small group differences will not be discussed.

Table 5-9. Median infant age^a (in days) when specific complementary foods are initiated by select socio-demographic characteristics

Socio-demographic characteristics	Median age (in days) of initiation								Unweighted n ^b	Weighted n
	Cereals	Fruits	Vege- tables	Meats	Salty snacks	Dairy foods other than cow's milk	High- protein foods other than meats	Sweet foods		
Race of mother/caregiver ^{c,d,e}										
African American	121.4	176.2	182.1	238.1	241.5	317.7	279.5	346.0	450	96,135
White	149.5	182.1	182.1	238.2	252.7	296.3	242.7	346.3	1,109	259,562
All Other	182.1	182.2	173.0	239.8	243.8	296.6	227.6	337.0	292	86,754
Ethnicity of mother/caregiver ^{c,e,f,g}										
Hispanic or Latino	182.1	182.2	182.2	239.3	261.9	302.4	240.2	362.3	733	201,522
Not Hispanic or Latino	121.7	182.0	182.1	218.7	242.6	297.1	270.9	336.4	1,118	240,930
Nativity status ^{c,d,e,f,g,h,i}										
Born in the U.S.	136.1	182.1	182.1	213.5	242.1	297.6	267.4	337.5	1,339	309,023
Not born in the U.S.	182.2	182.2	182.3	230.5	300.1	307.3	228.7	375.1	512	133,429
Mother age at birth ^{d,f,i,j}										
16-19	141.0	168.2	157.5	238.3	234.9	300.0	239.2	334.8	191	49,108
20-25	135.5	182.1	182.1	213.0	242.0	300.0	243.3	344.1	730	177,823
26 or older	153.7	182.2	182.2	239.0	269.3	287.9	243.1	348.8	930	215,521
Caregiver marital status ^{c,e,h}										
Married	177.0	182.2	182.2	238.1	253.2	295.8	241.7	348.3	620	155,228
Not married	143.0	182.1	182.1	238.8	245.2	301.3	267.1	342.8	1,231	287,223
Income poverty ^{d,f,j}										
75% of poverty guideline or less	149.4	182.1	182.2	239.5	253.8	302.6	243.0	348.3	1,158	276,755
Above 75% but below 130% of poverty guideline	146.9	182.1	182.1	212.6	242.6	270.8	239.6	339.7	510	118,010
Above 130% of poverty guideline	149.6	182.1	171.9	206.7	256.9	297.1	254.2	342.2	183	47,687

^a Infant age at which 50 percent of mothers have introduced the food.

^b Unweighted ns may differ slightly across foods.

^c All subgroup differences are statistically significant for median age of introduction of cereals.

^d At least one subgroup difference is statistically significant for median age of introduction of vegetables.

^e At least one subgroup difference is statistically significant for median age of introduction of high-protein foods other than meats.

^f At least one subgroup difference is statistically significant for median age of introduction of meats.

^g All subgroup differences are statistically significant for median age of introduction of sweet foods.

^h All subgroup differences are statistically significant for median age of introduction of fruits.

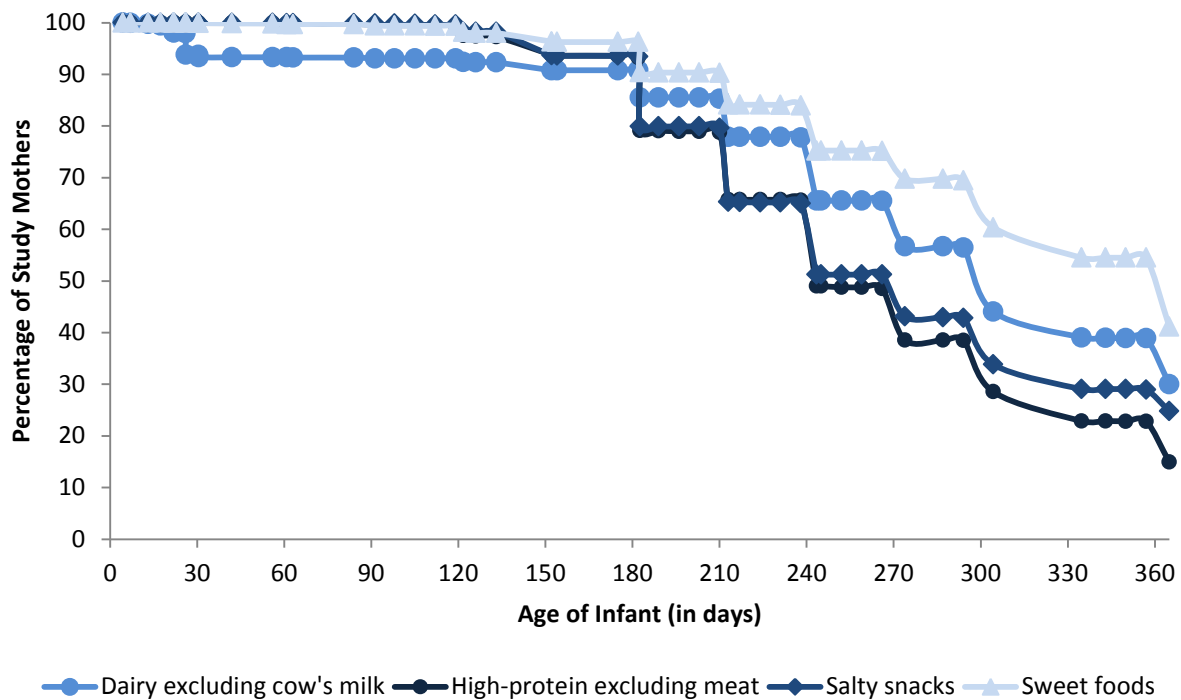
ⁱ At least one subgroup difference is statistically significant for median age of introduction of salty snacks.

^j At least one subgroup difference is statistically significant for median age of introduction of dairy foods other than cow's milk.

For more information on these data see Tables C4-17a-t in Appendix C4.

WIC IFPS-1 researchers highlighted the early introduction of complementary foods. They defined early as an introduction to complementary foods prior to 4 months of age. They found that 21 percent of mothers introduced sweet/snack foods prior to 4 months. Figure 5-8 presents our WIC ITFPS-2 data on the percentage of mothers who have not yet initiated dairy foods, high-protein foods other than meats, salty snacks, and sweet foods by infant age. Less than 10 percent of mothers have introduced any of these complementary foods prior to 4 months of age (122 days). In fact, less than 1 percent has introduced sweet foods by this milestone. Current data make clear that the introduction of complementary foods prior to 4 months of age (122 days) is not an issue for the vast majority of study mothers. Although this is a remarkable improvement from the previous study, the presence of sweet foods in infants' diets is worthy of notice. Approximately one-quarter of mothers have introduced sweet foods by 8 months of age.

Figure 5-8. Percentage of study mothers who have not yet introduced dairy foods excluding cow's milk, high-protein foods excluding meats, salty snacks, and sweet foods by infant age



5.6.2 Models of the Timing of Initiation of Select Foods

This section explores which factors are significantly associated with the likelihood of introducing select foods within the first 13 months. Because introduction of complementary foods is time-dependent, survival analysis is used to investigate how multiple variables may simultaneously affect the risk of earlier initiation.

Cereal. Table 5-10 presents the survival analysis findings in terms of the effect on risk of earlier introduction of infant cereals. The table highlights subgroups of women that are significantly more or less likely to introduce cereal across the first 13 months. Non-Hispanic mothers, U.S.-born mothers, and mothers with a firstborn child as compared to those with three or more children, are at higher risk for earlier introduction of cereal across the first 13 months. Those who combination fed at any point over the 13 months are also at higher risk for earlier cereal introduction. The receipt of WIC information on when to initiate cereal and other foods does not significantly affect when women initiate cereal.

Table 5-10. Survival analysis estimates of the relative risk of cereal introduction

Socio-demographic and WIC variables	Effect on risk of earlier cereal introduction ^a
Race	No effect
Ethnicity	Higher risk for non-Hispanic mothers
Nativity status	Higher risk for mothers born in U.S.
Maternal age at birth	No effect
Father lives in household	No effect
Parity	Higher risk for firstborn (compared to third or subsequent child)
Income poverty	No effect
Feeding type (formula, breastmilk, combination)	Higher risk if ever combination fed
Received WIC information on when to initiate cereal and other foods	No effect
Ever used regular non-parental child care	No effect

^a The Cox-proportional hazard model measures the effect the variables have on the likelihood of stopping breastfeeding over the course of the first year.

See Appendix B3d, Table B3d-2, for more detail.

Fruits. Table 5-11 presents the findings from the survival analysis in terms of the effect on risk of earlier introduction of fruits. This table highlights subgroups of women that are significantly more or less likely to introduce fruits across the first 13 months. Non-Hispanic mothers, U.S.-born mothers, women who have the infant's father living with them, those who ever used regular non-parental

child care, and those with a firstborn child (as compared to those with a second born child) are at higher risk for earlier introduction of fruit.

Table 5-11. Survival analysis estimates of the relative risk of earlier fruit introduction

Socio-demographic and WIC variables	Effect on risk of earlier fruit introduction^a
Race	No effect
Ethnicity	Higher risk for non-Hispanic mothers
Nativity status	Higher risk for mothers born in U.S.
Maternal age at birth	No effect
Father lives in household	Higher risk if father lives in household
Parity	Higher risk if firstborn (compared to second child)
Income poverty	No effect
Feeding type (formula, breastmilk, combination)	No effect
Received WIC information on when to initiate cereal and other foods	No effect
Ever used regular non-parental child care	Higher risk if used regular non-parental care

^a The Cox-proportional hazard model measures the effect the variables have on the likelihood of stopping breastfeeding over the course of the first year.

See Appendix B3d, Table B3d-3, for more detail.

Vegetables. Based on survival analysis, Table 5-12 shows the effect on risk of earlier introduction of vegetables. Consistent with the findings for introduction of fruit, non-Hispanic mothers, U.S.-born mothers, women who have the infant's father living with them, and those who ever used regular non-parental childcare are at higher risk for earlier introduction of vegetables through 13 months. White mothers (as compared to African American mothers), mothers of firstborn children (as compared to third or subsequent born children), and women who fed a combination of breastmilk and formula are also at higher risk for earlier introduction of vegetables.

Table 5-12. Survival analysis estimates of the relative risk of earlier vegetable introduction

Socio-demographic and WIC variables	Effect on risk of earlier vegetable introduction ^a
Race	Higher risk for White mothers (compared to African American mothers)
Ethnicity	Higher risk for non-Hispanic mothers
Nativity status	Higher risk for mothers born in U.S.
Maternal age at birth	No effect
Father lives in household	Higher risk if father lives in household
Parity	Higher risk if firstborn (compared to third or subsequent child)
Income poverty	No effect
Feeding type (formula, breastmilk, combination)	Higher risk if ever combination fed
Received WIC information on when to initiate cereal and other foods	No effect
Ever used regular non-parental child care	Higher risk if used regular non-parental care

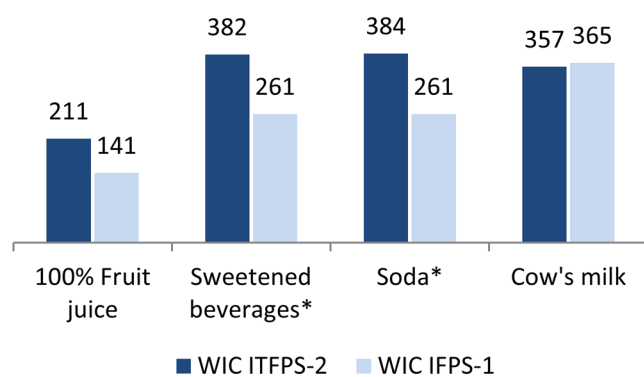
^a The Cox-proportional hazard model measures the effect the variables have on the likelihood of stopping breastfeeding over the course of the first year.

See Appendix B3d, Table B3d-4, for more detail.

5.6.3 Introduction of Beverages

Similar to the trend of study mothers today delaying introduction of complementary foods relative to the past, the beverage introduction is also occurring later, with the exception of cow's milk. WIC ITFPS-2 asks mothers about the timing of the introduction of specific beverages including cow's milk, 100 percent fruit juice, sweetened beverages excluding soda,⁹⁰ and soda. By approximately 7 months (211 days), half of the WIC ITFPS-2 study mothers have introduced 100 percent fruit juice. Cow's milk, sweetened beverages, and

Figure 5-9. Median age (in days) of infant when study mothers initiated fruit juice, sweetened beverages, soda, and cow's milk



* WIC IFPS-1 included soda in sweetened beverages.

⁹⁰ As examples, the instrument listed Kool-Aid, Hi-C, Fruit Punch, sweetened juice, sweetened or flavored water, Gatorade, or sweet tea.

soda are introduced later, with the median time of introduction closer to 12-13 months. Figure 5-9 presents data on the median age at which beverages are introduced, comparing the results from WIC ITFPS-2 and WIC IFPS-1. In the previous study, soda was not analyzed separately from other sweetened beverages. The median time to introduction of 100 percent fruit juice and sweetened beverages is later now than it was for WIC IFPS-1. The difference is particularly striking for sweetened beverages, where the median age of introduction is now 4 months later than it was in the earlier study. Median timing of introduction of cow's milk has remained steady over time, at approximately 12 months of age.

Another way of examining the timing of introduction of these beverages is to look at the pattern of introduction over the course of the first year. Figure 5-10 shows the percentage of study mothers who have not yet introduced these beverages by infant age. The figure does not reveal any striking variation in feeding practices prior to 4 months (122 days). As expected from the previous analysis of median age, 100 percent fruit juice is introduced earliest, with nearly 10 percent of mothers having introduced it by 4 months, and 50 percent by 6 months, the earliest recommended age. Eleven percent of mothers have introduced sweetened beverages by 6 months, and 41 percent have introduced them by 13 months. Soda is less common, with only about 16 percent of mothers introducing it by the end of the first year.⁹¹ Sweetened beverages are not recommended for infants since they lack nutritional value and may promote tooth decay (DeBoer, Scharf, and Demmer, 2013; Special Supplemental Nutrition Program for Women, Infants, and Children (U.S.), Commodity Supplemental Food Program (U.S.), 2009), so the evidence that less than half of the infants have consumed them by 13 months is worthy of note.

Current practice in the introduction of 100 percent fruit juice and sweetened beverages is a notable improvement over that found in WIC IFPS-1. About 40 percent of infants in WIC IFPS-1 consumed 100 percent fruit juice prior to 4 months of age. Currently, less than 15 percent do. Previously, about 31 percent of infants received sweet drinks prior to 4 months of age while currently, less than 3 percent have had sweetened beverages and under 1 percent have had soda by 4 months.

Cow's milk differs from the other three beverage types analyzed. For the vast majority of infants this beverage is introduced at 1 year, which is consistent with guidance. It is not until 8 months of age that 10 percent of infants have consumed cow's milk; by 10 months, only 25 percent of infants have

⁹¹ Because few mothers have introduced soda by the end of the first year, soda introduction will not be analyzed further in this chapter.

consumed it; and by 11 months, 37 percent have had it. The current trajectory for the introduction of cow's milk represents a modest improvement over the previous study's results.

Figure 5-10. Percentage of study mothers who have not yet introduced fruit juice, sweet beverages, soda, and cow's milk by infant age

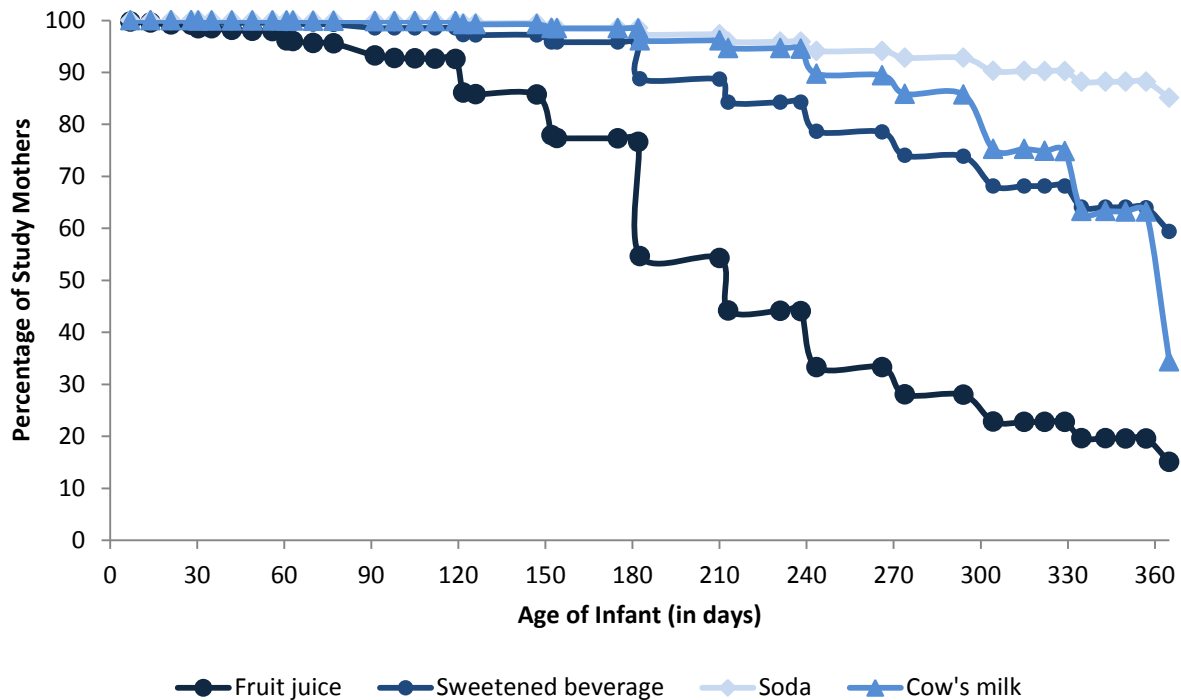


Table 5-13 presents the median age of beverage introduction by select socio-demographic variables. African American mothers introduce 100 percent fruit juice a month earlier than White or Other race mothers. Married mothers introduce 100 percent fruit juice significantly later than their unmarried counterparts, but not sweetened beverage. Mothers in the youngest age group introduce 100 percent fruit juice and sweetened beverages significantly earlier than do the older groups of mothers. More striking than the small number of differences is the consistency of median age of introduction of these beverages across groups with varied socio-demographic characteristics.

Comparing current findings on timing of introduction of beverages to those of WIC IFPS-1, the majority of median values in the current study are higher than those reported in WIC IFPS-1. The delay in initiation of sweet drinks by Hispanic mothers is particularly noteworthy. WIC IFPS-1 researchers found that the median time to introduction of sweet drinks for Hispanic mothers was 142 days. Current data indicate that 382 days is now the median time for introduction, a delay of nearly 8 months compared to the past. Although ethnicity and race were combined into one

question in the previous study, making the groups only approximately comparable, it is unlikely that this is driving the large change seen in the timing of when sweet drinks are introduced. Also striking is the delay in introduction of sweetened beverages by foreign-born mothers compared to the previous study. Previously, the median age of the introduction of sweetened beverages by foreign-born mothers was 142 days; now, this milestone is not reached until 383 days.

Table 5-13. Median age of the infant^a (in days) when 100 percent fruit juice and sweetened beverages are introduced by select socio-demographic characteristics

Socio-demographic characteristic	Median age (In days) of Initiation		Unweighted n ^b	Weighted n
	100% Fruit juice	Sweetened beverages		
Race ^c				
African American	182.5	382.0	450	96,135
White	212.1	382.1	1,109	259,562
Other	211.5	382.1	292	86,754
Ethnicity				
Hispanic	211.8	382.1	733	201,397
Non-Hispanic	210.8	382.1	1,119	241,055
Nativity status				
Born in the U.S.	210.7	381.5	1339	309,023
Not born in the U.S.	212.6	382.5	512	133,429
Mother age at birth ^{c,d}				
16-19	182.5	322.7	191	49,108
20-25	210.0	381.5	730	177,823
26 or older	212.9	382.4	930	215,521
Caregiver marital status ^c				
Married	238.7	382.4	620	155,228
Not married	182.6	381.5	1,231	287,223
Income poverty				
75% of poverty guideline or less	210.6	381.9	1,158	276,755
Above 75% but below 130% of poverty guideline	211.6	382.0	510	118,010
Above 130% of poverty guideline	224.5	382.9	183	47,687

^a Infant age at which 50 percent of mothers have introduced the beverage.

^b Unweighted n may differ slightly by beverage.

^c At least one subgroup difference is statistically significant for median age of introduction of 100 percent fruit juice.

^d At least one subgroup difference is statistically significant for median age of introduction of sweetened beverages.

For more information on these data see Tables C4-20a-t in Appendix C4.

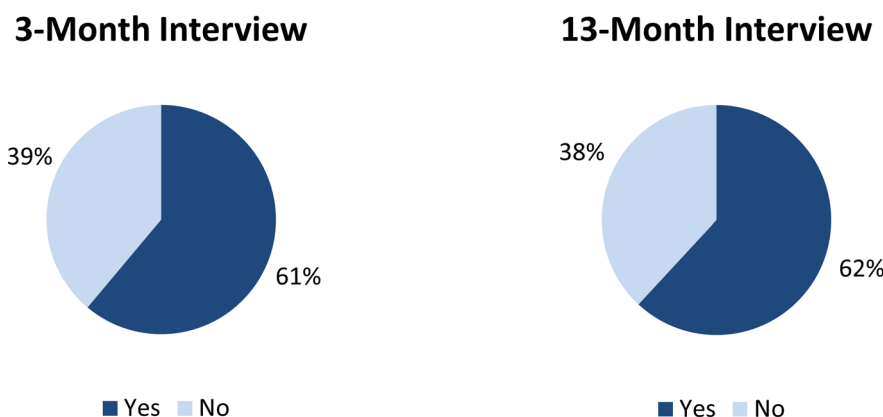
5.7 WIC Influence on Eating Patterns

The majority of study mothers report that the WIC program affected how they fed their babies or their families. At both 3 months and 13 months the interview asks study mothers whether they have changed a feeding practice based on something they learned since they have been receiving WIC education. As Figure 5-11 displays, more than 60 percent of study mothers report that they have changed a specific feeding practice based on what they learned at WIC. The distribution of responses is very stable between interviews.

Key Findings:

- More than half of study mothers reported changing a feeding practice due to something they learned at WIC.
- The most commonly reported changes were choosing healthier foods for themselves and their families, and eating more fruits and vegetables.

Figure 5-11. Percentage of study mothers reporting at month 3 or 13 that they changed a specific feeding practice because of something they learned at WIC



Study mothers who indicated that they had made changes based on something they learned at WIC were asked to identify the most important change made. Response options included: eating more fruits and vegetables; eating more whole grains; drinking more reduced fat milk; breastfeeding; learning how to prepare and feed formula; eating meals together; foregoing television during meals; drinking fewer sugar sweetened beverages; offering the right amount of food; knowing how to choose healthier foods for self and family; and other respondent-specified changes. Respondents were asked to pick only one response.

The most common impacts of WIC women cited were gaining knowledge of how to choose healthier foods for themselves and their families, and eating more fruits and vegetables. Table 5-14

examines the top eight most important changes made among study mother. The effects of changing lifestyle and diet are often long-term and wide-ranging; thus, they are not readily captured in this study at this stage. However, the delay in complementary foods and beverages since the previous study was conducted may, in part, reflect the new knowledge about healthier food choices that about one-third of WIC mothers say they gained. As the study progresses, impacts on toddler eating patterns may become more discernable.

Table 5-14. Top eight most important changes WIC recipients made because of something they learned at WIC, 3- and 13-Month Interviews

Most important change made ^a	Percent of study mothers who made changes	
	At 3 months	At 13 months
Know how to choose more healthy foods for myself/my family	32.6%	34.2%
Eat more fruits and vegetables	32.0	26.7
Other (not specified)	18.1	19.9
Offer the right amount of foods (portion)	5.3	9.7
Drink/buy fewer sugar sweetened beverages	3.9	4.1
Breastfeeding/breastfed	2.7	1.6
Eat more whole grains	1.9	1.2
Drink more reduced fat/low-fat/non-fat milk	1.7	1.8
Unweighted n ^b	1,668	1,714
Weighted n	265,795	271,329

^a Respondents were asked to choose only one response.

^b Unweighted n may differ slightly due to item nonresponse.

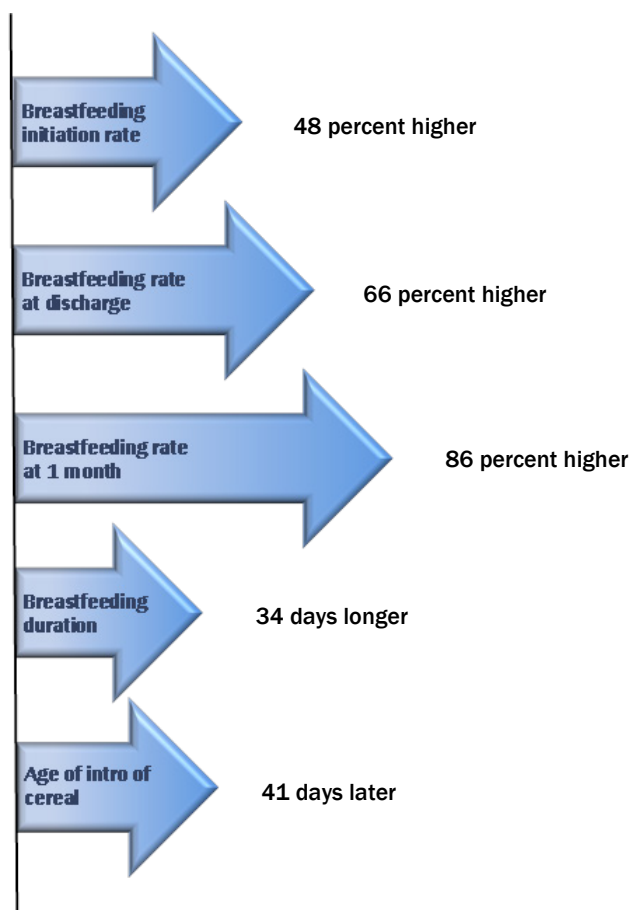
5.8 Summary and Conclusions

In general, study mothers are breastfeeding longer than they did at the time of the WIC IFPS-1 study. There have been improvements in duration across all socio-demographic categories. The overwhelming majority of breastfeeding mothers reported receiving extensive WIC support for breastfeeding. Additionally, women are closely following current feeding recommendations for when to introduce complementary foods. There is no longer a notable percentage of WIC infants receiving complementary foods prior to 4 months. The majority of women introduce complementary foods sometime between 4-6 months. Nearly one-quarter of women report introducing nutritionally poor sweet foods and sweetened beverages within the first 8 months, but these numbers represent considerable improvement since WIC IFPS-1. Finally, 60 percent of study mothers reported, at 3 and 13 months, that they made a positive change in how they feed their families or themselves due to something they learned from WIC.

6.1 Summary and Conclusions

Since the time of the WIC Infant Feeding Practices Study-1 (WIC IFPS-1) more than 20 years ago, there has been substantial progress in WIC mothers' feeding practices. Results show that today's WIC mothers are showing improvement over their predecessors from WIC IFPS-1 on every major feeding practice (see Figure 6-1). Furthermore, these improvements hold across a variety of socio-demographic characteristics, suggesting widespread increases in positive feeding practices.

Figure 6-1. WIC ITFPS-2 shows increases since WIC IFPS-1 in positive feeding practices



The changes observed include:

- **Attitudes toward breastfeeding have improved** since WIC IFPS-1, with prenatal WIC ITFPS-2 mothers endorsing more benefits of breastfeeding, and fewer barriers to breastfeeding, than their counterparts.
- **Breastfeeding rates have increased** for initiation, hospital discharge, and 1-month postpartum.
- **Breastfeeding duration has increased**, and women report both breastfeeding longer, and breastfeeding exclusively longer, than they did at the time of WIC IFPS-1.
- **The introduction of complementary foods is happening later.** Introduction of complementary foods prior to 4 months, which was a substantial problem in WIC IFPS-1, is no longer a major issue with only 20 percent of WIC ITFPS-2 mothers introducing complementary foods before 4 months.

6.1.1 Breastfeeding Beliefs and Intentions

Prenatal women enrolled in WIC today hold much more positive views, and fewer negative views, about breastfeeding than they did at the time of WIC IFPS-1. A higher percentage of women report agreeing with the benefits of breastfeeding and a much smaller percentage report agreeing with barriers than in the past. Among racial/ethnic groups, Hispanics are the most positive about the benefits of breastfeeding and African American are the least positive. This relative ranking has remained unchanged since WIC IFPS-1. In contrast, the results on barriers suggest that these less common negative attitudes do not vary systematically with race, ethnicity, or education.

When asked about their intentions to breastfeed,⁹² most WIC ITFPS-2 prenatal women intended to breastfeed their infants: 39 percent of prenatal women showed moderately strong intentions to breastfeed, and 35 percent of the women had strong or very strong intentions to breastfeed.

⁹² Prenatal women were asked to complete the Infant Feeding Intentions (IFI) scale (Nommsen-Rivers & Dewey, 2009), a measure that examines the strength of a respondent's intention to breastfeed her child exclusively over the first 6 months.

6.1.2 Breastfeeding Practices

These strong intentions to breastfeed translate into high breastfeeding initiation rates: 83 percent of the mothers initiated breastfeeding. These rates have risen dramatically since WIC IFPS-1, in which only 56 percent of study mothers initiated breastfeeding. The increase parallels national trends (CDC, 2013; McDowell, Wang, & Kennedy-Stephenson, 2008), but also may reflect changes in hospital practices, and the emphasis that WIC has placed on the importance of breastfeeding since the last study. Multivariate regression analysis, which yields information on those factors that exert unique influence on breastfeeding initiation, indicates that ethnicity; nativity status; breastfeeding history; support from family members, medical professionals, and WIC; parity; and health are all statistically significant contributors to breastfeeding initiation. In contrast to past studies, neonatal circumstances do not impede breastfeeding initiation.

The data demonstrate, however, that breastfeeding rates decline approximately 9 percentage points between initiation and hospital discharge, suggesting that some women try breastfeeding but move quickly to formula feeding. Factors influencing the likelihood of breastfeeding at discharge include some of the same factors that drive initiation (breastfeeding history, parity, and encouragement from others), as well as hospital experiences such as having breastmilk as the first feeding, having the infant stay in the same room as the mother, and not having breastfeeding problems. The evidence suggests that encouragement and support received from family, health care providers, and WIC is an important factor in sustaining breastfeeding in these early weeks.

By 14 days postpartum, half of breastfeeding study mothers had begun regular supplementation with infant formula. The most commonly endorsed reasons for supplementation among mothers who were breastfeeding were that breastmilk alone did not satisfy the baby, and that the mother did not have enough breastmilk, suggesting that mothers perceived their breastmilk to be insufficient for their infants. Returning to paid employment also emerged as a motivation for formula supplementation.

Although formula supplementation began for most breastfeeding mothers within the first month, breastfeeding, either exclusively or in combination with formula, continued for many study mothers. Looking longitudinally at those mothers who completed all the postnatal interviews through 13 months, by 3 months 43 percent are still breastfeeding, by 5 months 30 percent are still breastfeeding, and by 12 months 19 percent are still breastfeeding. Reasons for breastfeeding cessation paralleled reasons for formula supplementation, with mothers indicating that breastmilk seemed insufficient for their infants. In general, however, study mothers are breastfeeding longer

than they did at the time of the WIC IFPS-1 study. There have been improvements in duration across all socio-demographic categories, and the overwhelming majority of breastfeeding mothers reported receiving extensive WIC support for breastfeeding.

6.1.3 Introduction of Complementary Foods

In contrast to WIC IFPS-1, there is no longer a large percentage of WIC infants receiving complementary foods prior to 4 months. The majority of caregivers introduce infant cereal, fruits, and vegetables sometime between 4-6 months, and meats and other complementary foods in the months that follow. Although nearly one-quarter of caregivers report introducing nutritionally poor sweet foods and sweetened beverages within the first 8 months, these numbers represent considerable improvement since WIC IFPS-1.

6.1.4 Positive Influence of WIC

Study mothers credit WIC with teaching them to make healthy choices. Sixty percent of study mothers reported that they made a positive change in how they feed their families or themselves due to something they learned from WIC, highlighting the importance of WIC education. This suggests that the WIC program is meeting its goal of promoting healthy feeding practices for low-income women and their infants.

6.2 Interpreting the Data: Study Limitations

As with all research studies, design decisions and study-specific goals for WIC ITFPS-2 result in limitations to the conclusions that the study team can draw, both now and in future analyses. These limitations are most evident with regard to establishing causal relations, generalizing beyond the population represented by our probability sample, comparing data to WIC IFPS-1 findings, and disentangling caregiver perceptions of her WIC experiences from what WIC may have offered her.

6.2.1 Establishing Causal Relations

This is an observational study, which is a design well-suited to studying the influences of ongoing public programs. Under such circumstances, randomly assigning participants to a treatment group that gets the program and a control group that does not get program is not possible. Additionally, because WIC reaches a substantial portion of its eligible population there is no naturally occurring large, well-matched, unbiased comparison group available. As such, WIC ITPFS-2 also lacks a non-WIC comparison group. WIC ITPFS-2 will continue to follow study participants even if they are no longer on WIC, so future analyses will compare those who are on and off WIC to examine program influences. Because of this observational study design, however, the study team can only infer causality between program predictors and outcomes rather than establishing it with certainty.

6.2.2 Generalizing Findings

The study team also is limited in generalization of the findings by the study eligibility rules and sample design. Eligible mothers were either pregnant, or their infants were less than 3 months old, and they were enrolling in WIC for the first time for that pregnancy or child. Mothers were at least 16 years old at the time of enrollment, and spoke either English or Spanish. The study team chose these eligibility characteristics to be inclusive of a large portion of the WIC population. Nonetheless, there may be characteristics or feeding patterns not captured that pertain to mothers who are very young, who speak a language other than English or Spanish, or who enroll in WIC for the first time after 3 months postpartum. Similarly, the weighted sample represents the infants from this population who enrolled in WIC during our 20-week enrollment period. It does not represent a full year of WIC enrollments, and if there were strong seasonal differences in WIC enrollees, the sample would not capture that full variation.

6.2.3 Statistical Comparisons to WIC IFPS-1

One of the goals of WIC ITPFS-2 is to examine how the feeding choices and practices of WIC mothers have changed since WIC IFPS-1, 20+ years ago. Although this report describes many comparisons to WIC IFPS-1 findings, these are comparisons of the magnitude of the findings, and not tests of the statistical significance of those differences. As the standard errors of the weighted estimates from WIC IFPS-1 are not consistently available for analysis, it is not possible to conduct valid statistical comparison of the two studies. Additionally, the studies' methodologies, including

timing of all interviews, would need to be more clearly aligned than is possible while still meeting other important goals of WIC ITFPS-2. To ensure that comparisons between the two studies are robust, the study team focuses on describing differences that are large in magnitude, and that are comparable in nature and developmental stage. The WIC ITFPS-2 mothers also differ somewhat in their socio-demographic characteristics from the WIC IFPS-1 mothers. WIC ITFPS-2 mothers are older at the time of the birth of the target child, and a higher percentage identify as Hispanic or Latino, than WIC IFPS-1 mothers. The differences correspond to national shifts over time in the demographics of the U.S. population, and in women having children at later ages. It is possible that these demographic shifts may drive some of the differences in comparisons between the two studies.

6.2.4 Influence of WIC Services Received

Most of the study data about individual experiences with WIC come from caregiver report during telephone interviews. Although the study team collected data from WIC State Agencies and sites that were used in analyses, those data pertain primarily to the policies and practices of the states and their sites in general. Information on actual WIC services received by study participants came from the caregivers themselves, and therefore, these data are filtered through the perceptions and memories of those caregivers. Support for pregnant women and new mothers may come in many formats and from multiple sources, and women may not discern precisely what education or advice was offered by whom or when during this busy period in life.⁹³ Evaluating the influence of more granular components and methods of WIC education is beyond the scope of WIC ITFPS-2, and would require individual level tracking of the services received by each woman from her WIC site.

6.2.5 Scope of the Study

Finally, WIC ITFPS-2 will follow this national sample of study children until they turn 5 years old. While this is an unprecedented opportunity, and the study will yield many years of rich data, not all issues related to childhood weight and health outcomes may be apparent by age 5. Although children are no longer eligible for WIC services after their fifth birthdays, earlier WIC participation or continued participation by still-eligible family members, and factors beyond those explored in this

⁹³ Cognitive interviews conducted with WIC mothers prior to the study supported this idea; women who were asked about specific WIC education received were often unable to articulate the form or content of the WIC information.

study may influence, and continue to influence, eating and health as obesity risk continues into middle childhood and beyond.

6.3 Next Steps

This infant year report is a part of what will be a series of reports from the ongoing WIC ITFPS-2. Subsequent reports from the study will cover through ages 2, 3, 4, and 5, examining nutrition, health outcomes, and family feeding practices of WIC children. The data from the study, which the Food Nutrition Service will make available, will also provide scientific researchers and the public with a landmark platform of data from which to pursue further analyses on nutrition and health in children of low-income families.

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