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Evaluation of the Birth Month Breastfeeding Changes to the WIC Food Packages

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Final Report

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Evaluation of the Birth Month Breastfeeding Changes to the WIC Food Packages

Final Report

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Executive Summary

ES.1 Background

The Special Supplemental Nutrition Program for Women, Infants and Children (WIC) provides nutritious foods, nutrition education, breastfeeding support, and health referral services to low-income mothers and their children. In 2007, USDA published an Interim Rule changing the composition and quantities of prescribed foods in the WIC food packages (72 Federal Register 68965-69032). In particular, the regulatory changes sought to encourage WIC mothers to choose breastfeeding for their infants. The Interim Rule took effect in 2009.

A large body of research shows multiple benefits of breastfeeding for infant health, nutrition, immune system function, and social and psychological development. Leading health associations in the United States and internationally recommend exclusive breastfeeding, except in rare circumstances, for six months postpartum and support for breastfeeding up to 12 months (AAP, 2005; AAFP, 2007; APHA, 2007; WHO, 2003). WIC may affect breastfeeding in multiple ways. The provision of free infant formula could encourage formula feeding, while WIC's food package design and vigorous breastfeeding education efforts could encourage breastfeeding. Breastfeeding promotion and support are central tenets of the WIC Program.

ES.2 Changes to the WIC Food Package

WIC offers distinct food packages for mother-infant pairs (or "dyads") based on breastfeeding status: full breastfeeding, partial breastfeeding, and full formula. The Interim Rule limited the amount of infant formula available to dyads receiving the partial breastfeeding package. To encourage the successful initiation of breastfeeding, when the infant was in its birth month, WIC formula was no longer routinely provided to these partial breastfeeding dyads, and the amount that could be provided was limited to no more than 104 ounces. To encourage greater duration and intensity of breastfeeding, when the infant was aged 1-5 months, the formula amount for these partial breastfeeding dyads was limited to no more than about 45% of the maximum formula amount. After implementation, if a dyad required more than these amounts of formula, the mother would receive the full formula WIC package, even if she was partially breastfeeding her infant. Receiving the full formula package instead of the partial breastfeeding package may be a significant change. The full formula package provides less food for the mother, and these maternal benefits end when the infant is six months old. The partial breastfeeding provides more food for the mother, and the benefits last throughout the infant's first year.

ES.3 Study Design

The study focused on infants and their mothers for the birth month and the next five months postpartum, in 17 randomly sampled Local WIC Agencies (LWAs). The data came from several sources in each period, including interviews with State and local WIC staff, administrative records for all dyads with an infant aged 0-5 months in the sampled LWAs, and participant surveys with mothers of infants aged 0-9 weeks who had initiated breastfeeding.

The study used a pre/post research design, comparing outcomes shortly before and shortly after implementation of the Interim Rule. In some analyses, multivariate regression models were used to control as well as possible for explanatory variables that may have changed, but the basic research design had no control group. The well-known limitation of a pre/post research design without control group is its inability to account for all environmental changes that coincided in time with the implementation of the Interim Rule. In this study, the policy "treatment" appeared sufficiently strong, and the time periods before and after implementation appeared sufficiently close, that this limitation seemed acceptable. If we observe changes in outcomes between the pre-implementation and post-implementation period, we cannot be sure of causation, but the adoption of the Interim Rule is a leading candidate explanation.

ES.4 Study Outcomes

The study evaluated the impact of the Interim Rule on five outcome domains:

- *Domain 1: WIC participation.* After implementation, were there changes in WIC participation patterns and the demographic and economic characteristics of participants?
- *Domain 2: Food package choices and infant formula amounts.* (2a) Was there a change in the percentage of participants receiving each WIC package? (2b) Was there a change in infant formula amounts?
- *Domain 3: Breastfeeding initiation.* Was there a change in the percentage of participants who initiated breastfeeding?
- *Domain 4: Breastfeeding duration.* Was there a change in the duration of breastfeeding?
- *Domain 5: Breastfeeding intensity.* Was there a change in the percentage of participants with exclusive breastfeeding, a combination of breastfeeding and formula feeding, and exclusive formula feeding?

In addition to these five domains, the study reported on the implementation of the Interim Rule.

ES.5 Results

Program Participation Patterns (Domain 1)

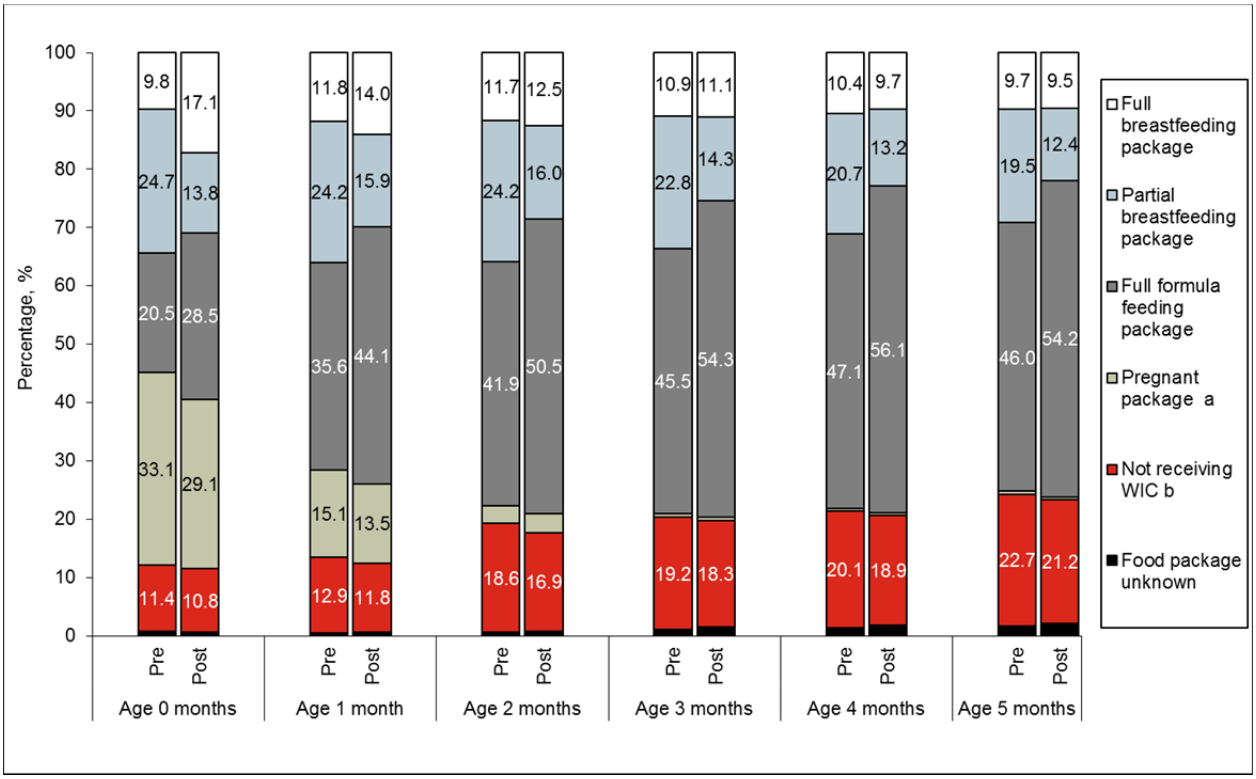
There was little pre/post difference in WIC program participation patterns among mothers and infants. The percentage of mothers receiving WIC during pregnancy whose infants were enrolled after birth was the same before and after implementation. The average age of infant's first enrollment was the same before and after implementation. The average demographic characteristics of WIC mothers and infants were largely the same before and after implementation. The lack of these differences in patterns bolsters the hypothesis that any changes in the remaining outcomes can be attributed to the implementation of the Interim Rule.

WIC Food Package Assignments and Infant Formula Amounts (Domain 2)

After implementation of the Interim Rule, fewer WIC mothers were assigned the partial breastfeeding package, while more mothers were assigned to the full breastfeeding and full formula packages (Exhibit ES.1). For dyads or partial dyads where the infant was in its birth month, the percentage whose mother

received the partial breastfeeding package fell from 24.7% (pre) to 13.8% (post). The percentage receiving the full breastfeeding package rose from 9.8% (pre) to 17.1% (post), and the percentage receiving the full formula package rose from 20.5% (pre) to 28.5% (post).

Exhibit ES.1 Food Packages Issued to New Mothers, by Age of Infant



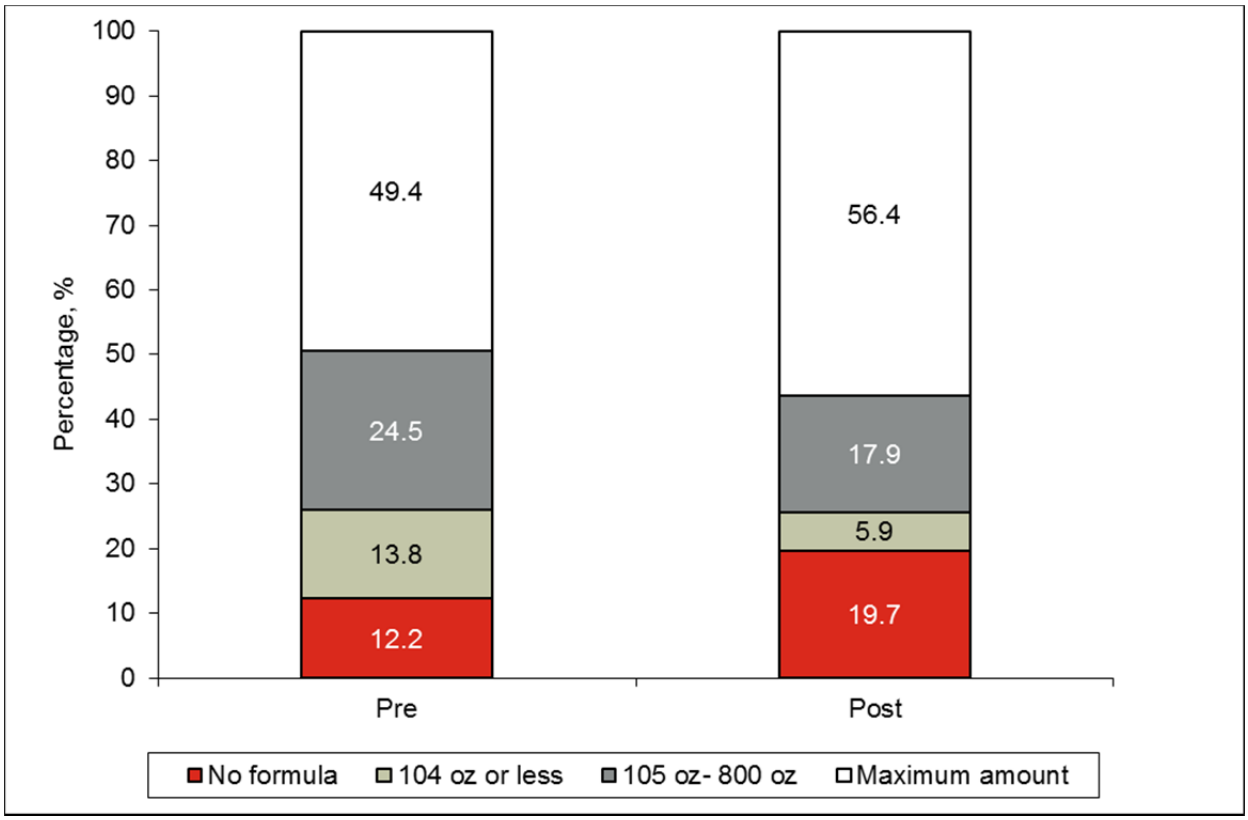
Sample: Administrative records, all dyads with infants aged 0 to 5 months, *n*=129,606 (pre) and *n*=528,597 (post) in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: Among dyads whose infants were in their birth month, 9.8% (pre) and 17.1% (post) received the full breastfeeding package as the mother's WIC food package.

[a] Mothers with infants certified for WIC. [b] Mothers who have not recertified postpartum, but who have infants who have been certified.

Infant formula amounts also changed after the Interim Rule was implemented (Exhibit ES.2). Among dyads with infants in the birth month, the proportion where the infant received no formula increased from 12.2% (pre) to 19.7% (post), which is a favorable outcome. However, the proportion where the infant received the maximum or nearly the maximum formula amount also increased, from 49.4% (pre) to 56.4% (post), which is a less favorable outcome. Both principal findings suggest a move away from intermediate WIC packages and toward the two extremes (full breastfeeding or full formula).

Exhibit ES.2 Infant Formula Amounts (Ounces) Issued for Infants in the Birth Month



Sample: Administrative records, all dyads with infants in the birth month in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: Among dyads with infants in the birth month, the percentage that receives the maximum amount of formula increased from 49.4% (pre) to 56.4% (post).

Notes: Infant formula amounts are expressed as four categories: (1) no formula; (2) 104 ounces, the post-implementation partial breastfeeding limit for the birth month, or less; (3) more than the post-implementation partial breastfeeding limit of 104 ounces but less than 800 ounces; (4) 800 ounces or more. The actual formula amount provided to a dyad could range from 0-806 ounces in the pre-implementation period and from 0-884 ounces in the post-implementation period (see Exhibit 1.1).

Breastfeeding Initiation Rates (Domain 3)

As measured in administrative records, the breastfeeding initiation rate for WIC participants was essentially unchanged: 65.5% (pre) and 65.1% (post) (Exhibit ES.3). Overall breastfeeding initiation rates appeared quite stable even as WIC package assignments changed.

Exhibit ES.3 Breastfeeding Initiation, Overall and by Mother's Food Package

	Pre (%)	Post (%)	Diff (%)	DF [a]	Chi-Square [a]	p-value [a]	
Overall	65.5	65.1	-0.4	1	0.307	0.580	
Mother's Food Package:							
Full breastfeeding package	99.6	99.3	-0.3	1	4.444	0.035	*
Partial breastfeeding package	96.5	96.5	0.1	1	0.017	0.895	
Full formula feeding package	46.7	55.4	8.7	1	12.812	<0.001	
Pregnant package [b]	67.3	64.8	-2.5	1	6.258	0.012	
Not receiving WIC [c]	47.7	45.8	-1.9	1	1.213	0.271	
	n= 80,658	*n*= 77,534					

Sample: Administrative records, all dyads with infants aged 0-5 months in analysis month 2 (pre) and analysis month 10 (post).

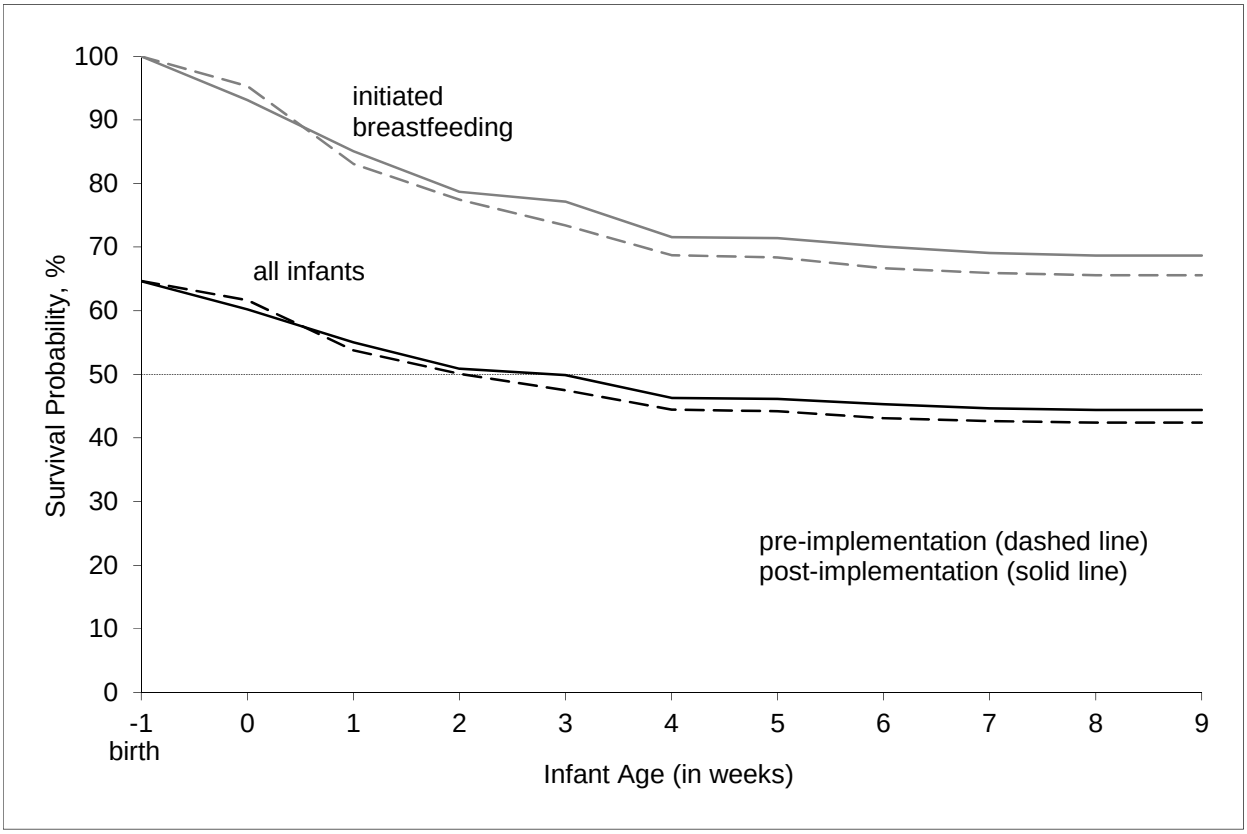
Interpretation Guide: The breastfeeding initiation rate was 65.5% (pre) and 65.1% (post).

[a] Chi-square tests indicate pre/post differences. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001. Missing values indicate that the test could not be estimated. [b] Mothers who have not recertified postpartum, but who have infants who have been certified. [c] Mothers with infants certified for WIC.

Breastfeeding Duration (Domain 4)

In pre/post comparisons, without adjustment for other explanatory variables, there was a small but statistically significant increase after implementation in breastfeeding duration over the infants' first 10 weeks of life. The duration estimates used data from the survey respondents, all of whom had at least initiated breastfeeding. A survival analysis showed a small statistically significant shift in the profile of breastfeeding duration: at each infant age measured in weeks, the percentage of respondents that was still breastfeeding was slightly higher after implementation than before implementation (Exhibit ES.4).

Exhibit ES.4 Estimated Survival Function of Survey Respondents Who are Still Breastfeeding in a Given Week Postpartum (Pre- and Post-Implementation, 2009-2010)



In addition to this survival analysis described above, simple estimates of respondents with infants who were still breastfeeding after four weeks, measured as a percentage of all respondents with infants observed at age four to nine weeks, increased from 73.1% (pre) to 81.9% (post).[1] Multivariate analysis, holding other factors constant, showed a pre/post difference that was negligible in magnitude and not statistically significant (see Chapter 9). The preponderance of evidence suggests that the Interim Rule had at most small impacts on breastfeeding duration.

Breastfeeding Intensity (Domain 5)

Based on the participant survey data, there was not a statistically significant change after implementation in the intensity of breastfeeding among initiators (Exhibit ES.5). The main analysis categorized participant feeding practices into five categories of breastfeeding intensity: (1) breastmilk only, (2) mostly breastmilk with some formula, (3) breastmilk and formula about equally, (4) mostly formula and some breastmilk, and (5) only formula. There was not a statistically significant difference in the percentage of respondents in these categories before and after implementation of the Interim Rule.

[1] Percentages reported here are shown in Exhibit 9.4 in Chapter 9 of the full report.

Exhibit ES.5 Intensity of Breastfeeding, Overall

	Pre (%)	Post (%)	Diff	DF	Chi-Square [a]	p-value
				4	2.755	0.600
Breastmilk only	18.3	20.0	1.7			
Mostly breastmilk and some formula	24.9	23.2	-1.7			
Breastmilk and formula equally	16.1	14.2	-1.9			
Mostly formula and some breastmilk	11.7	14.5	2.8			
Formula only	29.0	28.1	-0.9			
	n=814	*n*=800				

Sample: Participant surveys, mothers with an infant aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: 18.3% (pre) and 20.0% (post) of mothers who initiated breastfeeding fed their infants only breastmilk. These differences were not statistically significant.

[a] A Chi-square test was conducted.

ES.6 Policy Implications

The Interim Rule sought to address the challenging policy dilemma of balancing breastfeeding promotion with provision of safe and appropriate food for infants who are formula fed. After implementation, the study found more dyads were assigned the full breastfeeding package, but more dyads also were assigned the full formula package. After implementation, this study found no change in initiation and intensity, and only a small change in duration. These results are neutral in the sense that no adverse impact on breastfeeding was observed, but unfavorable in the sense that larger positive changes in breastfeeding outcomes were not observed. These results raise the question of what further policy changes could be explored, subsequent to the implementation of the Interim Rule, as the most sensible next steps toward even more vigorous breastfeeding promotion.

A first policy option is to further increase the economic value of the full breastfeeding and partial breastfeeding packages relative to the full formula package. Although the Interim Rule shifted the package incentives somewhat towards making the full breastfeeding package more valuable, the full formula package continues to have the highest market value. Compared to before implementation, this study found that more dyads had mothers receiving the full formula package after implementation, and that most of these full formula dyads received the maximum or nearly the maximum formula amount. Within the current structure of WIC's overall program design, policy-makers could consider further reducing the food content and economic value of the full formula package, while increasing the food content and economic value of the full breastfeeding package.

A second policy option is to continue to improve staff training and strengthen breastfeeding promotion efforts at the State- and LWA-level. The implementation of the Interim Rule should be seen as one event in an ongoing process of promoting breastfeeding through WIC. This study found considerable diversity across LWAs in breastfeeding promotion, package assignments and infant formula amounts, and breastfeeding outcomes. For example, although the Interim Rule allows the provision of up to 104 ounces of formula for partial breastfeeding dyads with infants in their birth month, LWAs are encouraged routinely to provide no formula to such dyads. FNS anticipates that over time fewer breastfeeding WIC dyads will be provided any formula in the birth month. Later, as the infant reaches ages 1-5 months, about half of the LWAs in this study responded to mothers' requests for additional formula by addressing their concerns through counseling before issuing a new package. Such efforts could be extended to more LWAs. FNS encourages States (a) to review existing policies and procedures to ensure they support

breastfeeding women and infants through minimum supplementation with infant formula, and (b) to ensure staff are adequately trained to provide the necessary counseling and support.

A third policy option, motivated in particular by the stability of the breastfeeding initiation outcomes after implementation of the Interim Rule, is to focus the next stage of WIC policy development on pregnant mothers and the very first days postpartum. WIC could invest even more heavily in educating pregnant women and new mothers about the relative merit of the full breastfeeding package. Through outreach efforts, and perhaps even through changes in the pregnancy WIC package, the WIC program could increase its recruitment of eligible pregnant women. WIC also could study the experience of those States and LWAs with the lowest provision of infant formula to breastfeeding mothers during the infant's birth month to inform further guidance to States. Finally, WIC could be used as a vehicle for more vigorously promoting appropriate lactation policies and practices for U.S. hospitals.

Chapter 1: Introduction

1.1 Purpose of This Study

The Special Supplemental Nutrition Program for Women, Infants and Children (WIC) has been providing nutritious foods, nutrition education, breastfeeding support, and health referral services to low-income mothers and their children for over 30 years. On December 6, 2007, an Interim Rule changed the composition and quantities of prescribed foods in the WIC food packages (72 *Federal Register* 68965-69032). The Interim Rule "reflects the most significant revisions to the food program since the program's inception" (Oliveira and Frazao, 2009). In particular, the regulatory changes sought to encourage WIC mothers to choose breastfeeding for their infants.

This study evaluates the impact of the regulatory changes on WIC package choices and the initiation, duration, and intensity of breastfeeding. The study focuses on infants and their mothers for the birth month and next five months postpartum. The study also investigates how States and local WIC Agencies (LWAs) implemented the Interim Rule.

1.2 WIC Background

WIC grew out of rising concern in the late 1960s and early 1970s about the nutrition status of low-income pregnant women and infants. In 1969, a summary report from President Nixon's White House Conference on Food, Nutrition, and Health described hunger and malnutrition among pregnant women and infants as a "national emergency" requiring immediate response (White House Conference on Food, Nutrition, and Health, 1970). Congress established the WIC program as a pilot in 1972 under Public Law 92-433, Section 17 to the Child Nutrition Act of 1966, and the program was made permanent in 1974 (Oliveira and Frazao, 2009).

WIC is authorized by Congress as a discretionary or non-entitlement program, so spending levels are determined by annual appropriations. If funding were exhausted in a given year, applicants would be placed on a waiting list. In practice, in recent years the federal appropriations have been based on estimates of the funding level required to provide benefits to all eligible applicants, so the program has functioned nearly as an entitlement. In FY 2008, WIC served an average of 8.9 million participants per month (Oliveira and Frazao, 2009).

WIC participants must have household income less than 185% of the Federal Poverty Level ($3,400 per month for a family of four in 2010), or be certified as adjunctively eligible based on participation in another means-tested safety net program such as the Supplemental Nutrition Assistance Program. In addition, WIC participants must be at nutritional risk. In years when there is sufficient funding, the nutritional risk criteria do not significantly constrain eligibility, but nutritional risk criteria would be used to prioritize WIC applicants if there were waiting lists due to budget limitations.

WIC provides nutrition services, referrals, and a package of nutrient dense foods to low-income pregnant and post-partum women, infants up to one year of age, and children up to their fifth birthday. Food and Nutrition Services (FNS) of the U.S. Department of Agriculture administers the WIC Program through grants to State agencies (or, in some cases, equivalent tribal or territory agencies), which in turn award subgrants to LWAs. LWAs determine eligibility and benefits and deliver WIC services. In most States

and tribal organizations, WIC participants receive vouchers or electronic benefit transfers (EBT), which can be redeemed for food from authorized food retailers. The federal government funds the WIC packages, nutrition services, referrals, and administration at the federal and State levels. Nutrition services and administration activities include breastfeeding promotion and support.

1.3 Breastfeeding Promotion

1.3.1 Recommendations and Objectives

The American Academy of Pediatrics (AAP) describes human milk as "uniquely superior for infant feeding" (AAP, 2005), and the American Academy of Family Physicians (AAFP) describes breastfeeding as the "physiological norm for both mothers and their children" (AAFP, 2007). A large body of research shows multiple benefits of breastfeeding for infant health, nutrition, immune system function, and social and psychological development. Leading health associations in the United States and internationally recommend exclusive breastfeeding, except in rare circumstances, for six months postpartum and support for breastfeeding up to 12 months (AAP, 2005; AAFP, 2007; APHA, 2007; WHO, 2003).

In the Healthy People 2010 initiative (U.S. Department of Health and Human Services, 2000), the federal government adopted measurable objectives for increasing the percentage of mother-infant pairs (or "dyads") who are exclusively breastfeeding and breastfeeding at all by the year 2010:

- 75% breastfeeding shortly after birth;
- 50% breastfeeding at six months;
- 40% exclusively breastfeeding at three months; and
- 17% exclusively breastfeeding at six months.

Mothers may face significant barriers to breastfeeding (APHA, 2007; Racine, et al., 2008). Some mothers may have difficulty or pain with breastfeeding. For some mothers, illness may prevent or discourage breastfeeding, although the medical contra-indications for breastfeeding are few and rare (AAP, 2005). Some mothers may not be aware of the health benefits associated with breastfeeding, or may perceive a social stigma against breastfeeding. Other mothers may find that work in the labor market presents insurmountable challenges to breastfeeding. Some mothers may be influenced not to breastfeed by infant formula marketing practices, including the early provision of free infant formula, which deters continued breastfeeding (APHA, 2007; IOM, 2005). Once breastfeeding has stopped, the mother of a young infant must rely on infant formula or supplemental foods and beverages thereafter.

The federal government's proposed Healthy People 2020 objectives (U.S. Department of Health and Human Services, 2010) increase the targets for breastfeeding rates and include four new objectives to address some of the leading barriers to breastfeeding:

- increase the percentage of women giving birth who receive a postpartum care visit with a health worker;
- increase the percentage of employers who have worksite lactation programs;
- decrease the percentage of breastfed newborns who receive formula supplementation within the first two days of life; and

- increase the percentage of live births that occur in hospitals, birthing centers, or other facilities that provide recommended care for lactating mothers and their babies.

Although policies recommended by the World Health Organization (WHO) prohibit hospitals from providing free infant formula samples to new mothers, such free formula samples remain common in the United States. The Centers for Disease Control and Prevention (CDC) reported that 70% of surveyed facilities gave discharge bags containing infant formula to breastfeeding mothers (CDC, 2008). A recent survey used a slightly broader question, which encompassed formula samples to any post-partum mothers. It estimated that 91% of hospitals provide such samples (Merewood, 2008).

According to the Institute of Medicine (IOM, 2005), providing formula to breastfeeding mothers in the first month after an infants' birth may be especially disadvantageous. This is because early supplementation with formula is associated with shorter duration of breastfeeding, particularly exclusive breastfeeding (Bergevin et al., 1983; Feinstein et al., 1986; Frank et al., 1987; Snell et al., 1992; Caulfield et al., 1998; Chapman et al., 2004).

1.3.2 WIC and Breastfeeding

WIC may affect breastfeeding in multiple ways. The provision of free infant formula could encourage formula feeding, while WIC's food package design and vigorous breastfeeding education efforts could encourage breastfeeding. This sub-section reviews how the program promotes breastfeeding and describes research that compares breastfeeding rates among WIC participants and nonparticipants.

Breastfeeding promotion and support are central tenets of the WIC Program. Regulations require that "all pregnant participants shall be encouraged to breastfeed unless contraindicated for health reasons" (7 Code of Federal Regulations 246.11). States must provide training on the promotion and management of breastfeeding to staff at local agencies, which, in turn, provide information and assistance on this subject to WIC participants. States are responsible for identifying or developing resources and educational materials for use in LWAs, including breastfeeding promotion and instruction materials. In addition, States must ensure that LWAs provide a positive clinic environment that endorses breastfeeding as the preferred method of infant feeding; train new WIC staff appropriately on breastfeeding promotion and support; and have a plan in place to guarantee that both pregnant and postpartum WIC participants have access to breastfeeding promotion and support activities.

USDA/FNS guidance issued after the publication of the Interim Rule places heavy emphasis on breastfeeding promotion:

> 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. Since a major goal of WIC is to improve the nutritional status of infants, WIC staff must provide education and anticipatory guidance to pregnant and postpartum women about breastfeeding unless medically contraindicated, encourage women to breastfeed for as long as possible, and provide appropriate support for the breastfeeding dyad, especially at time periods critical to breastfeeding success (USDA/FNS, 2009).

One aspect of breastfeeding promotion is a limit on the provision of infant formula. FNS guidance emphasizes "the importance of minimal formula supplementation." The guidance says, "WIC's goal is to encourage mothers to breastfeed exclusively without supplementing with formula." When a breastfeeding mother requests infant formula, WIC staff should first "troubleshoot" to explore the reason for the request, FNS advises: "Care must be exercised to ensure that provision of formula does not interfere with or undermine the breastfeeding mother's desire to maintain lactation" (USDA/FNS, 2009).

As part of the agency's breastfeeding promotion activities, in the mid1990s, USDA/FNS launched a national breastfeeding promotion campaign called *Loving Support Makes Breastfeeding Work. Loving Support* is an umbrella for ongoing activities, including Glow and Grow staff training, a standardized competency-based curriculum was developed to ensure that all staff attain a level of proficiency in the skills required to promote and support breastfeeding in the WIC setting. It also includes *Breastfeeding a Magical Bond of Love* (WIC Hispanic Breastfeeding and Promotion Project), which provides research-based, culturally-sensitive breastfeeding resources that address perceived barriers to breastfeeding among Hispanic participants. Other materials provided to LWAs are designed to encourage community partnerships to support breastfeeding.

In addition to the above activities, *Loving Support Makes Breastfeeding Work* includes a peer counseling initiative developed specifically for WIC: Using *Loving Support* to Implement Best Practices in Peer Counseling. This model has been adopted by 50 States and the District of Columbia and 34 tribal and related organizations. The Final Implementation Report for the *Loving Support* Peer Counseling initiative reported that State agencies made a variety of choices about which localities and participants to target for these counseling services, and that the estimated take-up rates among eligible participants varied substantially among LWAs that participated (Collins, Rappaport, and Burstein, 2010).

LWAs also undertake a number of other breastfeeding promotion activities, such as collaborating with local hospitals, participating in awareness campaigns, and making breastpumps available to women to facilitate their return to work.

Despite these efforts, during the period 2000-2007, before the revision of the WIC package, breastfeeding rates for WIC participants were lower than for eligible nonparticipants. The CDC National Immunization Survey 2007 describes trends in breastfeeding practices for WIC participants, eligible nonparticipants, and ineligible (generally higher income) nonparticipants. The data show the following:

- The percentage of infants that were ever breastfed was 67.5% for WIC participants, 77.5% for eligible nonparticipants, and 84.6% for ineligible nonparticipants. For comparison, the Healthy People 2010 goal was 75%.
- The percentage of infants that were breastfed for 6 months was 33.7% for WIC participants, 48.2% for eligible nonparticipants, and 54.2% for ineligible nonparticipants. The Healthy People 2010 goal was 50%.
- The percentage of infant that were exclusively breastfed for 3 months was 25.5% for WIC participants, 39.9% for eligible nonparticipants, and 41.9% for ineligible nonparticipants. The Healthy People 2010 goal was 40%.

While the breastfeeding rates for WIC participants were below the Healthy People 2010 goals, the breastfeeding rates for non-participants equaled or exceeded these goals. The CDC's survey data also estimated the percentage of infants who had infant formula supplementation within the first two days of

life: 31.0% for WIC participants, 19.7% for eligible nonparticipants, and 20.1% for ineligible nonparticipants.

Such cross-sectional participant/nonparticipant comparisons do not show the *effect* of WIC on breastfeeding. Breastfeeding rates might have been different even in the absence of WIC due to observable and unobservable differences between the two populations. For example, women who face great economic hardships may simultaneously be more likely to participate in WIC and less likely to breastfeed. Thus, cross-sectional comparisons are best interpreted as descriptive estimates of the extent to which breastfeeding practices meet or fall short of recommendations, for both WIC participants and nonparticipants.

Using other data sources, several studies have controlled for observable characteristics while measuring breastfeeding outcomes for WIC participants and nonparticipants. With data from the Ross Laboratories Mothers Survey for 1978 to 2003, Ryan and Zhou (2006) estimated higher rates of breastfeeding initiation for WIC nonparticipants compared to seemingly similar participants (*odds ratio* = 1.82), and likewise higher rates of breastfeeding at 6 months of age for WIC nonparticipants compared to seemingly similar participants (*odds ratio* = 2.11). In a multivariate hazard analysis of breastfeeding cessation, Racine et al. (2009) estimated that WIC participants had a significantly greater hazard of cessation (*hazard ratio* = 1.50) compared with seemingly similar nonparticipants. Using regression models to control for observable characteristics such as race and ethnicity, age, education, and region of the country, Jacknowitz et al. (2007) estimated that the percentage exclusive breastfeeding for at least four months was 5.9 percentage points lower for WIC participants than for comparable non-participants. Although they still do not prove causation, and cannot control for unobservable characteristics, these regression analyses suggest lower rates of breastfeeding among WIC participants.

1.4 The New WIC Food Package

In designing WIC food packages, policy-makers seek to serve the nutritional needs of mothers, infants, and children. With regard to infant feeding, any WIC food package design tries to balance two competing objectives: (i) promoting breastfeeding, and (ii) providing safe and nutritionally appropriate foods for infants who are partially breastfed or not breastfed. The first objective motivates restraint in providing infant formula, while the second objective motivates providing a sufficient quantity of infant formula. The new WIC food package was designed to shift the balance towards breastfeeding promotion. This section describes package changes that were initially considered, and the changes that were made in the Interim Rule.

Both before and after the Interim Rule, five of the seven WIC package types (denoted in Roman numerals) are most relevant to dyads with infants under six months of age:

- Package I, for young infants,
- Package II, for older infants,
- Package V, for pregnant women and post-partum women who are partially breastfeeding,
- Package VI, for post-partum women whose infants are receiving the full infant formula allotment,
- Package VII, for post-partum women who are fully breastfeeding.

To simplify terminology, so that readers will not need to remember federal food package numbers (in Roman numerals), this report will describe infant formula amounts in fluid ounce equivalents and

mothers' food package status using five categories. Three of these categories describe typical WIC packages for mothers in a WIC dyad:

- Full breastfeeding package (Package VII),
- Partial breastfeeding package (Package V for postpartum women), and
- Full formula package (Package VI)

The remaining two categories describe less common circumstances for the mother in the WIC dyad; these circumstances may be observed in the first several weeks after an infant is born:

- Pregnant package (Package V for pregnant women, which mothers may continue to receive for a short period after the infant is born), and
- Not on WIC (the infant is enrolled in WIC, but the mother is not yet enrolled).

The food package received is not synonymous with actual breastfeeding decisions. WIC's regulations define breastfeeding as the practice of feeding a mother's breastmilk to her infant(s) on average at least once per day. A mother who receives the full formula package may still partially breastfeed, and a mother who receives the full breastfeeding package may purchase some infant formula (typically with her own money).[2]

1.4.1 Developing the WIC Package Revision

The WIC food package revisions were based on recommendations from an expert panel of the Institute of Medicine, which published its consensus report in 2005: *WIC Food Packages: Time for a Change* (IOM, 2005). The committee recommended several modifications to the WIC package, designed to increase breastfeeding and improve nutrition. The committee recommended postponing the introduction of complementary foods (which are foods other than breastmilk and infant formula), increasing the value of the WIC package for mothers who fully breastfeed (without getting an infant formula package for their infant), and reducing the amount of infant formula in a package for mothers who partially breastfeed. These recommendations were adopted in the Interim Rule, described in Section 1.4.2 below.

The committee made a related recommendation that no infant formula should be provided to breastfeeding mothers in the first month. This recommendation was modified in the Interim Rule, to allow some formula in the first month. The committee's report correctly anticipated some of the concerns that this proposal would generate:

> [T]he committee recognizes the potential for some undesirable consequences of the recommended changes in the WIC food packages. A breastfeeding mother—especially one who intends to combine breastfeeding and formula feeding, who needs to return to work, or who faces other personal challenges to breastfeeding—may need some formula to nourish her infant adequately during the first month postpartum. Some mothers who might otherwise try breastfeeding may choose formula feeding to be sure they can obtain formula (a high-cost item) if they run into breastfeeding difficulties.

The IOM called for empirical research focused particularly on the effects of package alternatives on breastfeeding practices in the first month of the infant's life.

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[2] Administrative records will show (in Chapter 7) some atypical provision of WIC infant formula for infants in dyads where the mother receives the full breastfeeding package. This might occur, for example, if the WIC package was changed from full breastfeeding to another package status.

In the Interim Rule, FNS decided to permit a limited amount of infant formula for partially breastfeeding mothers in the first month under some circumstances. FNS explained:

> FNS' view is that the provision of a small amount of formula for certain infants in the first month of life is a temporary option that State agencies may invoke to assist breastfeeding mothers who may otherwise choose to fully formula feed. FNS expects that the proportion of participants offered the partially breastfeeding option in the first month will decrease over time as State agencies strengthen their breastfeeding support infrastructure.

In reaching this decision to include a small amount of formula in the partial breastfeeding package in the birth month, FNS responded to the concerns anticipated by the IOM and weighed the balance of the many public comments received, some of which warned of the potential hardship for new mothers if no formula were provided.

1.4.2 WIC Food Packages Under the Interim Rule

The Interim Rule published by USDA/FNS in December, 2007 (72 *Federal Register* 68965-69032), changed the composition and quantities of prescribed foods in WIC food packages, without changing the estimated average cost. Several changes were designed to promote nutrition quality. For example, the new packages for mothers included whole wheat bread and a new fruit and vegetable voucher, offset by less milk and juice; and low-fat milk replaced whole milk. Similarly, in the packages for older infants, juice was replaced by fruits and vegetables.

Other changes were designed specifically to promote breastfeeding. Exhibit 1.1 compares the WIC packages available before and after implementation of the Interim Rule. The three horizontal tiers apply respectively to the full breastfeeding package, the partial breastfeeding package, and the full formula package.

- When mothers received the **full breastfeeding** package, young infants (defined before implementation as ages 0-3 months and defined after implementation as ages 0-5 months) were assigned no infant formula before or after implementation, because the mother's breastmilk provides complete nourishment. The mother's food package (Package VII) was enhanced after implementation through a larger fruit and vegetable voucher and additional canned fish, and it continued to permit more eggs and milk than other maternal packages did.
- When mothers received the **partial breastfeeding** package, the amount of infant formula was sharply reduced. Before implementation, the maximum amount for infants aged 0-12 months was 806 oz. After implementation, the maximum infant formula amount was no more than 104 oz for infants in their birth month, 364 oz for infants aged 1-3 months, 442 oz for infants aged 4-5 months, and 312 oz for infants aged 6-12 months.
- When mothers received the **full formula** package, the amount of infant formula was less sharply changed. Before implementation, the maximum amount for infants aged 0-12 months was 806 oz. After implementation, the maximum formula amount was 806 oz for infants aged 0-3 months, 884 oz for infants aged 4-5 months, and 624 oz for infants aged 6-12 months.

Exhibit 1.1 shows that solid foods such as infant cereal are no longer included in any food packages for infants aged 4 or 5 months, which reflects AAP recommendations for when infants should begin solid foods. Eliminating solid foods from packages for infants aged 4 or 5 months enables the full formula

package to include more formula (884 ounces compared to 806 ounces before the Interim Rule) without increasing the total package cost.

Exhibit 1.1 also shows that dyads requiring greater than approximately 45% of the maximum formula amount were classified differently before and after implementation of the Interim Rule. For example, before implementation, a dyad with a 3-month-old infant receiving more than 364 oz of infant formula would be classified as receiving partial breastfeeding package. After implementation, such a dyad would be classified as receiving the full formula package. This reclassification has consequences for the amount of food in the maternal food package (which is lower in the full formula category) and the length of time the maternal food package is received because the maternal package ends when the infant reaches 6 months old under the full formula package.

The Interim Rule altered package contents and also the incentives to choose a particular package. To interpret the potential effect of these changes in food package options, one must consider the changes in food quantities within a particular package category and, simultaneously, the potential changes in the percentage of WIC dyads that could be assigned to each category (see hypotheses in Section 1.6 below).

1.4.3 State Implementation of WIC Food Packages

The federal food packages specify the types of allowable foods and their maximum quantities. In practice, LWA staff tailor the food packages to the specific needs of each mother–infant pair. If a mother does not want a food item from the package for which she is qualified, or a WIC nutritionist determines that the item is not nutritionally necessary, the item may be excluded from the mother's package. These practices result in many combinations of foods issued by States, some of whom use their own systems of food package numbers.

The Interim Rule did not change the ability of LWAs to tailor formula quantities according to the needs of dyads, but it did specify a federal food package category for each formula quantity. For infants aged 1 to 5 months, if the infant formula amount is less than half of the maximum, the State package would be classified as a federal partial breastfeeding package. For the birth month, if the nutritionist issues more than the equivalent of 104 fluid ounces, the package would be categorized as a federal full formula package.[3]

[3] For simplicity, we refer to formula amounts for infants aged 1-5 months in the partial breastfeeding package as "less than half of the maximum" and formula amounts in the full formula package as "more than half of the maximum." However, for infants aged 1-3 months, the post-implementation threshold between the partial breastfeeding package and the full formula package is 45% of the full formula allocation. For dyads with infants aged 1-3 months who receive more than 45% of the maximum amount of formula after implementation of the Interim Rule, the package is categorized as the full formula package.

Exhibit 1.1 Summary of Changes to WIC Food Packages for Mothers and Their Infants

		Infants' Package				Mothers' Package	
		Former Rule		Interim Rule		Former Rule	Interim Rule
		Package #	Content	Package #	Content	Package #	Package #
Full Breastfeeding Package	Birth Month	none	None	none	None	VII	VII
	1-3 months						
	4-5 months	II	24 oz iron-fortified infant cereal 96 oz vitamin C-rich juice	II	24 oz iron-fortified infant cereal 256 oz infant fruits & vegetables 77.5 oz infant meats		
	6-12 months						
Partial Breastfeeding Package	Birth Month	I	up to 806 oz formula	I	up to 104 oz formula	V	V
	1-3 months				up to 364 oz formula		
	4-5 months	II	up to 806 oz formula 24 oz iron-fortified infant cereal 96 oz vitamin C-rich juice		up to 442 oz formula		
	6-12 months			II	312 oz formula 24 oz iron-fortified infant cereal 128 oz infant fruits & vegetables		V If > 312 oz formula, then none
Full Formula Package	Birth Month	I	806 oz formula	I	806 oz formula	VI	VI
	1-3 months						
	4-5 months	II	806 oz formula 24 oz iron-fortified infant cereal 96 oz vitamin C-rich juice		884 oz formula		
	6-12 months			II	624 oz formula 24 oz iron-fortified infant cereal 128 oz infant fruits & vegetables	None	None

1.5 Conceptual Framework

This project's goal is to estimate the impact of the Interim Rule on WIC package choices, infant formula amounts provided, and breastfeeding outcomes. The breastfeeding outcomes will be described in three ways:

1. Initiation, using a dichotomous breastfeeding initiation status (ever initiated / never initiated),
2. Duration, measured in weeks of breastfeeding from the child's birth, and
3. Intensity, using five categories of breastfeeding intensity (breastmilk only / mostly breastmilk and some formula / breastmilk and formula equally / mostly formula / formula only).

A conceptual framework provides an overview of potential effects of the Interim Rule on mother's initial and subsequent breastfeeding decisions and food packages issued (Exhibit 1.2). At the top of the left side are regional and community characteristics, including social and cultural norms, sources of free infant formula, the practices of local hospitals, and labor market conditions. These community characteristics affect, at the bottom of the left side, both the WIC participants and the LWAs. Important WIC participant

characteristics include race and ethnicity, economic variables, and knowledge and attitudes about breastfeeding. LWA characteristics include the LWA's predominant race and ethnicity, breastfeeding promotion efforts, and other State and LWA-specific policies. The central box depicts the LWA's implementation of the Interim Rule.

At the right side of the conceptual framework, all of these community, participant, and program factors influence initial outcomes (initial package assignment, infant formula amounts, and breastfeeding initiation) and subsequent outcomes (such as breastfeeding duration and later package changes). Two points are relevant to later decisions about the empirical research design:

- This framework does not conceive of the initial WIC package assignment as a causal factor that influences the breastfeeding initiation decision, nor vice versa. Instead, these initial outcomes are placed within the same box to indicate their nearly simultaneous nature. The policy and community environment and the Interim Rule together affect these near-simultaneous initial WIC package assignments and breastfeeding initiation.
- Subsequently, as the right-most arrow indicates, initial outcomes may influence later outcomes. In this study, this possibility will be modeled using survival analysis, showing the frequency of later changes after the initial WIC package assignment and breastfeeding initiation decisionOne way to view a mother's decision about breastfeeding and food package is a net benefit maximization framework. In such a framework, in making breastfeeding and food package decisions, the mother balances incentives and disincentives to breastfeed (Racine et al., 2009). Incentives to breastfeed include infant health, maternal health, and bonding. Disincentives include difficulties in combining breastfeeding with work, physical difficulties, and lack of information or support. One incentive among many is the relative value of the breastfeeding package and the formula feeding package. In a net benefit maximization framework, the incentive to breastfeed would be stronger if the full formula package had a lower economic value than the full breastfeeding package.

Before the Interim Rule, the partial breastfeeding package had the highest market value for participants. The partial breastfeeding package could include significant amounts of formula. In the revisions recommended by the IOM, the partial breastfeeding package decreased in value, while the full breastfeeding package increased in value. Yet, even after implementation, the full breastfeeding package still had the lowest economic value to the participant (Exhibit 1.3, Oliveira and Frazao, 2009).

Exhibit 1.2 A Conceptual Framework for Decisions by Policymakers and WIC Mothers

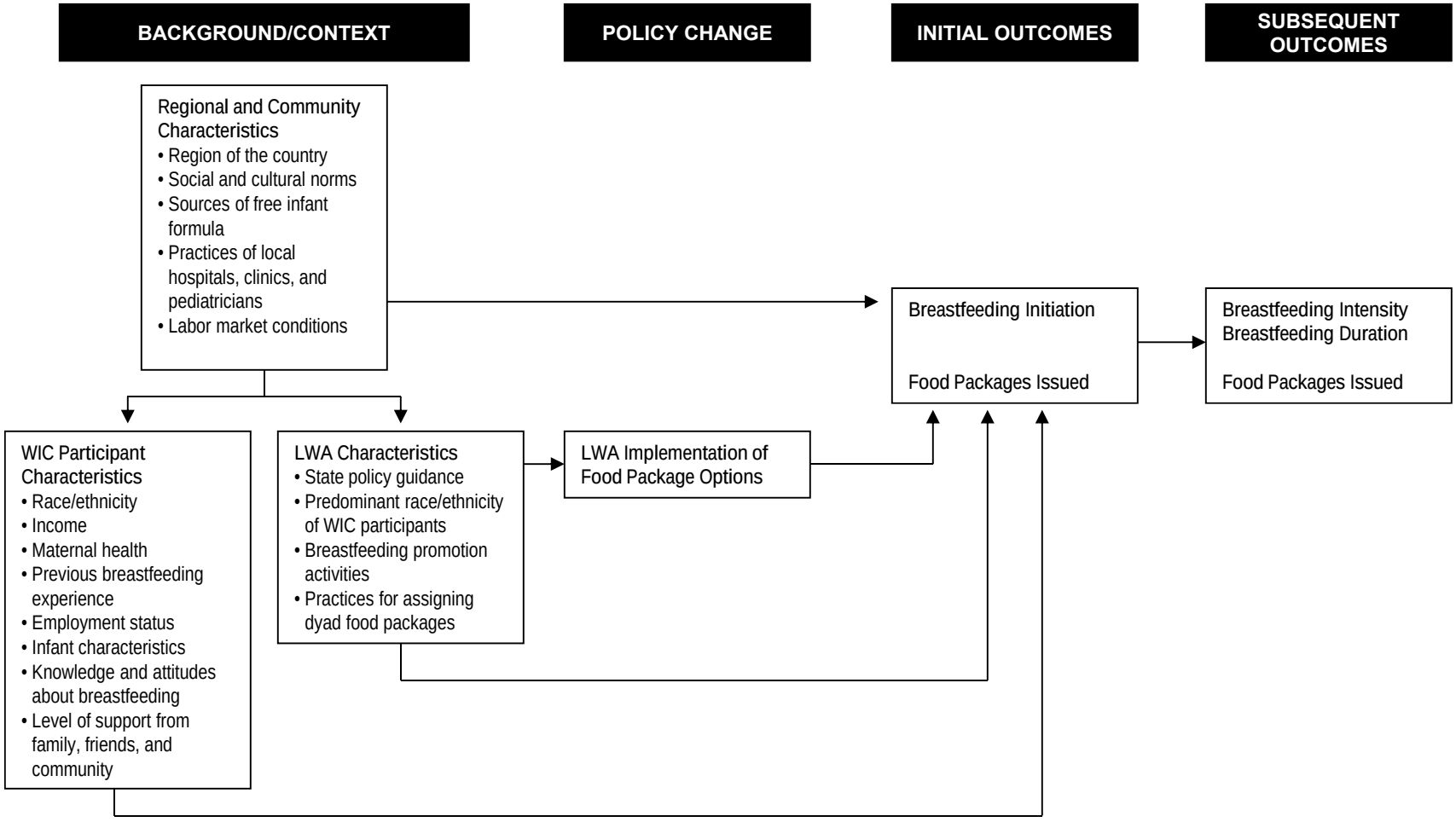
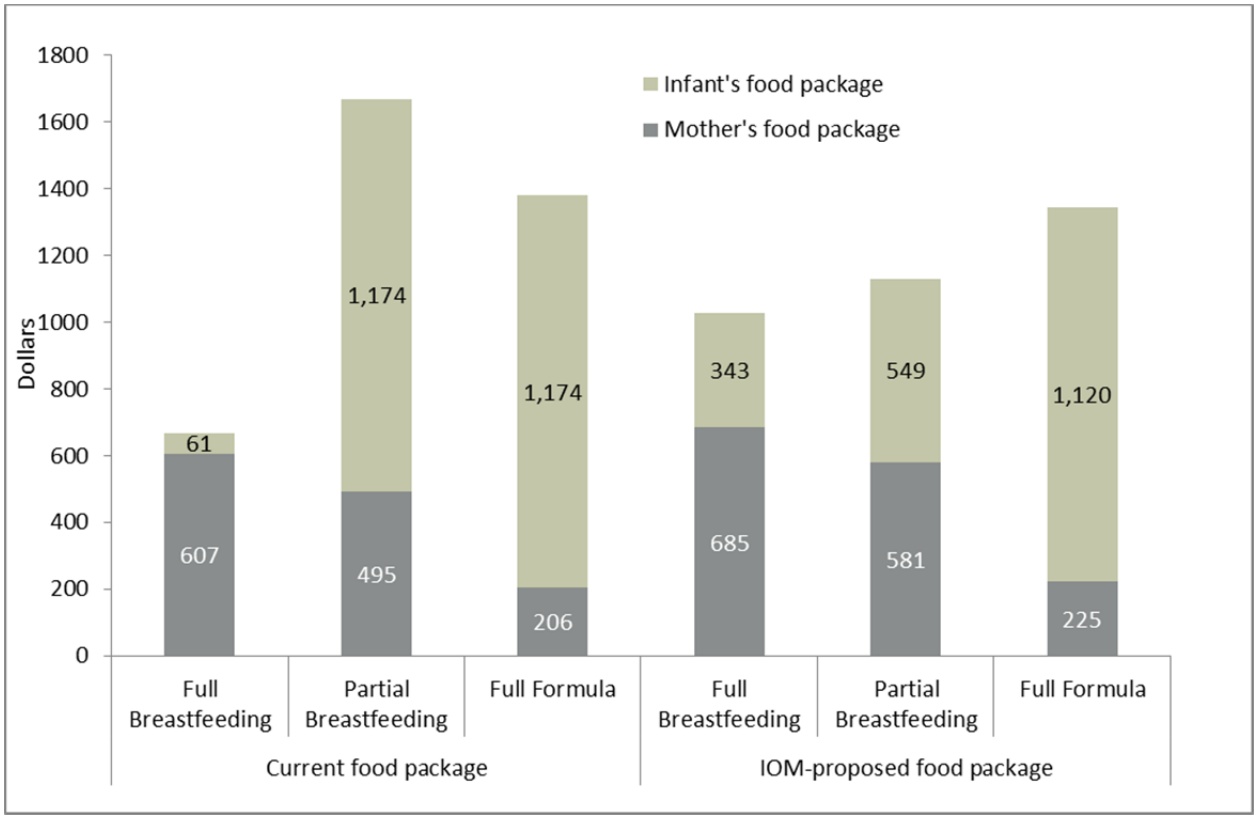


Exhibit 1.3 Estimated Annual Market Value (Pre-Rebate) of Current and IOM-Proposed WIC Food Packages for Infant/Mother Pairs, 2002



Source: Based on Oliveira and Frazao (2009), using data from Institute of Medicine (2005).

1.6 Research Questions and Hypotheses

The study's research questions fall into five domains:

- *Domain 1: WIC participation.* After implementation, were there changes in WIC participation patterns and the demographic and economic characteristics of participants?
- *Domain 2: Food package choices and infant formula amounts.* (2a) Was there a change in the percentage of participants receiving each WIC package? (2b) Was there a change in infant formula amounts?
- *Domain 3: Breastfeeding initiation.* Was there a change in the percentage of participants who initiated breastfeeding?
- *Domain 4: Breastfeeding duration.* Was there a change in the duration of breastfeeding?
- *Domain 5: Breastfeeding intensity.* Was there a change in the percentage of participants with exclusive breastfeeding, a combination of breastfeeding and formula feeding, and exclusive formula feeding?

In addition to these five domains, the study reports on the implementation of the Interim Rule.

Based on the objectives of the food package changes, discussed in Section 1.4, we hypothesized that food package choices and infant feeding outcomes would change after implementation in a direction that favored breastfeeding: greater use of the full breastfeeding package, a higher rate of breastfeeding initiation, longer breastfeeding duration, and increased breastfeeding intensity.

Exhibit 1.4 Potential Effects of Interim Rule on Choices of WIC Mothers

What Mother Would Have Done Before Implementation	How Her Options Have Changed	What She Might Do After Implementation
Exclusively breastfeed until infant is ready for real food and then enroll in WIC	Better full breastfeeding food package	Enroll in WIC in 1st month postpartum
Exclusively breastfeed until returned to work, then partially breastfeed and choose packages accordingly	If chooses "partial breastfeeding," will have more limited formula and more limited food package for herself	Choose the full formula package even though may be partially breastfeeding; may subsequently breastfeed less OR Take partial breastfeeding package and later convert to full formula OR Take the full breastfeeding package and use free formula from other sources or purchase formula
Never breastfeed	No change	No change
Plan to breastfeed partially in the 1st month, but later decisions depend on the amount of formula provided	No formula under the partial breastfeeding package in the first month	Take the full breastfeeding package and keep unused extra formula OR Take the full breastfeeding package and later convert to full formula OR Take the full formula package

However, we recognized that actual outcomes would depend on a mother's infant feeding preferences and intentions, and the extent to which they are flexible and responsive to changing incentives. Exhibit 1.4 summarizes several possible responses that we hypothesized in advance. For example, the final row of this exhibit notes that changes to the partial breastfeeding package could encourage more mothers to choose either the full breastfeeding or full formula packages.

Other possible maternal responses became apparent to the research team as the study proceeded, based on information from analyses of program implementation and participant outcomes. In particular, the likely response to the change in the partial breastfeeding package depends on how strongly mothers are influenced by WIC food package incentives.

- If maternal breastfeeding decisions are strongly predetermined, and little influenced by changing incentives, then the main effect of this change could be to shift some partial breastfeeding mothers who need more than approximately 45% of the maximum formula amount to the full formula food package, even though they are still partially breastfeeding. Essentially, there would be a change in package classification with little change in breastfeeding outcomes.

- On the other hand, if mothers' infant feeding decisions are highly responsive to the incentives provided by the WIC package, then the change to the partial breastfeeding package option could lead to changes in actual breastfeeding behaviors and the actual amounts of formula taken. Participants could become less likely to choose the partial breastfeeding package and more likely to choose either the full breastfeeding or full formula packages.

1.7 Evaluation Design

This study used a pre/post research design, comparing multiple outcomes shortly before and shortly after implementation of the Interim Rule. In some analyses, multivariate regression models were used to control as well as possible for explanatory variables that may have changed, but the basic research design has no control group. The well-known limitation of a pre/post research design without a control group is its inability to account for all environmental changes that coincided in time with the implementation of the Interim Rule. In this study, the policy "treatment" appeared sufficiently strong, and the time periods before and after implementation appeared sufficiently close, that this limitation seemed acceptable. If we observe changes in outcomes between the pre-implementation and post-implementation period, we cannot be sure of causation, but the adoption of the Interim Rule is a leading candidate explanation. The implementation analysis provides contextual information, to document any changes in other factors that may affect WIC breastfeeding outcomes, and to learn about the ways in which the LWAs implemented the Interim Rule.

The data describing the study's outcomes come from several sources:

- **WIC staff interviews**, at the State and local level, before and after implementation,
- **Administrative records** for all mother-infant dyads with an infant aged 0-5 months collected from a random sample of 17 LWAs, and
- **Participant surveys** with a sample of WIC mothers with infants aged 0-9 weeks who had initiated breastfeeding, which included approximately 800 respondents before and 800 respondents after implementation.

Exhibit 1.5 identifies the principal data sources for each of the research question domains listed earlier in Section 1.6. Chapter 2 describes the data and methodology in greater detail.

Exhibit 1.5 Research Question Domains and Principal Data Sources

Research Questions Domains	Principal Data Sources	Results Chapters
Implementation of the Interim Rule	Local WIC staff interviews	Chapter 4
WIC participation (Domain 1)	Administrative records and participant survey	Chapter 6
Food package choices and infant formula amounts (Domain 2)	Administrative records	Chapter 7
Breastfeeding initiation (Domain 3)	Administrative records	Chapter 8
Breastfeeding duration (Domain 4)	Participant surveys	Chapter 9
Breastfeeding intensity (Domain 5)	Participant surveys	Chapter 10

Note: Data and methodology are described in Chapter 2.

1.8 Organization of the Report

This report is organized as follows:

- Chapter 2 explains the data collection and methodology,
- Chapter 3 describes the sampled LWAs before implementation,
- Chapter 4 describes the implementation of the package changes,
- Chapter 5 describes influences on WIC mothers' breastfeeding decisions, as reported by the mothers themselves,
- Chapter 6 reports results for WIC participation patterns (Domain 1),
- Chapter 7 reports results for WIC food package assignments (Domain 2a) and infant formula amounts (Domain 2b),
- Chapter 8 reports results for breastfeeding initiation (Domain 3),
- Chapter 9 reports results for breastfeeding duration (Domain 4),
- Chapter 10 reports results for breastfeeding intensity (Domain 5), and
- Chapter 11 offers discussion and conclusions.

Chapter 2: Data and Methodology

This chapter discusses data collection and analytic methodology. Data collection in support of the study followed a two-stage design. The first stage sampled 17 Local LWAs out of 1,885 LWAs in the United States. The second stage sampled data from participants within those agencies. Four data sources provide information about WIC participants and program operations in these agencies.

The main analyses compare multiple outcomes before and after implementation of the Interim Rule. Logistic regression analyses study the association between these outcomes and observable explanatory variables. Survival analyses explain in greater detail the dynamics of changes in outcomes over time.

This chapter is organized as follows:

- Section 2.1 describes the sampling of LWAs,
- Section 2.2 summarizes the data sources within each LWA,
- Section 2.3 provides detail about variable construction,
- Section 2.4 describes the logistic regression methods used in multivariate analyses, and
- Section 2.5 explains the survival analysis used for two outcomes.

2.1 Selection of Local WIC Agencies

The sampled LWAs were drawn in early 2008 from the universe of the 1,885 LWAs in the United States. The sampling frame was constructed using data from WIC PC 2006, the most recent data available at that time. LWAs were selected for the sample with probability proportional to size, measured as the number of pregnant women served.

The survey sample has 16 LWAs, while the administrative records come from 17 LWAs (Exhibit 2.1). The original sample design called for sampling 16 LWAs for both survey and administrative results. Due to complications in the field, one of the sampled LWAs was replaced by an adjacent LWA. Specifically, the Metro East (DeKalb Health District) LWA in Georgia was originally sampled, while the adjacent East Metro LWA in Georgia was the site of interview data collection. Rather than discard data, the study used the administrative data from all 17 sites, including the 16 originally sampled LWAs and the replacement LWA. Using administrative data on participant characteristics, we conducted a sensitivity analysis that shows negligible differences in analyses using all 17 LWAs or the 16 surveyed LWAs.

Based on FNS' priorities for ensuring representativeness, the selection of LWAs was stratified by the following site characteristics:

A. ***U.S. Census region:*** Northeast, South, Midwest, and West. These Census regions account respectively for 13%, 41%, 19%, and 27% of pregnant WIC participants.

B. ***Percentage of women who are breastfeeding but do not receive the enhanced food package (i.e., receive the partial breastfeeding package):*** top, middle, and bottom third of distribution of LWAs in WIC Participant Characteristic data set (2006) with respect to fraction of WIC mothers who are receiving the Package V for Pregnant and Postpartum Women (i.e., the non-enhanced food package).

C. ***Racial/ethnic composition of LWA:*** The original stratification design was: (i) predominantly (at least 60%) Hispanic, (ii) predominantly non-Hispanic white, (iii) predominantly black, and (iv) "diverse" (indicating that none of the groups above comprises 60% or more of racial/ethnic composition). However, because the Metro East (DeKalb Health District) was predominantly black, while the adjacent replacement East Metro LWA was diverse, the last two categories were combined in the analyses of participant surveys. Thus, the final strata for analyses of participant surveys were: (a) predominantly Hispanic, (b) predominantly non-Hispanic white, and (c) other, including predominantly black and diverse. However, all of the original strata were used in analyses of administrative records, including four strata for racial/ethnic composition

There were several reasons for choosing this approach to stratification. Because of resource constraints, the sample was limited, a priori, to 16 LWAs and 1,600 surveyed WIC participants. As such, we had to limit our stratifying variables to three and choose those for which there were available data. The LWA sample was selected to represent dimensions that seemed likely to have an impact on the outcomes of interest. We stratified on the U.S. Census region, because breastfeeding rates vary greatly by region. The partial breastfeeding rate was a stratifier because we believed that variation in this variable reflected different State and local policies and practices. The predominant racial/ethnic composition of the LWA was selected, because of possible ecological effects at the LWA level.

There were 48 combinations of the categories for the three stratification variables, yet only 16 LWAs could be selected. Consequently, we modified the traditional method of sampling from each stratum to draw the original sample of 16 LWAs. We adapted a method developed by Bryant, Hartley, and Jessen (1960) for use when the sample size to be selected is less than the number of strata. In this method, strata from which to select LWAs and the number to be selected are determined simultaneously to achieve proportional representation to each category of three stratification variables. For example, the sample matches the national WIC population in describing the proportion of LWAs in the West, and the proportion of LWAs serving a predominantly Hispanic population, but not necessarily the proportion of LWAs in the West that serve a predominantly Hispanic population.

In the main results chapters for research domains two to five (Chapters 7 to 10), we first present results for the full sample and then results disaggregated by these stratification variables. For the second stratification variable only (the percentage of women receiving the partial breastfeeding package), we found that actual package assignments did not vary as expected with the stratification categories (see Section 7.2 for details). We did find as expected that the "high stratum" had the highest rate of receiving the partial breastfeeding package, but the "medium stratum" and "low stratum" had lower and essentially equal probabilities of receiving the partial breastfeeding package. This appears to be because package assignment patterns had changed during the three years between the time the stratification variable was created (based on WIC PC data for 2006) and the time of the pre-implementation analysis (in 2009), so LWAs in the "low stratum" no longer had a lower rate of receiving the partial breastfeeding package as expected. This pattern causes no problems for the main analysis or the weights, but it reduces the utility of presenting results that are disaggregated by the partial breastfeeding stratification variable. For thoroughness, we present the disaggregated results for all three stratification variables once (in Section 7.2). Then, in later chapters (Chapters 8 to 10), we present disaggregated results just for two of the three stratification variables.

Exhibit 2.1 Sampled Local WIC Agencies (LWAs)

Local WIC Agency	Census Region	Partial Breastfeeding Rate [a]	Predominant Race/ Ethnicity	Implementation Month
County of Riverside Health Services (CA)	W	Low	Hispanic	October
Harbor-UCLA Research & Education Institute (CA)	W	High	Hispanic	October
Sacramento County Department of Health and Human Resources (CA)	W	Medium	Diverse	October
Brevard County Health Department (FL)	S	Medium	White	October
Palm Beach County Health Department (FL)	S	High	Diverse	October
Broward County Health Department (FL)	S	High	Diverse	October
South Plains Community Action Association, Inc (TX)	S	Low	Hispanic	October
Harris County Health Department (TX)	S	High	Hispanic	October
District Seven Health Department (ID)	W	Low	White	October
Utah County Health Department (UT)	W	Medium	White	July
Providence Ambulatory Health Care Foundation, Inc (RI)	NE	Low	Hispanic	October
Chicago Department of Health (IL)	MW	Medium	Diverse	August
Hennepin County Human Services (MN)	MW	High	Diverse	August
East Metro Health District (GA) [b]	S	High	Diverse	October
Mid-Cumberland Region (TN)	S	Medium	White	October
South Central Health District (GA)	S	Low	Diverse	October
Metro East Health District (GA) [c]	S	High	African American	October

[a] As determined by WIC Program Characteristics data, 2006. [b] Served as the replacement LWA for Metro East Health District. [c] Included in the original sampling frame, but data not collected in the participant surveys.

The LWAs were selected with probability proportional to size within each stratum. This procedure gives higher probability of selection to large LWAs. In addition, LWAs included in the sampling frame had to be of sufficient size to support the study. We required that LWAs serve a minimum of 125 infants up to age 2 months during a one-month recruitment period. This sampling procedure favored States that had both a large WIC population and large LWAs. Hence, multiple LWAs were randomly sampled from several States (see Exhibit 2.1).

LWAs in some States were excluded because they were implementing the Interim Rule before we could begin data collection. Based on the estimate of when it was likely that OMB clearance would be obtained, five States with implementation dates prior to July 2009 were eliminated from the sampling frame: Delaware, Kentucky, New Mexico, New York, and South Carolina. Exhibit 2.1 shows the implementation month for the sampled LWAs. Most LWAs implemented the Rule in October 2009.

2.2 Four Data Collection Methods

The study relies on four data collection methods within these LWAs:

1. ***WIC participant characteristics*** *(WIC PC).* Extracts from data from the 2006 and 2008 WIC Participants Characteristics Study for contextual information about sites selected for the study;
2. ***WIC staff interviews.*** Interviews with staff at LWAs and their corresponding State WIC agencies before and after the Interim Rule was implemented;

3. ***Participant survey.*** Surveys of 1,617 WIC recipients with infants under 67 days old who had initiated breastfeeding (an average of just over 50 participants from each LWA before, and 50 participants after the implementation of the Interim Rule); and
4. ***Administrative records.*** Extracts from administrative records about food packages and breastfeeding initiation for all dyads with infants aged 0-5 months before and after the implementation of the Interim Rule.

Exhibit 2.2 presents a timeline for the data collection activities. The key features are:

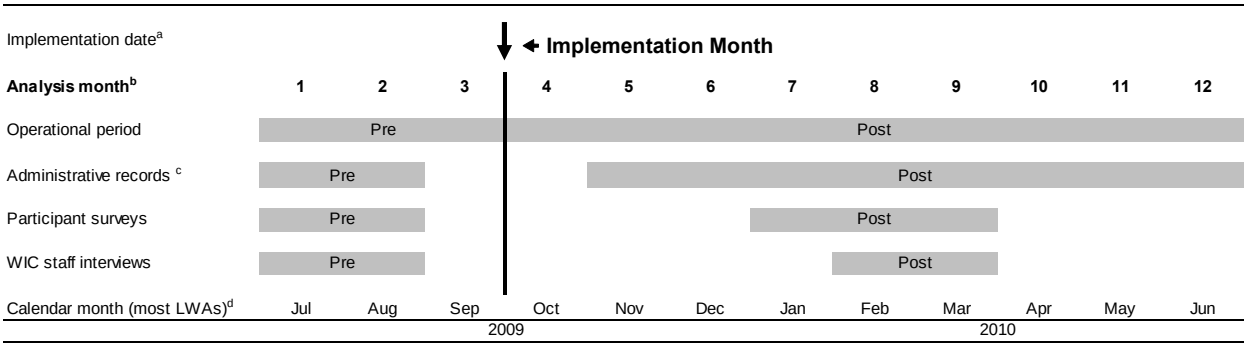
- ***Implementation date.*** The implementation date was October 2009 in 14 LWAs, July 2009 in one LWA, and August 2009 in two LWAs (as noted in Exhibit 2.1).
- ***Analysis month.*** For ease of reference throughout this report, the **analysis month** is defined relative to the implementation date, and hence refers to different calendar months for LWAs with different implementation dates. According to our numbering convention, the implementation date is at the start of analysis month 4. Analysis months 1-3 were the pre-implementation period (denoted later simply as "pre"), and analysis months 4-12 were the post-implementation period (denoted later simply as "post").
- ***Administrative data period.*** Except where otherwise noted, tabulations using administrative records selected analysis months 1-2 as pre, and they selected analysis months 5-12 as post. These tabulations exclude analysis months 3-4, as they are likely to be transitional months with incomplete response to the change in regulations.[4]
- ***Participant survey data.*** The pre-implementation survey took place approximately in analysis months 1-2 (about 1-2 months before implementation), and the post-implementation survey took place in approximately analysis months 7-9 (about 4-6 months after implementation).
- ***WIC staff interviews.*** For the 14 LWAs that implemented in October, WIC staff were interviewed in analysis month 1 ("pre") and analysis month 8 ("post"). Staff interviews occurred with the earlier implementers in analysis month 3 ("pre") and analysis months 8 and 9 ("post").

The decision to use a short time period between the pre-implementation and post-implementation data collection is fundamental to interpreting the results. In part, the short time period was made necessary by the study's operational constraints. Also, for a pre/post research design, a short time period has the advantage of reducing the scope for broad secular changes to influence the results. The short time period has the disadvantage of limiting the ability to discern changes that happened more gradually. Chapter 4 describes how package changes were rolled out over time during the months before and after the formal implementation date. In Chapter 7, most tabulations use a binary two-column pre/post format, but some results are broken out to show more detailed time trends within the 12 analysis months, so that the possibility of more gradual implementation may be investigated.

The next subsections describe the data sources in greater detail.

[4] For some tabulations, as noted in the results chapters, just one analysis month was selected for pre and one analysis month for post. This approach was necessary in these few tabulations, to avoid double counting the same dyads in multiple months (for example, a dyad with a one-month old infant in analysis month 1 and a two-month old infant in analysis month 2).

Exhibit 2.2 Timeline of Policy Implementation and Data Sources



[a] Implementation date was the start of October 2009 for 14 LWAs, July 2009 for 1 LWA, and August 2009 for 2 LWAs (see Exhibit 2.1). [b] Throughout this report, analysis months 1-3 are pre-implementation, and analysis months 4-12 are post-implementation. [c] Administrative data analyses, except where otherwise noted, uses analysis months 1-2 as pre and analysis months 5-12 as post, to exclude two transition months. [d] Calendar months are displayed for the 14 LWAs whose implementation was October 2009. The calendar months are shifted in parallel fashion for the LWAs whose implementation was July 2009 or August 2009.

2.2.1 WIC PC Data

We used WIC PC data from 2006 to develop the sampling frame to select the 16 LWAs. In addition, we used WIC PC data from 2008 in earlier project reports to FNS to characterize the participating WIC agencies in terms of their size, breastfeeding rates, and demographic composition. As discussed below, the 2008 WIC PC data on breastfeeding initiation were also used to determine the target size of the WIC participant sample at each of the agencies.

2.2.2 WIC Staff Interviews

As shown in the study time line, we interviewed State and LWA staff during the pre- and post-implementation periods. The pre-implementation interviews were conducted by telephone at both the State and local levels. In the post-implementation period, State interviews were conducted again by telephone, and the LWA interviews were conducted during site visits. Four project staff members served as research liaisons. Each research liaison was assigned four specific LWAs and served as their primary contact. The liaisons were responsible for the State and local interviews. When interviews were conducted by phone, liaisons were assisted by junior staff who acted as note takers. Interviewers were trained in a half-day session prior to the pre-implementation data collection and during a 90-minute refresher session before the post-implementation interviews.

Interviews were conducted using structured topic guides. The pre-implementation interviews collected general information about the State and the LWA, breastfeeding promotion activities, and local policies related to breastfeeding. In respect to the implementing the Interim Rule, information was collected on systems and materials development, plans for communication and training for WIC staff, and plans for communication and training for WIC participants. Post-implementation interviews probed for differences between the planned and actual implementation, and changes in breastfeeding promotion activities that could have influenced breastfeeding outcomes. At post-implementation, interviewers asked staff to reflect on successes and challenges of the implementation of the Interim Rule.

At the State level, we interviewed approximately 28 respondents (an average of two or three per State) pre and post. At the local level, we interviewed 54 WIC personnel (an average of three or four staff per

LWA) at each of these time points. These interviews often were conducted in groups, and we generally interviewed the same staff at both periods. Staff often included State WIC directors, breastfeeding promotion coordinators and nutrition coordinators. In some cases, those in charge of staff development and lead nutritionists were also interviewed. Because WIC staff played different roles in the implementation of the Interim Rule, depending on the State and the LWA, the site liaison identified specific staff to be interviewed by going through the major topics in the guide with a designated LWA study coordinator.

The interview guides included open- and close-ended questions. Data were collected using an Access database structured so that the forms matched a written topic guide. During the in-person interviews, data were entered directly into a data base on a laptop during the interview process. After the interview was completed, the data were cleaned.

2.2.3 Participant Survey

In each LWA, we drew the sample for the participant survey from the population of mother-infant dyads in which: (a) the infant was aged 0-9 weeks, (b) the mother ever initiated breastfeeding of the infant, and (c) the mother or infant was certified for WIC during the survey month or in the previous month. In analyses of the participant survey (see especially Chapters 6 and 8), the observation is denoted for brevity simply as the ***survey respondent.***

The participant survey enabled us to collect more information about breastfeeding decisions and behavior than could be obtained from administrative records. For example, it gathered in-depth information about breastfeeding duration and breastfeeding intensity. Because the administrative data already contained information about breastfeeding initiation for a far larger sample than we could ever survey (see Section 2.2.4), we sampled only mothers who had initiated breastfeeding and not mothers who never initiated breastfeeding. If the survey had also sampled women who did not initiate breastfeeding, the power to detect impacts on duration and intensity would have been greatly reduced. In this study's results using the participant survey (see Chapters 6 and 8), most estimates are conditional on having initiated breastfeeding. An exception is the analyses of breastfeeding duration, which present both unconditional estimates (for example, the fraction of all infants that reaches four weeks of breastfeeding duration) and conditional estimates (the fraction of breastfeeding initiators that reaches four weeks of breastfeeding duration).

More than 1600 WIC participants were surveyed (817 pre-implementation and 800 post-implementation). Participants were sampled proportional to the breastfeeding initiation rate in the sampled LWA. We determined the site-level sample targets for sampling based on WIC PC 2008 data. According to these data, site-level initiation rates ranged from 36% to 87%. The within-site samples therefore ranged between 56 WIC participants (including pre- and post- data collection) and 134 WIC participants.

We conducted pre-implementation surveys one to two months prior to the implementation of the Interim Rule at each LWA. We conducted post-implementation surveys approximately four to six months after implementation. The data collection period was one to two months. Women could enter the participant survey sample through two streams: (i) a list of eligible participants who were enrolled prior to the month of sample selection, and (ii) eligible walk-ins in either all clinics or some subset of clinics in each included LWA. We developed and used a site-specific data collection plan (e.g., which clinics to visit for walk-in surveys; the approximate target number from the previous month of certifications) for both the pre- and post-implementation participant survey process, with the aims of obtaining the sample during the two time periods with uniform methods, completing the data collection as quickly as possible, and

minimizing burden on the LWAs. During the participant survey data collection period, some women who went to clinics where an on-site data collector was unavailable were not surveyed. This two-stream sampling methodology, following site-specific data collection plans, is a convenience sample rather than a simple random sample. Although it is not possible to compute the exact statistical probability of selection for each of the sampled units, in the analysis that follows we will proceed assuming that the survey data can in practice be analyzed as a random sample of the corresponding population of WIC dyads within each LWA. To provide reassurance that this assumption is consistent with the empirical evidence, we tabulate participant characteristics in the survey sample and compare them to characteristics of the whole population of participants from the LWAs who were eligible for the survey.

2.2.4 Administrative Records

Twelve months of administrative records were abstracted for mother-infant dyads and partial dyads with infants aged 0-5 months. For most observations, the observation included an infant plus a mother on one of the three maternal WIC packages (full breastfeeding, partial breastfeeding, or full formula). For a smaller number of observations, especially for dyads with very young infants, the observation included an infant plus a mother who was still on the pregnant food package or not on WIC with a package of her own. In analyses of the administrative records (see especially Chapters 6 and 7), the observation is denoted for brevity simply as the ***dyad.***

The administrative records were used to create three analysis files:

1. ***The large file.*** Administrative data for all dyads with infants aged 0- 5 months and all pregnant WIC participants in the sampled LWAs. This "large file" is used in analyses that can be accomplished solely with administrative data. This file has a total of 289,884 observations - 206,092 dyads with infants aged 0-5 months, 11,279 mom-only dyads (in which the mother is certified as breastfeeding or postpartum but the infant is not receiving WIC), and 72,513 pregnant WIC participants.
2. ***The small file***. Administrative data for just the dyads that were sampled for the participant survey. This “small file” with 1,617 observations (817 pre-implementation and 800 post-implementation) was used for analyses of linked administrative records and survey responses.
3. ***The comparison file.*** Administrative data for all dyads in the sampled LWAs with infants aged 0-9 weeks, in which the mother ever initiated breastfeeding of the infant. This file provides information about all dyads in the sampled LWAs that are comparable to the dyads in the survey sample. This “comparison file” is used in the analysis of the representativeness of the survey sample. This file has 13,179 observations.

2.2.5 Sampling Weights

Sampling weights were used in all analyses of the participant survey and administrative records, to account for unequal probabilities of selection. See Appendix A for details of weight construction. All analyses were corrected for stratification and clustering in the complex sampling design, using the Taylor Series expansion approach in SAS.

2.3 Analytic Measures

This section describes the principal outcome measures and explanatory variables that are used in the analyses reported in Chapters 6-8. Section 2.3.1 describes the construction of the key outcome measures: mother's food package choice, infant formula amount, breastfeeding initiation, breastfeeding duration and breastfeeding intensity. Section 2.3.2 describes the construction of the covariates used in the multivariate analyses.

2.3.1 Outcome Measures

The outcome measures for the analyses are: mother's food package, infant formula amount, breastfeeding initiation, breastfeeding duration, and breastfeeding intensity.

Food Packages Issued to Mothers of Infants Aged 0-5 Months Old (Administrative Records)
We created a five-category variable to describe the WIC food package issued to the mother in the dyad. Three of the categories were based on our main classification of WIC packages:

1. Full breastfeeding,
2. Partial breastfeeding, and
3. Full formula.

Two (less common) categories were also found, based on the mother's package status:

1. Pregnant (the mother receives the WIC package for pregnant women, typically for a short period after the infant's birth for a mother who had participated in WIC while pregnant), and
2. Not on WIC (the mother is not recorded as receiving a WIC food package, typically for a short period after the infant's birth for a mother who had not participated in WIC while pregnant).

Note that the "pregnant" category does not mean that the woman is still pregnant, but rather that she continued to receive the pregnancy package after the child's birth. The "not on WIC" category does not mean that the mother is completely uninvolved with the program, but rather that she does not receive her own food package in a particular month. The unit of observation in these administrative data analyses are the dyad, after the infant is born, and this five-category variable describes five possibilities for the WIC package of the mother in the dyad.

We created this five-category variable using two types of information in the administrative records:

- The mothers' certification category (pregnant, breastfeeding, or postpartum), and
- The specific food quantities that a dyad received, which were used to determine the federal food package number (V, VI, VII) (see Exhibit 1.1).

Using these two pieces of information, we defined the five-category variable for WIC package issued to mothers as follows:

- If the mother received federal food package VII, the mother's package category is "full breastfeeding";
- If the mother received federal food package V and was certified as breastfeeding, the mother's package category is "partial breastfeeding";
- If the mother received federal food package VI, the mother's package category is "full formula";

- If the mother received federal food package V and was certified as pregnant, the mother's package category is "pregnant";
- If the mother is not coded as receiving a federal food package, but the dyads' observation contains a record for an infant aged 0-5 months, the mother's package category is "not on WIC".

Infant Formula Amount (Administrative Records)

A uniform measure of the prescribed amount of infant formula was constructed based on data on quantities and forms (ready-to-feed, powder, or concentrate) as reported in the administrative records and then converted to fluid ounces. In addition to this continuous measure of infant formula amount, for some analyses, we defined a categorical variable based on the post-implementation limit for the partial breastfeeding package.

After implementation, for a dyad with an infant aged 0 months (the birth month), the limit on infant formula in the partial breastfeeding package is 104 fluid ounces, and the limit on infant formula in the full formula package is 806 ounces. Hence, we use a variable with four categories:

- no formula,
- low formula (> 0 ounces and <= 104 ounces),
- high formula but less than maximum (> 104 ounces and <= 800 ounces),
- maximum or nearly maximum formula amount (> 800 ounces).

Similarly, after implementation, for a dyad with an infant aged 1-3 months, the limit on infant formula in the partial breastfeeding package is 364 ounces, and the limit on infant formula in the full formula package is 806 ounces. Hence, we use a variable with four categories:

- no formula,
- low formula (> 0 ounces and <= 364 ounces),
- high formula but less than maximum (> 364 ounces and <= 800 ounces),
- maximum or nearly maximum formula amount (> 800 ounces).[5]

Breastfeeding Initiation (Administrative Records)

Breastfeeding initiation was defined using two measures from the administrative records: (a) whether the infant is currently being breastfed and (b) whether the infant was ever previously breastfed.[6] Mothers were asked if they were currently breastfeeding, and those who reported that they were not were asked if they had ever breastfed. A dyad was defined as not having initiated breastfeeding if the infant was not currently being breastfed, was not breastfed in an adjacent month, and had not ever previously been breastfed.

Duration (Participant Survey)

Breastfeeding duration was measured by asking all survey participants whether they were currently breastfeeding or, if not, when they stopped (see Questions 4 and 4a in the WIC Participant Survey in Appendix B). Although WIC's regulations formally define breastfeeding as the practice of feeding a mother's breastmilk to her infant(s) on average at least once per day, we accepted the mother's self-report

[5] The threshold slightly lower than 806 ounces was chosen, so that dyads receiving the maximum number of whole containers were counted as receiving the "maximum or nearly maximum formula amount."

[6] The indicator of whether the infant was ever previously breastfed was missing if the infant was currently being breastfed. Therefore both variables were required to determine if breastfeeding had ever been initiated.

of "currently breastfeeding." As the survey sample only consisted of breastfeeding initiators, all respondents were defined as breastfeeding at birth. For all mothers surveyed, we calculated the number of weeks that the infant was breastfed either until the mother stopped breastfeeding or, if mothers were still breastfeeding, the number of weeks after the infant's birth that the survey was conducted. For example, if a mother was surveyed when the infant was three weeks old, she would report either that she was still breastfeeding or that she had quit breastfeeding. If she reported that she was still breastfeeding, we would know that she breastfed the infant for *at least* three weeks; however, we would not know how long she continued breastfeeding after that point. If she reported that she had quit breastfeeding prior to the survey, her breastfeeding duration was coded as the number of weeks from the infant's birth until she quit breastfeeding (i.e., 0 weeks, 1 week, …, 9 weeks). The survival analyses discussed below in Section 2.5 use these data on breastfeeding duration together with an indicator of whether the mother had stopped breastfeeding or was surveyed prior to quitting (i.e., her record was censored at the time of the survey), to estimate the distribution of completed breastfeeding durations up to nine weeks.

Breastfeeding Intensity (Participant Surveys)

The participant surveys asked mothers to report what they had fed the infant in the previous 24 hours: "breast milk only", "mostly breast milk with some formula", "breast milk and formula about equally", "mostly formula with some breast milk", or "formula only". Mothers who reported that they were no longer giving the infant breastmilk were categorized as "formula only".

This five-level measure based on behavior in the previous 24 hours was validated against self-reported frequency of breastfeeding and formula amounts. This analysis offers reassurance that the mother's self-reported intensity is strongly related to infant feeding practices. For mothers classified as "mostly breastmilk with some formula" the mean amount of infant formula given to the infant in the previous 24 hours was 7.3 ounces (post), as compared with a mean of 26.2 ounces (post) for mothers classified as "formula only". Similarly, all mothers (post) classified as "mostly breastmilk with some formula" reported breastfeeding their infant two or more times a day, as compared with 4.3% (post) of mothers classified as "formula only". For more information on the survey questions from which the breastfeeding intensity measure was constructed, please refer to the WIC Participant Survey in Appendix B (Questions 4 and 5 were used to construct the breastfeeding intensity measure while Questions 5a, 5b, 6, 6a and 6b were used for the validation).

2.3.2 Covariates

Specific explanatory variables for the multivariate analyses (sometimes referred to as "covariates") were constructed from the survey or the administrative data. Unless otherwise noted, explanatory variables were constructed as similarly as possible with these two sources.

Income

We use income as a covariate in all multivariate analyses. Our measure of income was constructed using the administrative data. The measure was constructed using household income, household size, and the federal poverty guidelines.[7] A variable for missing income was also constructed in order to retain respondents with missing income in the multivariate analyses.

[7] Federal Register Vol. 74, No. 14, Issued Friday Jan. 23, 2009.

Race/Ethnicity

Race/ethnicity categories were (i) Hispanic, (ii) non-Hispanic black, (iii) non-Hispanic white, and (iv) other. The race/ethnicity variable in the administrative records was used in analyses of administrative data, and the survey respondent's self-report was used in analyses of participant surveys. The survey measure combined 'missing' race/ethnicity with 'other' race/ethnicity, due to insufficient sample size for separate analysis.

Program Participation

Two variables, constructed from the administrative data, indicated participation in the Supplemental Nutrition Assistance Program (SNAP) and Temporary Assistance for Needy Families (TANF), respectively. Information on Medicaid coverage was available in both sources of data, but it was highly correlated with these other two measures, and was dropped from multivariate analyses. The fields for SNAP and TANF participation in the administrative data may understate actual participation levels (see Chapter 6). We nevertheless used these variables in the multivariate analyses, because we had no reason to believe that the degree of under-reporting would differ before and after implementation. We recognize that measurement error in an explanatory variable can bias the corresponding parameter toward zero, but we do not believe in this case that this reporting issue harms the main estimates of pre/post differences in multivariate analysis.

Household Size

The number of members in a household was included as a continuous variable in analyses using the administrative data. An alternative measure was used for analyses using the survey data. Respondents to the participant survey were asked about the total number of members in their household and the number of members who were 18 years old or less. The latter estimate was subtracted by the former to obtain a measure which was whether or not the household was a single adult household.

Employment and Education

Employment status and education level were only available in the survey data. The employment question asked "are you currently employed?" and the education question asked about the highest grade or level of school completed. We constructed the education measure by collapsing responses into four categories: less than high school, high school/GED, some college and 2-year college degree or higher. For the covariate analysis, we constructed a binary measure from those four categories.

2.4 Logistic Regression for Binary Outcomes

Several analyses use logistic regression, a method for studying how a binary outcome (e.g., whether or not breastfeeding was initiated) is related to multiple explanatory variables. For example, Chapter 7 reports how the probability of being issued the full breastfeeding package is related to variables describing race and ethnicity, participation in other safety net programs, household income, and family size.

The analysis includes fixed effects (i.e., dummy variables) for the LWAs. These fixed effects control for unobserved LWA-specific confounding variables. Thus, the logistic regression estimates show how within-LWA variation in the explanatory variables is associated with within-LWA changes in the probability that the binary outcome happens.

For ease of interpretation, it is most common to convert the estimated coefficients from logistic regression into odds ratios. For example, Section 1.3.2 cited previous research that used odds ratios to describe the relationship between WIC participation and breastfeeding outcomes, while holding other factors constant. Appendix C discusses how odds ratios are interpreted, and the footnote to each table of logistic regression results gives an example of an interpretation sentence.

In this study, the multivariate results presented in the body of the report come from two models. In the first model, the explanatory variables include a binary indicator for the post-implementation period, which estimates the post-implementation change in the odds that the outcome would happen, while controlling for the other explanatory variables. In the second model, interaction terms allowed the estimated effect of each explanatory variable to differ after implementation, compared to before implementation. For both models, the odds ratios for the explanatory variables are presented in tables in the body of the report, while more detailed logistic regression coefficients and their accompanying standard errors are reported in Appendix D.

2.5 Survival Analyses (Discrete-Time Hazard Models)

Two of our analyses examine the time that passes before an event happens. In Chapter 7, we report estimates of when fully breastfed infants begin receiving formula, based on administrative data. In Chapter 8, we report estimates of breastfeeding duration based on women's survey responses about whether they are currently breastfeeding and, if not, when they stopped.

Our analysis approach addresses a complication: at the time of the data collection, some dyads will already have experienced the event (and we will know when it occurred), while other dyads will not yet have experienced the event (and we will not know when it will occur). We use discrete time hazard modeling to address this methodological challenge. This approach estimates the distribution of times to the event from data on a mixture of dyads that have and have not experienced the event.

Using the breastfeeding duration analysis as an example, we can explain how to interpret findings from the hazard analysis. *Hazard probabilities* estimated using this method indicate the probability of ending breastfeeding by week *t* of infant age, given that the infant was still breastfeeding at age *t*-1. Because women are surveyed when infants are 0-9 weeks of age, we are able to estimate the hazard probability for each week from age 0-9 weeks. For example, a hazard probability of 0.10 for age one week would indicate that 10% of mothers who have breastfed through the infant's first week of life will quit breastfeeding when the infant is one week old (i.e., during the second week of life). As part of the analyses, we present a graphical display of hazard probabilities for each week.

Hazard analysis also provides overall estimates of how long women continue to breastfeed. Based on the hazard probabilities, we estimate a *survival probability* for each week, which is the overall probability of reaching *t* weeks (or months) without experiencing the event (quitting breastfeeding). For example, a survival probability of .70 for age four weeks would indicate that 70% of women who initiate breastfeeding are still breastfeeding when infants are four weeks old. The survival probability for week *t* equals the survival probability for the preceding week (*t*-1), minus an adjustment for the fraction of the sample that stopped breastfeeding (or was censored from the sample[8]) between weeks *t*-1 and *t*. As with

[8] Dyads are censored from the sample when we no longer have data for them but they have not yet experienced the event. In other words, survey respondents who are interviewed when the infant is 4 weeks old and are still

the hazard probabilities, we present survival probabilities for each week in a graphical display. By plotting the survivor function graphically, we are able to illustrate how rapidly or slowly event occurrence adds up over time.

For the analysis of breastfeeding duration, we report estimates of breastfeeding duration for a sample of survey respondents who initiated breastfeeding, because only mothers who had initiated breastfeeding were surveyed. In addition, using estimated breastfeeding initiation rates, we adjust the survival probabilities for breastfeeding initiators to estimate breastfeeding duration for all dyads with infants aged 0-9 weeks (whether or not they ever breastfed). For the example above, where the estimated survival probability at age four weeks is 0.70 among initiators, we can estimate the percentage of all four-week old infants who are still being breastfed. If the estimated breastfeeding initiation rate is 0.65, then the unconditional survival probability would be 0.46 (because 0.70 x 0.65 = 0.46). In this example, 46% of all four-week old infants are still being breastfed.

breastfeeding are censored at that point. We have no information about if or when they quit breastfeeding after that point.

Chapter 3: Description of the Sampled LWAs

To describe the background and setting for this study, this chapter provides demographic characteristics for the 17 sampled LWAs shortly before implementation. To illuminate the diversity of the sampled agencies, most results in this chapter are disaggregated by LWA. Later, for the 17 LWAs combined, Chapter 6 will describe the characteristics of WIC participants before and after implementation of the Interim Rule.

This chapter is organized as follows:

- Section 3.1 draws on administrative records to describe the size of the 17 sampled LWAs and the composition of WIC mothers served.
- Section 3.2 describes the representativeness of the sample of LWAs, the WIC dyads from administrative records and the respondents to the participant survey.

3.1 Characteristics of Local WIC Agencies and WIC Mothers

WIC agencies vary greatly with regard to the number and characteristics of participants served. Implementation of the Interim Rule may be tailored to specific agency circumstances. In addition, the characteristics of LWAs provide an important context for understanding food package choice and breastfeeding behavior among WIC participants. Based on administrative records collected two months prior to the implementation of the Interim Rule, we describe the sampled LWAs in terms of the number and characteristics of WIC mothers of infants aged 0-5 months. We provide information on the agency size, participants' racial/ethnic composition, poverty, family size, participation in other social safety net programs, and breastfeeding initiation rates.

3.1.1 Agency Size

As described in Chapter 2, the sampled LWAs were drawn from the population of LWAs that were sufficiently large to support the survey data collection. The sampled LWAs provided services for a large number of WIC participants. In one month during the pre-implementation period, together they provided services for approximately 63,813 mothers with infants aged 0-5 months. However, even with the exclusion of the smallest LWAs in the sampling frame, the sampled LWAs varied greatly in size. The LWAs served from 598 to 9,957 mothers with infants of these ages (Exhibit 3.1).

In addition, the LWAs in the study had from 4 to 19 clinics (Exhibit 3.1). LWAs with more clinics either served larger numbers of participants, had bigger catchment areas, or both. For instance, the County of Riverside, CA, with 9,392 WIC mothers of infants aged 0-5 months, is the second largest of the sampled LWAs. It also takes four hours to drive between the two furthest among its 17 clinics. Mid-Cumberland Region, TN, with 3,567 mothers of infants in this age range, covers 12 counties and also includes 17 clinics. South Central Health District, GA, the smallest agency in the sample in terms of the number of mothers (598), is located in a geographically large rural area and has 12 clinics. In contrast, Broward County Health Department, FL, which is located in a densely-populated area, serving 4,933 mothers of infants aged 0-5 months, has only 6 clinics.

Exhibit 3.1 Size of Local WIC Agencies Selected for WIC Birth Month Study (Pre-Implementation, 2009)

Local WIC Agency	Number of Mothers [a]	Number of Clinics
South Central (GA)	598	12
Providence (RI)	758	4
District Seven (ID)	1,102	9
Brevard County (FL)	1,257	4
South Plains (TX)	1,839	16
Utah County HD (UT)	1,870	14
Hennepin (MN)	3,042	8
Sacramento (CA)	3,202	4
Metro East (GA)	3,227	5
Chicago (IL)	3,276	19
Mid-Cumberland (TN)	3,567	17
Palm Beach County (FL)	3,847	7
East Metro (GA)	4,040	6
Broward County (FL)	4,933	6
Harris County (TX)	7,906	13
Riverside (CA)	9,392	17
LA Biomed (CA)	9,957	10

Sample: WIC staff interviews and administrative records, 2 months prior to implementation of the Interim Rule, *n*=17.

[a] Dyads with infants aged 0-5 months who are certified in WIC breastfeeding and postpartum participant categories during a single month.

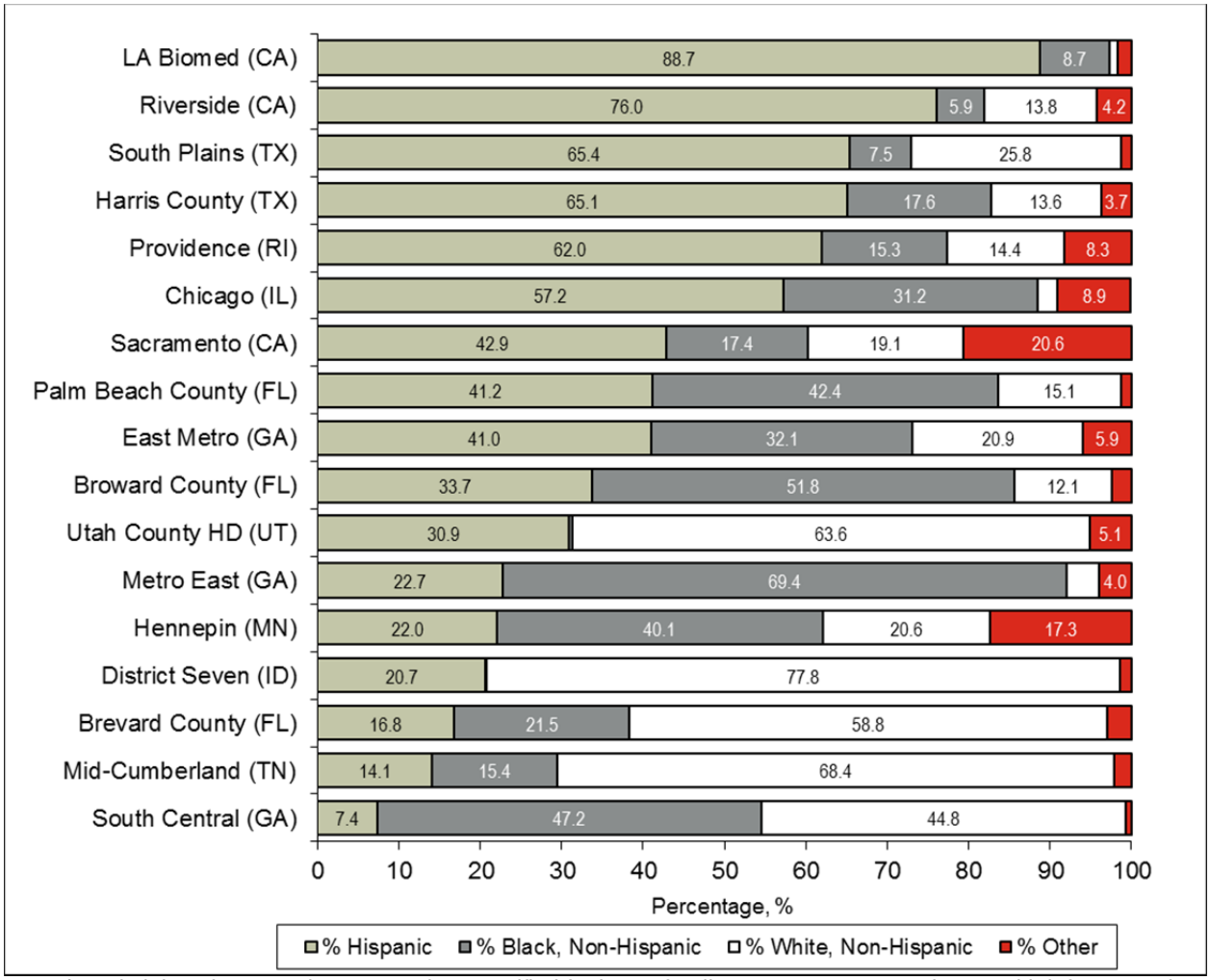
3.1.2 Racial/Ethnic Composition

Race and ethnicity are strongly related to differences in income, program participation, and breastfeeding practices. LWAs vary widely with regard to the racial/ethnic composition of participants served. The LWA's range from 77.8% non-Hispanic white (District Seven, Idaho) to 88.7% Hispanic (Harbor-UCLA Research and Education Institute in California) (Exhibit 3.2). When asked about the race and ethnicity of the WIC populations served, staff from most of the LWAs mentioned their diversity. Among all of the LWAs, 20 different ethnic groups were specifically named, coming from the Caribbean, South and Central America, Asia, Eastern Europe, and Africa.

3.1.3 Poverty Rate among WIC Mothers of Infants Aged 0-5 Months

Differences in LWA poverty rates may influence how the Interim Rule is implemented, how food packages are chosen, and how breastfeeding decisions are made. In general, breastfeeding rates are lower among low-income mothers than among high-income mothers. Although we did not stratify the sample by income, the poverty rate for WIC mothers varied across the LWAs (see Exhibit 3.3). Rates of deep poverty also varied; WIC mothers of infants aged 0-5 months with incomes at or below 50% of the Federal Poverty Level comprised 73.1% of those served in Providence, RI, compared to 30.3% of WIC participants in Harris County, TX.

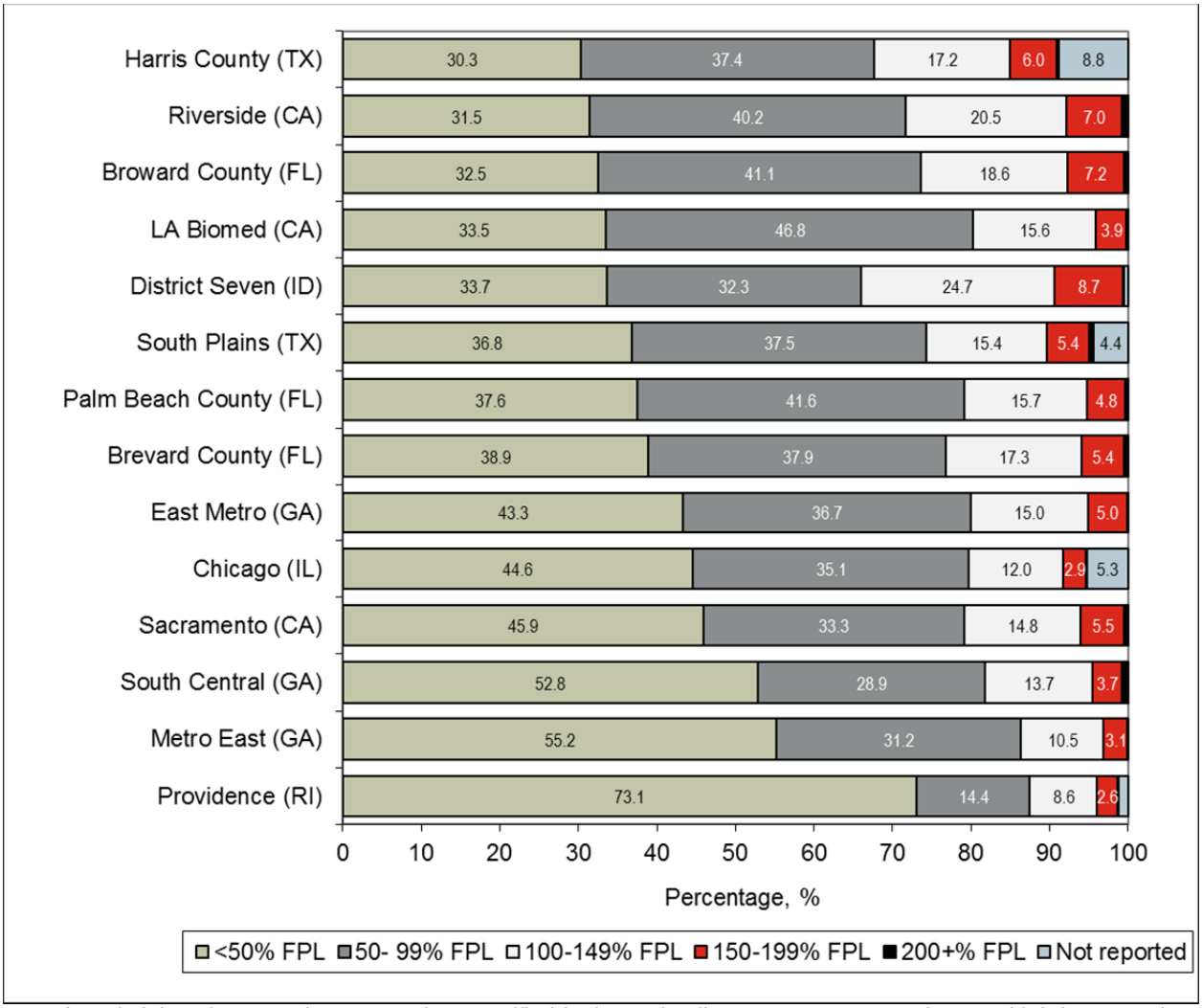
Exhibit 3.2 Racial/Ethnic Composition of WIC Mothers in Local WIC Agencies Selected for WIC Birth Month Study (Pre-Implementation, 2009)



Sample: Administrative records, WIC mothers certified for breastfeeding or postpartum packages with infants aged 0-5 months in LWAs 2 months prior to the implementation of the Interim Rule, *n*=17.

Interpretation Guide: The racial and ethnic composition of WIC mothers varied greatly among the LWAs in the sample, ranging from 77.8% non-Hispanic white (District Seven, ID) to 88.7% Hispanic (LA Biomed, CA).

Exhibit 3.3 Poverty Rate of WIC Mothers in Local WIC Agencies Selected for WIC Birth Month Study (Pre-Implementation, 2009)



Sample: Administrative records, WIC mothers certified for breastfeeding or postpartum packages with infants aged 0-5 months in LWAs 2 months prior to the implementation of the Interim Rule, *n*=14.

Interpretation Guide: Rates of deep poverty varied across LWAs. Mothers with incomes at or below 50% of the Federal Poverty Line (FPL) comprised 73.1% of those served in Providence, RI compared to 30.3% of WIC mothers in Harris County, TX.

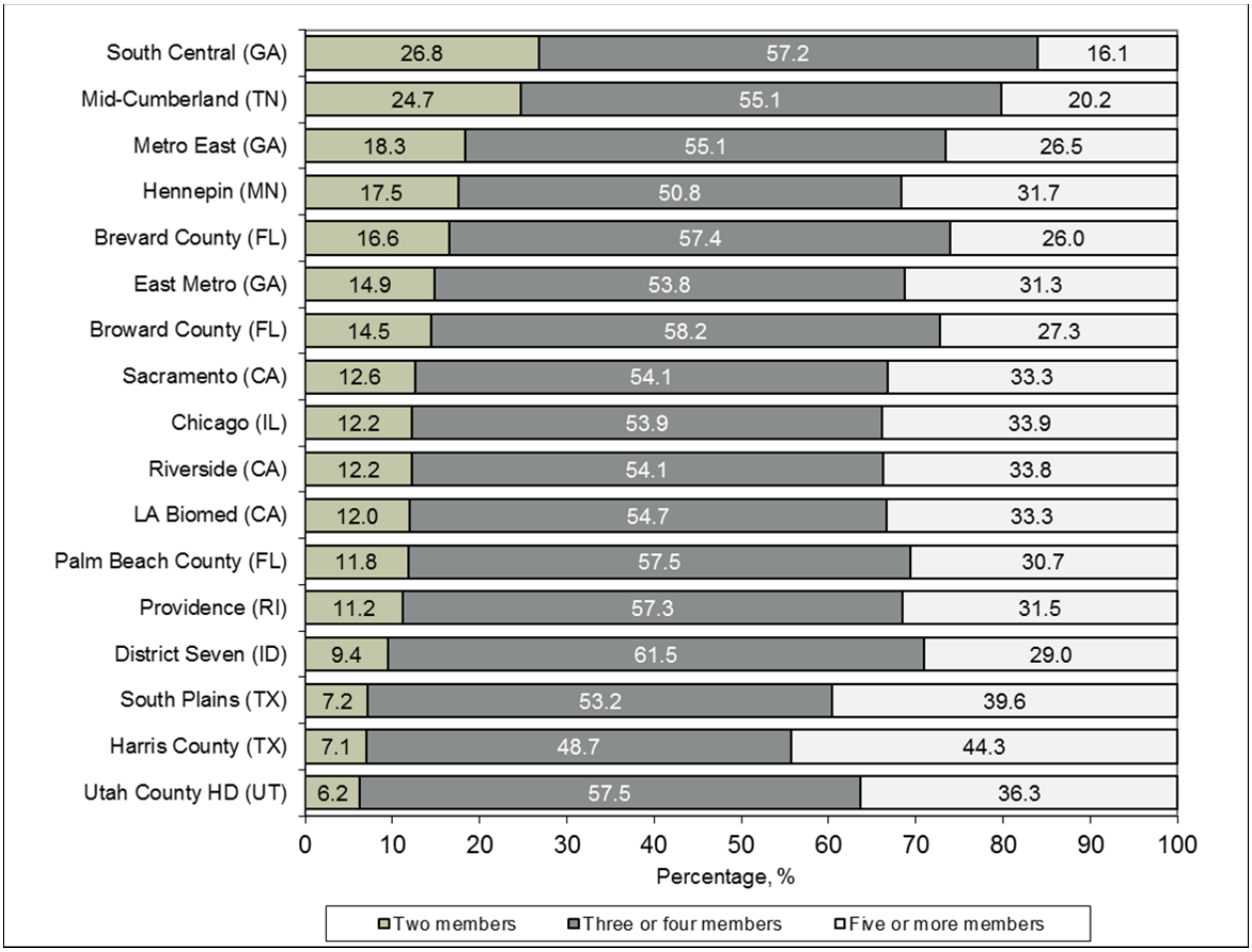
Note: Complete information on income was not available for three local WIC agencies because of high rates of missing data. Data were missing for 73% of participants in Hennepin County, MN, for 48% of participants in Mid-Cumberland, TN, and for 14% in Utah County, UT.

3.1.4 Household Size

Household size is related to household income and poverty, availability of other adults for support, time constraints, and other aspects child care and feeding, all of which can influence program participation and breastfeeding decisions. There was considerable variation among LWAs in proportions of WIC mothers from relatively small or large households (see Exhibit 3.4). For instance, 39.6% or more WIC mothers in the two Texas LWAs (Harris County and South Central Community Action) were from households of five or more, and 7.1% and 7.2% of WIC mothers in those agencies, respectively, were from households

of two people. Conversely, in South Central Health District in Georgia and Mid-Cumberland Region in Tennessee, 20.2% or fewer WIC mothers were from households of five or more, and approximately 25% of were from households of two people.

Exhibit 3.4 Household Size in Local WIC Agencies Selected for WIC Birth Month Study (Pre-Implementation, 2009)



Sample: Administrative records, WIC mothers certified for breastfeeding or postpartum packages with infants aged 0-5 months in LWAs 2 months prior to the implementation of the Interim Rule, *n*=17.

Interpretation Guide: Household size varied across LWAs. 44.3% of WIC mothers in Harris County and 39.,,6 mothers in South Plains were from households of 5 or more, and approximately 7.1% and 7.2% of WIC mothers in those agencies were from households with two members.

3.1.5 Other Program Participation: TANF, SNAP, and Medicaid

Participation in other federal assistance programs is likely related to low household income and families' motivation and resources for obtaining assistance. Exhibit 3.5 shows rates of participation in TANF, SNAP, and Medicaid for the sampled LWAs. Information about participation in other programs is often provided by WIC participants during their certification process. These data fields in the administrative records may not reflect changes in participation status after certification.

Exhibit 3.5 TANF, SNAP, and Medicaid Participation Rates Among WIC Mothers Selected for WIC Birth Month Study (Pre-Implementation, 2009)

Local WIC Agency	TANF (%)	SNAP (%)	Medicaid (%)
Metro East (GA)	0.0	2.9	13.3
East Metro (GA)	0.1	0.5	52.0
District Seven (ID)	0.1	28.1	57.8
South Plains (TX)	0.5	17.0	79.3
Harris County (TX)	0.7	11.1	54.5
South Central (GA)	0.8	0.6	87.3
Chicago (IL)	1.2	57.4	95.2
Brevard County (FL)	3.7	34.8	72.7
Broward County (FL)	3.6	23.7	66.2
Palm Beach County (FL)	4.2	23.6	61.6
Mid-Cumberland (TN)	7.1	36.4	54.9
Hennepin (MN)	7.6	7.5	73.8
LA Biomed (CA)	11.9	18.6	77.6
Riverside (CA)	13.2	22.1	80.4
Utah County HD (UT)	21.9	45.3	63.9
Sacramento (CA)	27.7	40.4	82.2

Sample: Administrative records, WIC mothers certified for breastfeeding or postpartum packages with infants aged 0-5 months in LWAs 2 months prior to the implementation of the Interim Rule, *n*=17.

Interpretation Guide: In Sacramento, CA, 27.7% of mothers participated in Temporary Assistance for Needy Families (TANF), while 40.4% participated in SNAP (Supplemental Nutrition Assistance Program) and 82.2% participated in the state's Medicaid program.

TANF Participation

TANF participation rates were quite variable across LWAs, ranging from 27.7% in Sacramento, CA to 0.1% in Metro East Health District, GA, District Seven Health Department, Idaho, and East Metro Health District, GA. In seven of the 17 LWAs in the sample, 1% or fewer WIC mothers of infants aged 0-5 months old received TANF. In another eight agencies, 4.2% to 13.2% of WIC mothers received TANF benefits.

SNAP Participation

SNAP participation rates among WIC mothers of infants aged 0-5 months old in sample LWAs were also variable, ranging from 57.4% in Chicago, IL to 0.8% in South Central Health District, GA and East Metro Health District, GA. Again, these very low SNAP participation rates may not be accurate, as they are based on reporting by WIC mothers during the certification process.

Medicaid Participation

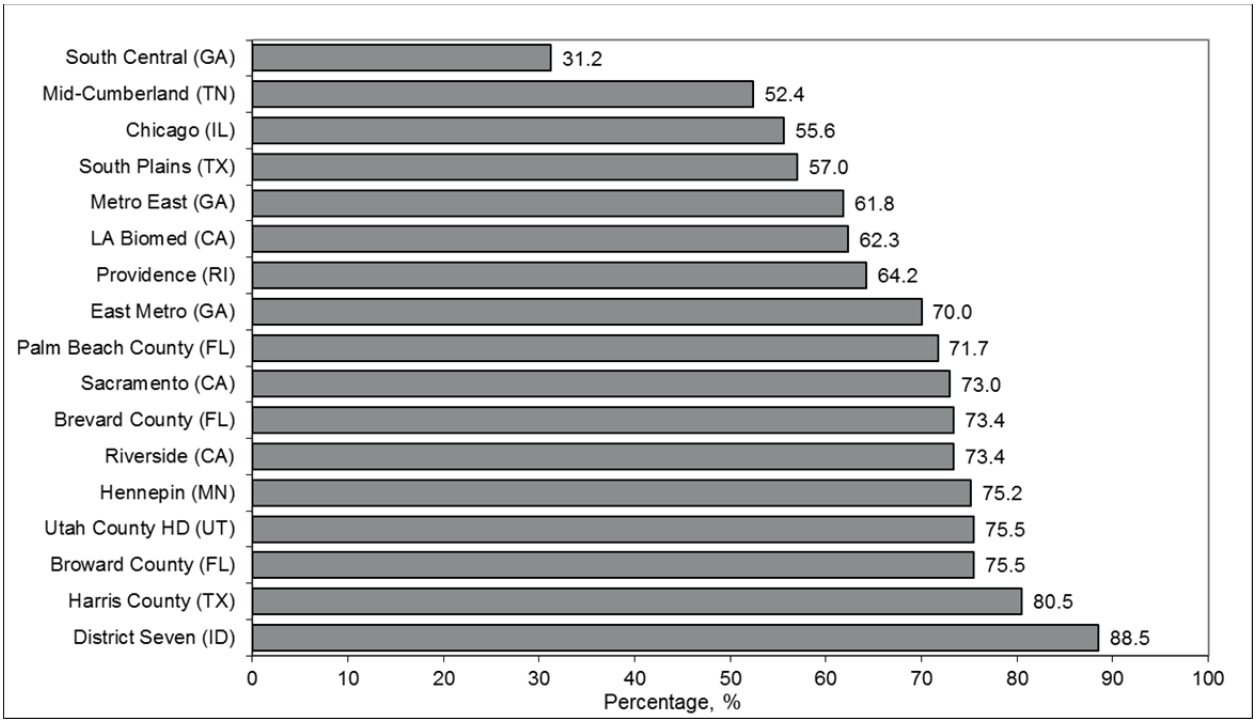
Rates of Medicaid participation among WIC mothers in the sampled LWAs are substantially higher than those for TANF and SNAP, ranging from 95.2% in Chicago, Illinois to 52.0% in East Metro Health District, GA. Reported Medicaid participation was a great deal lower in Metro East Health District, GA, at 13.3%.

3.1.6 Breastfeeding Initiation Rate

The breastfeeding initiation rate also varies widely across LWAs. The Interim Rule may influence food package and breastfeeding decisions differently, depending on prior breastfeeding behavior among the LWA's population. Knowledge of breastfeeding initiation rates in the sample of LWAs prior to the Interim Rule provides important contextual information for understanding implementation of the policy and patterns of food package and breastfeeding decisions.

Breastfeeding initiation rates in the sample ranged from 88.5% in Idaho to 31.2% in South Central, Georgia (see Exhibit 3.6).

Exhibit 3.6 Breastfeeding Initiation Rates Among WIC Mothers Selected for WIC Birth Month Study (Pre-Implementation, 2009)



Sample: Administrative records, WIC mothers certified for breastfeeding or postpartum packages with infants aged 0-5 months in LWAs 2 months prior to the implementation of the Interim Rule, *n*=17.

Interpretation Guide: The rate of breastfeeding initiation ranged from 31.2% in South Central, GA to 88.5% in District Seven, ID.

3.2 Representativeness of Sample

This section describes the representativeness of the study sample.[9] The first subsection compares unweighted estimates from the LWAs in the study sample to the population of LWAs in the United States from which the sample was drawn. The second subsection compares both unweighted and weighted estimates based on WIC mothers with infants aged 0-5 in the study sample to the population of similar mothers in the entire U.S. WIC program. The third subsection compares unweighted estimates from the participant surveys to administrative records from the same 16 LWAs.

3.2.1 Representativeness of Randomly Selected LWAs

As described in Chapter 2, we selected a random sample of LWAs, stratified by three site characteristics: racial and ethnic composition of participants served; Census region; and partial breastfeeding rate. Exhibit 3.7 shows the percentage of LWAs in each stratum in the U.S. population, in the administrative data

[9] All comparisons between the study sample and the relevant population (e.g., LWAs, WIC mothers) presented in this section are descriptive. We do not test whether differences are statistically significant (i.e. a test of the probability that the sample was drawn from a population with similar characteristics), because the standard errors for the population estimates are not known.

sample (unweighted), and in the participant survey sample (unweighted). As explained in Section 2.1, one originally sampled LWA in Georgia was replaced by an adjacent LWA. Because the originally-sampled LWA was the only predominantly non-Hispanic black LWA, analysis of participant survey data necessarily combined the predominantly non-Hispanic black and diverse strata. Exhibit 3.7 shows that the distribution of sampled agencies is similar to the population of agencies with regard to racial and ethnic composition and partial breastfeeding rate. However, there are some differences in Census region. Compared to the U.S. population, the sample had a lower percentage of agencies in the Northeast (5.9% vs. 12.9%) and in the Midwest (11.8% vs. 19.0%) and a higher percentage of agencies in the South (approximately 52.9% vs. 41.1%).

Because we sampled LWAs within strata with probability proportional to size, the average agency size in the unweighted sample is larger than the average agency size in the population. LWAs in the sample serve an average of 3,754 WIC mothers in a given month compared to the population of LWAs in the U.S., which serve an average of 1,789 WIC mothers in a given month. As described in Section 2.2.3 and Appendix A, we adjust for the sample design by applying weights in statistical analyses.

Exhibit 3.7 Comparison of Sampled LWAs With the Population of LWAs (Pre-Implementation, 2009)

	WIC PC Data [a]	Sample of LWAs with Administrative Records [b]	Sample of LWAs with Participant Survey [c]
Racial/Ethnic Composition [1]			
Predominantly black	6.1%	5.9%	—
Predominantly Hispanic	30.0%	29.4%	—
Predominantly white	24.9%	23.5%	—
Diverse	39.0%	41.2%	—
Racial/Ethnic Composition [2]			
Predominantly Hispanic	30.0%	-	31.3%
Predominantly white	24.9%	-	25.0%
Predominantly black / diverse	45.1%	-	43.8%
Census Region			
Northeast	12.9%	5.9%	6.3%
South	41.1%	52.9%	50.0%
Midwest	19.0%	11.8%	12.5%
West	27.0%	29.4%	31.3%
Partial Breastfeeding Rate			
Low	33.3%	29.4%	31.3%
Medium	33.3%	29.4%	31.3%
High	33.3%	41.2%	37.5%
	n=526	*n=17*	*n=16*

Sample: [a] WIC Program Characteristics data, 2006, *n*=526 LWAs. [b] Administrative records, 2 months prior to implementation of the Interim Rule, *n*=17 LWAs. [c] Administrative records, 2 months prior to implementation of the Interim Rule, *n*=16 LWAs.

Interpretation Guide: As compared with the WIC PC data, there was a lower percentage of sampled LWAs with administrative records in the northeast (5.9% vs. 12.9%) and in the midwest (11.8% vs. 19.0%) and a higher percentage of LWAs in the south (52.9% vs. 41.1%).

Notes: The sampling frame for the study was identified using WIC Program Characteristics data, 2006, which were the most recent data available at the time the sample was selected in 2007. [1] For analyses of administrative records four race / ethnicity strata were used. [2] For analyses of participant surveys the predominantly black and diverse strata were combined into one stratum.

3.2.2 Representativeness of WIC Mothers in the Sampled LWAs

From the 17 sampled LWAs, we obtained administrative records for all WIC mothers with infants aged 0-5 months. We compare the characteristics of these WIC mothers (unweighted and weighted) to characteristics of the population of WIC mothers in the U.S., based on data from WIC PC 2008. The WIC mothers in the sampled LWAs appear generally quite similar to the national population of WIC mothers with infants aged 0-5 months in terms of race/ethnicity, income, family size, participation in other assistance programs, and breastfeeding initiation rate (see Exhibit 3.8). However, there are some differences between the mothers from the 17 sampled LWAs vs. the population of similar WIC mothers. Compared to the population of the WIC mothers with infants aged 0-5 months, the sampled LWAs have a higher percentage of Hispanic mothers (55.2% compared to 44.8%) and a lower percentage of white, non-Hispanic mothers (15.7% compared to 27.0%). The sampled LWAs have a somewhat higher percentage of mothers in poverty (<100% FPL[10]) compared to the national population of WIC mothers (69.6% compared to 64.0%). Although the pattern of reported participation in other assistance programs is similar in both the sampled LWAs and the national population – with participation rates lowest for TANF, then SNAP, and highest for Medicaid – the participation rates of WIC mothers in the sampled LWAs are slightly higher than in the national population. WIC mothers in the sampled LWAs and the national population do not differ with regard to family size. Finally, breastfeeding initiation rates are higher in the sampled LWAs than in the national population.

[10] Summing the percentage below 50% of the Federal Poverty Level (<50%) and the percentage between 50% and 99% of the FPL (50% - 99% FPL) yields the percentage below 100% FPL (see Exhibit 3.8).

Exhibit 3.8 Comparison of Sample With the Population of WIC Mothers (Pre-Implementation, 2009)

	WIC PC Data [a]	Unweighted Sample Data [b]	Weighted Sample Data [b]
Race/Ethnicity			
Black	22.6%	23.0%	23.4%
Hispanic	44.8%	53.2%	55.2%
White	27.0%	18.8%	15.7%
Other	5.6%	5.0%	5.7%
Income (% Federal Poverty Level)			
<50% FPL	32.7%	34.9%	34.0%
50%-99% FPL	31.3%	35.6%	35.6%
100%-149% FPL	19.0%	15.9%	15.1%
≥150% FPL	8.1%	5.6%	5.0%
Missing	9.0%	8.1%	10.3%
Household Size			
Two members	13.8%	13.0%	13.3%
Three to four members	55.1%	54.2%	54.2%
Five or more members	31.1%	32.7%	32.5%
Program Participation			
TANF	5.2%	7.5%	7.1%
SNAP	17.8%	21.5%	25.8%
Medicaid	60.6%	67.4%	72.9%
Breastfeeding Initiation Rate	62.0%	71.2%	69.5%
	n=2,515,925	*n*=63,813	*n*=641,170

Sample: [a] WIC Program Characteristics data, 2008. [b] Administrative records, 2 months prior to implementation of the Interim Rule, n=17.

Interpretation Guide: Compared to the population of WIC mothers, the weighted sample has a higher percentage of Hispanic mothers (55.2% compared to 44.8%) and a lower percentage of white mothers (15.7% compared to 27.0%).

3.2.3 Representativeness of Participant Survey Sample

This subsection compares unweighted estimates from administrative records for the participant survey sample to administrative records for the corresponding population of the same 16 LWAs. The survey sampled WIC mothers who initiated breastfeeding and completed the participant survey when their infants aged 0-9 weeks. Hence, as described in Section 2.2.4, the comparison file for the population of the 16 LWAs is restricted in the same fashion.

Exhibit 3.9 presents unweighted estimates of the characteristics of mothers in the participant survey sample and the comparison file. Overall, the sample of survey respondents is similar to the comparable population of breastfeeding initiators in the 16 LWAs, with regard to race/ethnicity, poverty rates, family structure, participation in other programs, and infant age. Formal hypothesis tests, to determine whether observed differences in estimates could be due to sampling variation, were not conducted. There were some observed differences in the point estimates and they include the following:

- Survey respondents included a greater percentage of white, non-Hispanic mothers (28.0%), compared with the corresponding population of the 16 LWAs (15.5%); survey respondents included a smaller percentage of Hispanic mothers (49.0%), compared with the corresponding population (56.1%).
- Data on income are missing for 28.8% of survey respondents and for 7.0% of WIC mothers in the full sample of breastfeeding initiators in the 16 LWAs, which makes it difficult to compare the poverty rates in the two samples. Among those with non-missing income, survey respondents had

approximately the same percentage in poverty (75%) as the corresponding population of the 16 LWAs had (78%). A higher percentage of survey respondents had very low incomes less than 50% of the FPL (46.7%), compared with the corresponding population of the 16 LWAs (35.0%).

- Participation rates for other programs – TANF, SNAP, Medicaid – follow a similar pattern in both samples, with the majority of mothers reporting participation in Medicaid, a smaller percentage reporting participation in SNAP, and a small percentage reporting receipt of TANF. A slightly higher percentage of survey respondents report participation in these other assistance programs.

Exhibit 3.9 Characteristics of Breastfeeding Initiators with Infants Aged Zero to Nine Weeks (Pre-Implementation, 2009)

	16 LWAs Overall (%) [a]	Survey Respondents Only (%) [b]
Race/Ethnicity		
Black	19.0	18.9
Hispanic	56.1	49.0
White	15.5	28.0
Other	4.5	4.2
Missing	5.0	4.4
Income (% Federal Poverty Level)[c]		
<50% FPL	35.0	46.7
50%-99% FPL	40.0	31.3
100%-149% FPL	18.6	16.7
≥150% FPL	6.4	5.3
Household Size		
Two members	12.1	13.1
Three or four members	53.9	56.7
Five or more members	33.9	30.2
Program Participation		
TANF	5.8	9.0
SNAP	20.3	26.6
Medicaid	67.5	70.6
Age of Infant		
Zero months	46.5	44.2
One month	53.5	55.8
	n=13,179	*n*=817

Sample: [a] Administrative records for WIC mothers with infants aged 0-9 weeks who initiated breastfeeding in the 16 LWAs, 2 months prior to implementation of the Interim Rule. [b] Administrative records for WIC mothers with infants aged 0-9 weeks who initiated breastfeeding for the sample of participant survey respondents in the 16 LWAs, 2 months prior to implementation of the Interim Rule. [c] The distribution of income is reported for non-missing cases; data on income are missing for 28.8% of survey respondents and for 7.0% of WIC mothers in the full sample of breastfeeding initiators in the 16 LWAs.

Interpretation Guide: Compared to breastfeeding initiators in the 16 LWAs overall, survey respondents included a greater percentage of white mothers (28.0% vs. 15.5%) and a smaller percentage of Hispanic mothers (49.0% vs. 56.1%).

Chapter 4: Implementation of the Interim Rule

The Interim Rule made several ambitious changes to program policies for the WIC program. The process of implementation was complex and required cooperation between federal, State, and LWA administrators over a period of many months. Extensive interviews with State and LWA staff before and after implementation are useful in the later interpretation of key results in Chapters 6-10. The procedures for these WIC staff interviews were described in Chapter 2, and the results from these interviews are described in this chapter.

This chapter is organized as follows:

- Section 4.1 explains the State and LWA decision-making process for implementing the Interim Rule, including the timing of changes.
- Section 4.2 describes the implementation of the new WIC infant formula packages.
- Section 4.3 addresses information and support to local LWA staff.
- Section 4.4 addresses information and support for WIC participants.
- Section 4.5 addresses information for community organizations.
- Section 4.6 focuses more specifically on breastfeeding support, which is an issue closely connected to a key objective of the Interim Rule.
- Section 4.7 summarizes positive aspects and challenges of implementation.
- Section 4.8 serves as bridge between this implementation chapter and later results chapters, summarizing WIC staff insights into participant experiences.

4.1 Decision-Making Process for Implementing the Interim Rule

4.1.1 State and Local Roles

State WIC agencies had significant discretion in how they implemented the Interim Rule, including the choice of specific eligible foods, the development of information and materials for local WIC staff and WIC participants, and training of local staff. Respondents from all but 1 of the 10 State WIC agencies described the decision-making process as collaborative, with extensive LWA participation. In some States, formal committees were jointly staffed by State and local WIC personnel. LWA staff provided input and feedback on materials and instructions in preparation for the training process and other aspects of the implementation of the Interim Rule. LWA staff in some States also piloted new computer systems and local trainings. Some States went so far as to describe the interaction as a joint decision-making process, while other States said that LWAs provided "feedback" or "were kept in the loop." Once decisions had been reached about how implementation would proceed, the decisions were generally implemented with little local discretion, with a few minor exceptions. For instance, one State agency created all materials and trained the LWA staff, while the LWAs decided how to conduct outreach activities in the community.

4.1.2 Timing of Changes

Staff from all State and local agencies reported that the changes were implemented in full by the planned implementation date. States highlighted the fact that making the changes all at once was facilitated by the

long planning process. For instance, many of the States had trained staff and had developed and distributed public awareness materials about the food package changes many months in advance of the implementation date.

Although all of the changes were made at once, there was a period during which some WIC participants had the old packages and some had the new ones. In most States, WIC participants were issued new food packages at their recertification appointments, which could happen as long as six months after a pregnancy certification, or at quarterly voucher pick-up, whichever happened first. Consequently, in 7 of the 10 States, it generally took three months before all participants were issued the new food packages. Respondents from two other States estimated that the transition process would take six months. In one State, participants were issued the new food packages when they picked up vouchers for foods, even if this was at a point earlier than three months.

4.2 Changes to Infant Formula Packages

The Interim Rule lowered the amount of formula that a dyad can receive under the partial breastfeeding package. It also shortened from 12 to 6 months the time that partially breastfeeding mothers may receive a maternal food package (see Section 1.4).

The effect of these changes may depend on how WIC participants are assigned food packages by LWAs after implementation. In many LWAs, nutritionists and certifiers issue the amount of formula needed based on information obtained about infant feeding practices. If the amount of formula issued is greater than the maximum allowed under the partial breastfeeding package, the dyad is classified as receiving a full formula package. Thus, even if the amount of infant formula issued was the same, some dyads that would have been classified as partial breastfeeding pre-implementation could be classified as full formula post-implementation. If this happened, the dyad would receive less than the maximum formula amount, but would nevertheless have some of the disadvantages of the full formula classification, including a smaller amount of food in and shorter period of eligibility for the maternal food package and the maternal food package.

The Interim Rule gave States the option of allowing a small amount (equivalent to 104 ounces) of formula for partial breastfeeding mothers of infants in their birth month. Five of the States either did not allow this option or provided specific guidelines to the LWAs for when a new mother can receive the small amount of formula. The other States left whether or not to issue the small amount of formula in the first month to the discretion of LWAs.

4.3 Information and Support to Local WIC Staff

States and LWAs offered WIC staff several types of support, including materials, training, and other assistance.

4.3.1 Materials

All 10 State WIC agencies developed at least some written materials for LWAs to use to describe food package changes. In addition to brochures, letters, and hand-outs, some States also produced public service announcements, mailings to the medical and vendor communities, flip charts, shopping guides,

DVDs, nutrition education kits, newspaper articles, notebooks, vendor materials, interactive CD ROMs, and food lists.

4.3.2 Training

Fifteen of the 17 LWAs used trainings and materials provided by their States. Some agencies reviewed the materials together at staff trainings. Others expected staff to look at the materials on their own time. Two LWAs used the materials as a reference when counseling participants or deciding which package to assign them.

Several LWAs created State-level teams or committees to travel to all clinics and educate staff. States also provided information directly through webinars, conference calls, emails, video conferences and online learning modules. A few of these training modules were geared towards specific staff members, such as directors or nutritionists, but in general the State provided common materials for all staff. State WIC staff described a variety of training methods and topics:

- In-person trainings or workshops (six States, including one State using a train-the-trainer approach),
- Satellite meetings or webinars (two States),
- Training conference calls (two States),
- Online training modules or CD-ROMs for the local agencies to use on their own time (two States), and
- An interactive shopping class intended for participant use, that all local staff were also required to take (one State).

One State followed a train-the-trainer model. Local WIC directors were trained, and these directors trained their staff. In one State, only the local agency director was trained; in two other States, only the local agency directors and/or nutritionists were trained by the State, while in the remaining States, all local staff were trained, including certifiers who were not nutritionists.

Topics covered in the trainings included supporting the breastfeeding mother in the first 30 days post-partum, conducting formal nutrition assessments, using new computer systems, products that can be counted as whole grains, and the intricacies of the new food package rules, especially for breastfeeding dyads. States often followed up on trainings by maintaining and circulating lists of questions and answers that came up during or after the trainings.

For the most part, LWAs perceived that the level of training and support was sufficient for staff to comprehend the changes in the WIC food packages and implement the Interim Rule appropriately. However, six of the LWAs reported that they did not feel sufficiently prepared initially. Of these, only two reported that problems persisted beyond the initial period of implementation.

4.3.3 Other State Assistance to Local WIC Agencies

In addition to providing training and materials, three States provided funds to LWAs. This funding was used to hire temporary staff (one State), for training (one State), and for help assessing formula needs and prescribing the appropriate food packages (one State).

4.4 Information and Support to WIC Participants

Before the implementation of the Interim Rule, local WIC staff worried that WIC participants might misunderstand or dislike the changes. These concerns affected the timing and methods of efforts to educate participants.

4.4.1 Timing of Information on Food Package Changes to WIC Participants

All 17 LWAs reported telling WIC participants about the changes to food packages before implementation of the Interim Rule, though there was variation in the timing. WIC participants were informed as early as a full year before the Rule change and as late as two months before the change. In one State, local agencies rolled out the information in phases, beginning with information about changes from whole milk to reduced-fat, low-fat, or non-fat milk, then about the addition of whole grains to the new food packages, followed by information about fresh fruits and vegetables, and finally the changes to the mother and infant food packages. One State began its campaign in December 2008, and the WIC staff started educating participants in April 2009, six months before the package changes were implemented.

4.4.2 How WIC Staff Explained the Changes to WIC Participants

Seventeen LWAs educated participants about upcoming changes at certification and follow-up appointments. Three-quarters of the LWAs (12 agencies) discussed food package changes at prenatal, nutrition education, or breastfeeding classes. In addition, two local agencies mailed information to their participants about upcoming changes to the food packages, and one agency informed its participants by telephone.

LWA staff used multiple approaches to explain the food package changes to their participants. Virtually all agencies (16 out of 17) explained the food package changes from a nutritional standpoint, using it as an opportunity to highlight the benefits of breastfeeding (discussed further in Section 4.6 below).

With the exception of one agency, all LWAs said communication to WIC participants about the partial breastfeeding package changes went according to plan. Staff indicated that it was a difficult transition for participants who were already partially breastfeeding, but whose formula amount exceeded the new limits for the partial breastfeeding package. If their package was reclassified as a full formula package, these mothers could only receive food benefits for six months instead of a year. However, for the most part, women accepted the changes and were enthusiastic about the support for additional foods, such as the vouchers for fruits and vegetables. One agency reported communication about partial breastfeeding packages did not go smoothly and attributed the difficulties to general confusion among the local WIC staff about the changes.

Most LWAs (11 of 17) said they explained all food package options, regardless of the participant's certification category, to show how the packages differ and what is included. Staff then tailored the conversation to the needs of the individual participant, based on food preferences and infant feeding decisions. In the remaining six agencies, nutritionists explained just the most relevant package options, as determined through a nutrition assessment.

4.5 Information to the Community

WIC plays an important role in local communities, encompassing food assistance functions and health services and referrals. In many communities, there is a network of other local institutions and non-profit organizations that serve as advocates for and partners to WIC. Sixteen LWAs reported communicating about the new WIC packages to physicians, health centers, schools, churches, and other organizations (Exhibit 4.1). (The other LWA did not report about communicating to the broader community.) Of those agencies that publicized food package changes in the community, the majority reported using written materials and information sessions to disseminate their message. LWAs also used posters and word of mouth, created DVDs and websites, put articles in the newspaper, and sent staff members out into the community to spread the word.

Exhibit 4.1 Locations Where New WIC Food Packages Were Publicized (Post-Implementation, 2010)

	Number of LWAs
Local physicians' offices	16
Health centers	13
Hospitals	10
Vendors/stores	8
Community centers/Child care centers	5
Schools	4
Churches	3

Sample: WIC staff interviews, 3-6 months after implementation of the Interim Rule, *n*=16. Data are missing from one LWA.

Note: Numbers do not sum to 16 as local WIC staff could provide multiple responses.

The 16 LWAs who responded to this question reported that communication within the community went according to plan. Staff from a few LWAs mentioned the communication was a lot more positive than they had anticipated, and everyone in the community was very excited for the changes. For one LWA, one aspect of its community-focused communication did not work out as it had hoped—the intended media coverage did not take place, and they did not have any television or newspaper public service announcements. Another LWA reported having trouble getting the necessary information about the changes to local vendors because the vendor managers did not pass the information to their front-line staff. As a result, the cashiers were not immediately aware of the changes.

4.6 Breastfeeding Promotion and Support

Breastfeeding promotion and support is a central tenet of the WIC Program (see Section 1.3). The WIC staff interviews discussed:

- staff training about breastfeeding,
- breastfeeding information provided to WIC mothers,
- peer counseling programs for breastfeeding,
- additional breastfeeding promotion activities, and
- the role of local hospitals in breastfeeding promotion.

We sought to determine whether changes in breastfeeding and food package outcomes could be attributed to the actual changes in the food packages from Interim Rule, as opposed to other concurrent changes. Hence, we needed to understand whether other activities, such as LWA's efforts at breastfeeding promotion and support, were similar before and after implementation. Prior to our first interviews with WIC staff, many LWAs had already begun to educate WIC participants about the changes in the food packages and weave these into messages in support of breastfeeding. However, they reported that there were few, if any, differences in messages and support at our two data collection periods, since the pre-implementation data collection occurred so close to the implementation of the Interim Rule. They also reported that there were few, if any, changes to ancillary activities to support breastfeeding, such as the issuance of breast pumps and collaborations with local hospitals. However, LWAs varied in the approaches and the extent to which they offer breastfeeding support.

4.6.1 WIC Staff Training About Breastfeeding

All 17 LWAs provided training for staff that certify or provide nutrition counseling to WIC participants. The training covered lactation education, management, and/or support. Agency staff most qualified to discuss breastfeeding were IBCLCs (International Board Certified Lactation Consultants), followed by CLCs (Certified Lactation Consultant) and CLEs (Certified Lactation Educators). Each of the 17 LWAs had on staff some combination of IBCLCs, CLCs, and CLEs, or had staff members who had received some other type of training that yielded a certification. Thirteen agencies had at least one IBCLC on staff; all but one LWA had at least one CLC and/or CLE on staff. Agencies offered ongoing training to staff in-house or sent their employees to classes or training sessions. Thirteen agencies offered training to all staff members at least once a year. Additional training was provided as frequently as monthly in some LWAs, or as infrequently as every two to three years in other LWAs. Many LWAs said that the cost of training and the burden of giving leave time were barriers to providing lactation education to more staff.

4.6.2 Information Provided To WIC Mothers About Breastfeeding

All 17 LWAs reported that pregnant women are routinely given information from WIC staff about breastfeeding prior to delivery. Nearly all agencies provide breastfeeding information at certification during pregnancy, whenever it occurs (15 LWAs), and during special classes/nutrition education sessions (14 LWAs). Fewer agencies provide information about breastfeeding during each of the three trimesters of pregnancy (seven LWAs). Although the majority of pregnant women enrolling in WIC do so in their first trimester (USDA, 2010), LWAs more often provide women with information about breastfeeding during the second and third trimesters.

All 17 LWAs said they communicate to their participants about breastfeeding both verbally and using written materials. Additionally, some agencies provide education via DVD, computerized learning modules, and individualized peer counseling. LWAs also said they disseminate information and support to postpartum women regularly, as needed/requested.

Some LWAs discussed breastfeeding as part of communication with clients about WIC packages. Four agencies said they highlight the advantages of the breastfeeding packages, such as additional foods and longer length of benefits. These agencies reported that they do not bring up the topic of formula, but work under the assumption that participants will be breastfeeding unless the participant brings up formula as an issue.

The majority (14 of 17) of LWAs reported they explained the changes to the postpartum food packages from a practical standpoint (e.g., ease of breastfeeding relative to preparing bottles) as well as from a

monetary standpoint (15 of 17) (e.g., more foods for a longer time period for breastfeeding mothers and babies).

4.6.3 Peer Counseling Programs to Support Breastfeeding

Sixteen of the 17 LWAs provided peer counseling to WIC mothers. Eleven local agencies offered the FNS *Loving Support* Peer Counseling model. The *Loving Support* Peer Counseling Program augments ongoing breastfeeding promotion efforts in WIC agencies throughout the country in the hopes of improving breastfeeding outcomes among WIC participants, especially breastfeeding intensity and duration. Three LWAs offered another peer support program; and one LWA offered both a *Loving Support* Peer Counseling Program and another peer support program.

The peer counseling program models varied considerably. Half of the local agencies reported most contact was made in WIC offices. Most of the remaining LWAs reported most contact was made by phone. One remaining agency reported most contact was made by mail. More than one third of agencies reported that peer counselors meet with WIC mothers in hospitals after delivery, and another one third reported WIC counselors go to WIC mothers' homes as part of the program, although not necessarily routinely.

4.6.4 Additional Breastfeeding Promotion Activities

In addition to staff training, breastfeeding classes, and peer counseling, staff from all LWAs described additional breastfeeding promotion activities, including:

- Participating in media campaigns (14 LWAs),
- Providing breastfeeding support groups (13 LWAs),
- Having a warmline or hotline to answer breastfeeding questions (11 LWAs), and
- Lending or providing breastfeeding pumps or equipment (all LWAs).

4.6.5 Influence of Local Hospitals on WIC Participants' Breastfeeding Practices

Because formula is often introduced to infants before they leave the hospital, local hospital policies may have a large impact on WIC mothers' initial breastfeeding decisions and is important contextual information to use when assessing the impact of the Interim Rule. All LWAs reported that either no local hospitals or very few of them were designated as Baby-Friendly. The Baby-Friendly Hospital Initiative (BFHI) is a global program sponsored by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) to encourage and recognize hospitals and birthing centers that offer an optimal level of care for lactation. The BFHI assists hospitals in giving breastfeeding mothers the information, confidence, and skills needed to successfully initiate and continue breastfeeding their babies. It gives special recognition, such as designating hospitals as Baby-Friendly, to hospitals that encourage and support breastfeeding. Of the 17 LWAs, five reported that at least one hospital in the area was working on getting this certification.

Exhibit 4.2 provides information about whether hospitals in LWA catchment areas had specific policies that encouraged breastfeeding. At least one hospital in each LWA's catchment area provided hospital staff with training in lactation management within the past three years. Mothers' experiences may vary within and across hospitals in a particular LWA's catchment area.

Exhibit 4.2 "Baby-Friendly" Hospital Policies Reported by LWA Staff (Post-Implementation, 2010)

	Proportion of Local Hospitals			
	All Local Hospitals	Most Local Hospitals	Some Local Hospitals	Few / No Local Hospitals
	# of LWAs			
Have rooming-in for newborns	9	3	2	1
Have lactation consultants on staff[a]	9	4	1	2
Encourage mothers to breastfeed within the first hour after birth	4	5	3	3
Have rooming-in for newborns	9	3	2	1
Have lactation consultants on staff	9	4	1	2
Encourage mothers to breastfeed within the first hour after birth	4	5	3	3
Do not routinely give breastfeeding infants supplementation (including water)	6	3	5	2
Have provided staff with training in lactation management within the past three years	8	7	1	0
Do not provide formula discharge packs	2	3	4	7
Are designated baby-friendly, as outlined by UNICEF and the World Health Organization	0	0	0	16

Sample: WIC staff interviews, 3-6 months after implementation of the Interim Rule, *n*=16. One of the 17 LWAs did not report on specific hospital policies in the catchment area.

[a]One of the 16 LWAs that responded to the question did not know about this specific policy.

Four of the 17 LWAs reported changes to local hospital policies between the pre-implementation and post-implementation interviews. All four reported that additional hospitals were taking steps to become Baby Friendly, with one hospital being certified over the summer 2009 and one hospital ceasing to give discharge gift packs with formula. One LWA mentioned a push by the hospitals to develop and implement breastfeeding policies such as: rooming in, substituting or getting rid of discharge packs, and having a golden hour/quiet hour to provide time for skin to skin contact between mothers and newborns.

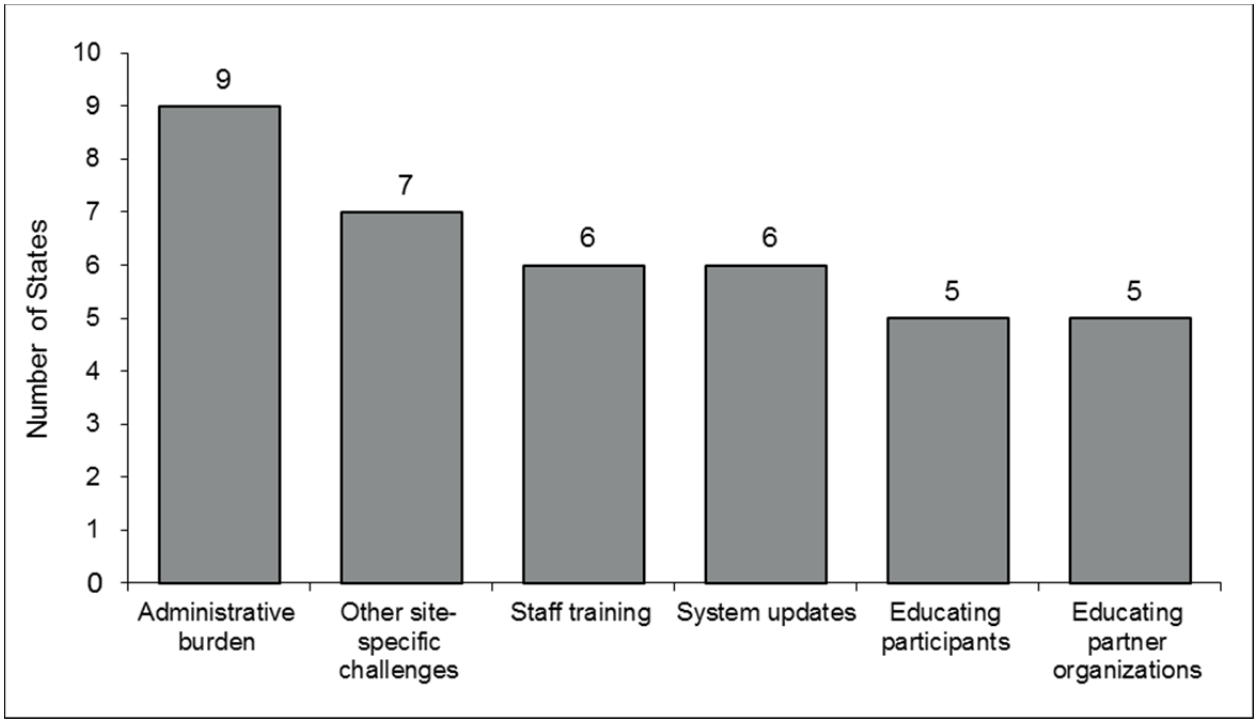
4.7 Positive Aspects and Challenges of Implementation

Respondents from 9 of the 10 States and staff from 9 of the 17 LWAs reported few, if any, problems with implementation of the Interim Rule. In many cases, problems were relatively minor. In some cases, staff were (pleasantly) surprised by the lack of problems. Although initially there were numerous questions and concerns, State and local staff in the majority of States and LWAs were able to handle the issues that arose without disruption to implementation. Problems were generally handled quickly and effectively, without affecting large numbers of participants. For the most part, local staff attributed the implementation success to the positive policy changes, early planning, support from their States, and high quality educational materials for training and publicity. This section discusses the positive aspects and challenges of implementation for States and LWAs.

4.7.1 State WIC Offices

As shown in Exhibit 4.3, the most notable challenges States faced were the administrative burden (nine States) and the need to update management information systems (MIS) and other systems (six States). Half of the interviewed States also mentioned challenges associated with educating partner organizations and WIC participants about the new food packages. Three States reported challenges in the availability of some of the new foods. Finally, three States reported site-specific challenges. The leading challenges are discussed below.

Exhibit 4.3 Biggest Challenges States Faced in Implementing Food Package Changes (Post-Implementation, 2010)



Sample: WIC staff interviews, 3-6 months after implementation of the Interim Rule, *n*=10.

Administrative Burden

All but one State reported the administrative burden the Interim Rule posed was one of their biggest challenges. Most States did not have funding to hire additional staff to help with preparations for the Interim Rule. Because staff members had to take on responsibilities in addition to their usual work, many staff members worked extra hours and/or weekends. One State said the staffing challenge resulted in depleted focus on breastfeeding in order to prepare and implement the new food packages.

Staff Training

Six of the 10 States reported that staff training was one of the biggest challenges faced in implementing the Interim Rule. States often found it difficult to include the needed content in the limited time available for training LWA staff. Moreover, some States struggled to train all the individuals involved in certification and food package assignments. Three States reported that LWAs could not afford staff travel. Instead, they used online and video-conferencing options for training, which was often resource intensive and challenging. Despite these challenges, staff from only 5 of the 17 LWAs thought that they had received insufficient levels of training and many perceived themselves to be well-equipped to implement the Interim Rule.

System Updates

Implementing necessary computer system updates was reported as a main challenge by 6 of the 10 States. Many of these States faced difficulties associated with legacy computer systems that were ill-equipped to handle new food packages. One State wanted to take the burden off LWAs and have all updates ready, which was very time intensive for the State office. Other States could only support LWAs when problems

arose, which happened regularly during the early phase of implementation. For example, one State noted that twins were difficult to accommodate in the new computer systems. Another State had a three-month check issuance cycle and, as a result, exceptions that required changing the cycle length were difficult to handle.

Educating WIC Participants

Half of the States reported facing large challenges in educating WIC participants about the changes. One State originally tried to prepare responses for all questions that would arise, but soon realized that trying to predict what would happen and address all concerns was not effective. Instead, the State reminded LWAs that they have tools to deal with difficult questions/participants, and could use the State office for support as needed. Two States mentioned the challenge of verifying that participant education was actually provided to WIC participants. In one of these States, some clinic staff only handed out brochures before sending participants on their way.

Educating Partner Organizations

Half of the 10 States mentioned they faced challenges in educating partner organizations. These difficulties related primarily to physicians and the medical community. Some physicians did not understand what documentation is necessary for medical exceptions. Three States specifically discussed a requirement for a physician's referral for certain food items (e.g., soy-based beverage for children with milk protein allergies). WIC participants often face financial expenses, such as copays to the physician, as a result of this requirement for a physician referral.

Availability of Some of the New Foods

Three States noted struggled to ensure that some of the new foods were available to participants. States worked with manufacturers to find the correct food sizes/amounts and be sure they meet USDA specifications. Staff members worked with grocery stores where WIC vouchers are accepted, trying to ensure the stores carry the approved foods in approved sizes.

Other Site-Specific Challenges

Three States faced site-specific challenges:

- ***More time needed.*** Staff would have liked clearer federal guidance and more time to get regional approval for the changes required by the Interim Rule.
- ***Ensuring that LWA staff implement new breastfeeding packages correctly.*** State Staff had a difficult time ensuring that the new breastfeeding packages were implemented correctly. Approximately three months after the Interim Rule was being implemented, State staff reported that some LWA staff were still having a hard time distinguishing among food packages and breastfeeding categories.
- ***Overcoming communication and other barriers between the State and*** *LWAs*. Staff in one State discussed the sometimes difficult relationship between the State WIC office and LWAs and health agencies. The added stress and work associated with implementing the Interim Rule strained these relationships.

4.7.2 Local WIC Agencies

Positive Reactions from LWAs

The State respondents generally observed positive reactions from their LWA staff. One State said that LWAs had previously been prevented from implementing a policy much like the new partial breastfeeding package rules and were pleased to see these rules adopted in the Interim Rule. Overall, LWA staff mentioned the same advantages highlighted by State staff (Exhibit 4.4). Staff from 15 LWAs reported that they appreciated the new foods. Staff from eight LWAs thought that the new time limits on the maternal package for partially breastfeeding women promoted breastfeeding.

Exhibit 4.4 Local WIC Staff Perceptions of Positive Aspects of New Food Packages (Post-Implementation, 2010)

	Number of LWAs
New foods	15
Additional six months of food benefits for partially breastfeeding mothers promotes breastfeeding	8
No formula in birth month unless fully formula feeding	3
Universal policy across all agencies	1

Sample: WIC staff interviews, 3-6 months after implementation of the Interim Rule, *n*=17.

Note: Numbers do not sum to 17 as local WIC staff could provide multiple responses.

LWA Questions About the Interim Rule

LWAs had questions about how to determine partial breastfeeding status, how long women can stay on WIC, and how long they can receive food benefits depending on their certification category. In some cases, LWA staff were unsure about procedures for changing WIC food packages, the maximum amounts of formula for each package category, and what to do when a participant asked for more formula. Some local staff also had logistical questions for the State about how a new computer system developed by the State to implement the new food packages would work and how the new vouchers would be issued and used.

Challenges Faced by LWAs

Respondents from several LWAs reported concerns with the new partial breastfeeding package and were apprehensive about their own ability to understand and effectively communicate the food package changes to WIC participants. Given the more stringent requirements to stay within the federal maximum to qualify for the partial breastfeeding package, LWA respondents feared that WIC participants might give up too easily on breastfeeding. Some staff felt women were opting for the full formula package even if they only wanted two cans of formula in the first month. They worried that some participants might be dissuaded from attempting to at least partially breastfeed. There were also other worries such as the ability of vendors to supply the correct foods in the proper quantities, and the ability of participants to understand the new foods and to buy the right amounts. One LWA also mentioned concern about requirements for participants feeding multiples (twins or triplets). Exhibit 4.5 displays the local WIC staff concerns about the food package changes.

Exhibit 4.5 Local WIC Staff Concerns about New Food Packages (Post-Implementation, 2010)

	Number of LWAs
WIC participants might not understand changes	10
WIC staff do not fully understand changes	8
Increased workload	9
Concern about negative consequences for partially breastfeeding mothers	9

Sample: WIC staff interviews, 3-6 months after implementation of the Interim Rule, *n*=17.

Note: Numbers do not sum to 17 as local WIC staff could provide multiple responses.

LWAs addressed staff apprehensions in a variety of ways. The agencies reported using additional communication to address the concerns of the staff. They also mentioned using coaching, role playing and creating and disseminating formal policies or guidelines to address the concerns.

LWAs reported more implementation problems than did the States.[11] Respondents from half of the LWAs reported that local vendors often did not have the correct foods on stock, misunderstood the rules and did not give WIC participants their full allotment of food, and/or were confused in the first months of implementation because they were receiving both old and new versions of WIC food instruments. Respondents from seven LWAs said that there were issues with food package issuance, in some cases because WIC staff did not fully understand the new rules. Five LWAs said that they did not feel sufficiently trained by the State and five reported computer problems, some of which resulted in having to manually issue food packages.

Seven of the 17 LWAs reported that there were no problems at all or only very minor problems during implementation. The remaining 10 LWAs reported they experienced more sizeable challenges. Most of these difficulties, which ranged in magnitude, were similar to many of those faced at the State level. They included:

- ***System updates.*** Ten of the 17 LWAs mentioned they faced substantial challenges related to updating their computer system. These difficulties had largely been resolved across LWAs within three months after implementation of the Interim Rule.
- ***Availability of new foods***. Seven LWAs reported concerns about the availability of some of the new foods in the new packages.
- ***Staff knowledge***. Six LWAs noted that educating WIC participants about the food packages was a challenge because the LWAs themselves were not always clear about the food package rules. The majority of these challenges were addressed soon after the Interim Rule was implemented, though two local agencies noted longer periods of difficulty.
- ***Class scheduling***. About one-quarter of LWAs (four agencies) noted that some of their WIC participant classes ended up going longer than planned, they had a hard time opening enough slots for participants, and/or they needed to scheduled more classes.
- ***Site-specific concerns***. Four LWAs also mentioned specific concerns related to agency's unique features. These included: 1) educating participants about using powdered milk; 2) more time needed to print checks than previously; and 3) meeting the targeted roll-out date.

[11] Implementation challenges reported by LWAs are reported in the text only, not in a table.

- ***Time for appointments***. Three local agencies reported that certain appointments took longer and required longer wait times than prior to the Interim Rule.
- ***Educating partners, especially health care providers.*** Two LWAs discussed the challenge of educating healthcare providers on the new medical documentation requirements and changes to procedures.

Six local agencies reported that these various challenges affected the process of providing women with the correct food packages after the Interim Rule was implemented. The time period for resolving problems ranged from a few days (four agencies) to a few weeks (two agencies) and a few months (three agencies). Three other agencies reported that at least some problems persisted beyond three months.

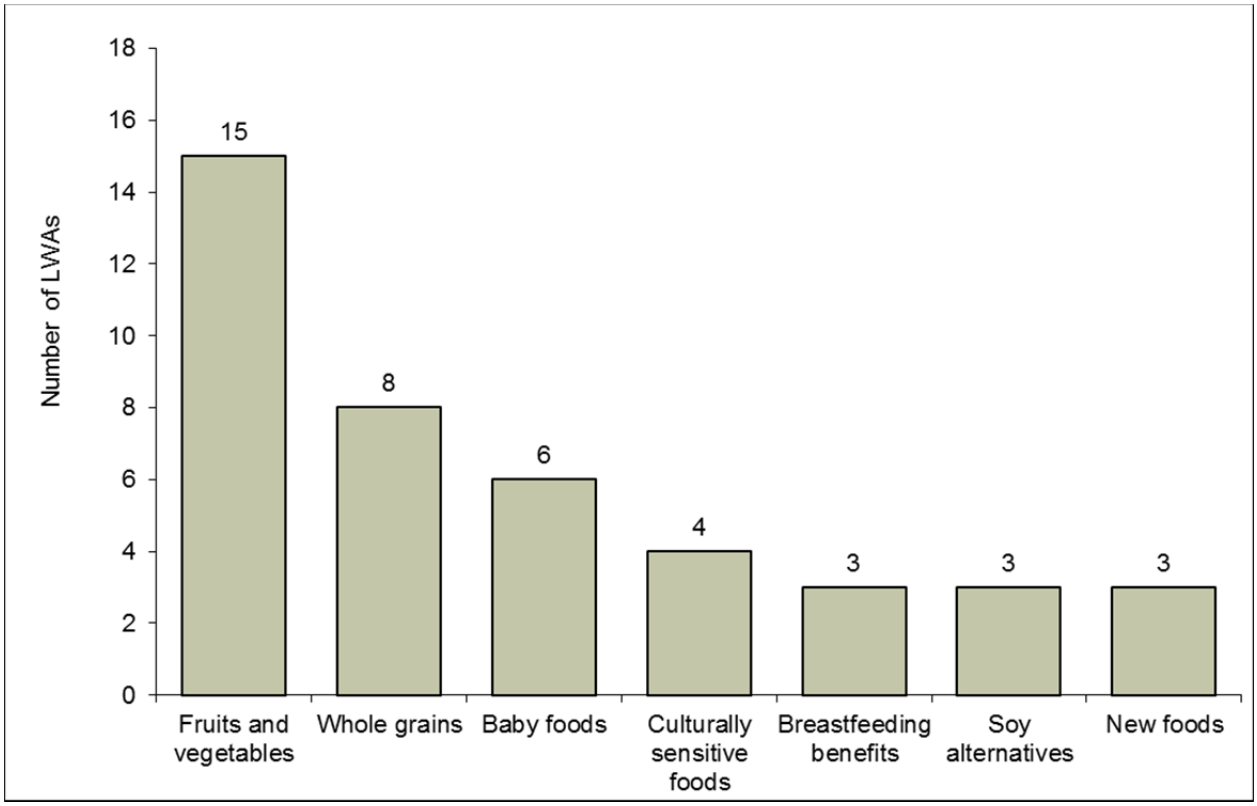
4.8 Staff Insight into Participant Experiences and Outcomes

In addition to providing information about the implementation process, State and LWA staff offered their perspectives on participant experiences and outcomes under the Interim Rule. The State and LWA interviews included questions about the factors motivating a mother's choice of a food package and her ensuing decisions about breastfeeding. This section provides a bridge between this chapter, which discusses implementation issues, and Chapter 5, which discusses WIC mothers' experiences as reported in the participant surveys. This section discusses participant feedback to LWA staff (Section 4.8.1), and staff perceptions of the Interim Rule's influences on package choices and breastfeeding initiation (Section 4.8.2) and later package changes and breastfeeding continuation (Section 4.8.3).

4.8.1 Participant Feedback to LWA Staff

Staff from 11 of the 17 LWAs reported that participant reactions were positive, while the remaining five LWAs reported that reactions were more mixed. In general, participants were very excited about the new foods, in particular the fruits and vegetables, whole grains, and baby foods (see Exhibit 4.6). Staff from local agencies also said that WIC participants appreciated the more culturally sensitive foods, soy options, additional foods for breastfeeding participants, and canned beans as an alternative to dried beans. Similarly, respondents from all 10 State agencies said that participants were happy with the contents of new food packages. State staff expressed surprise at how few complaints they received, especially with regard to the formula amounts.

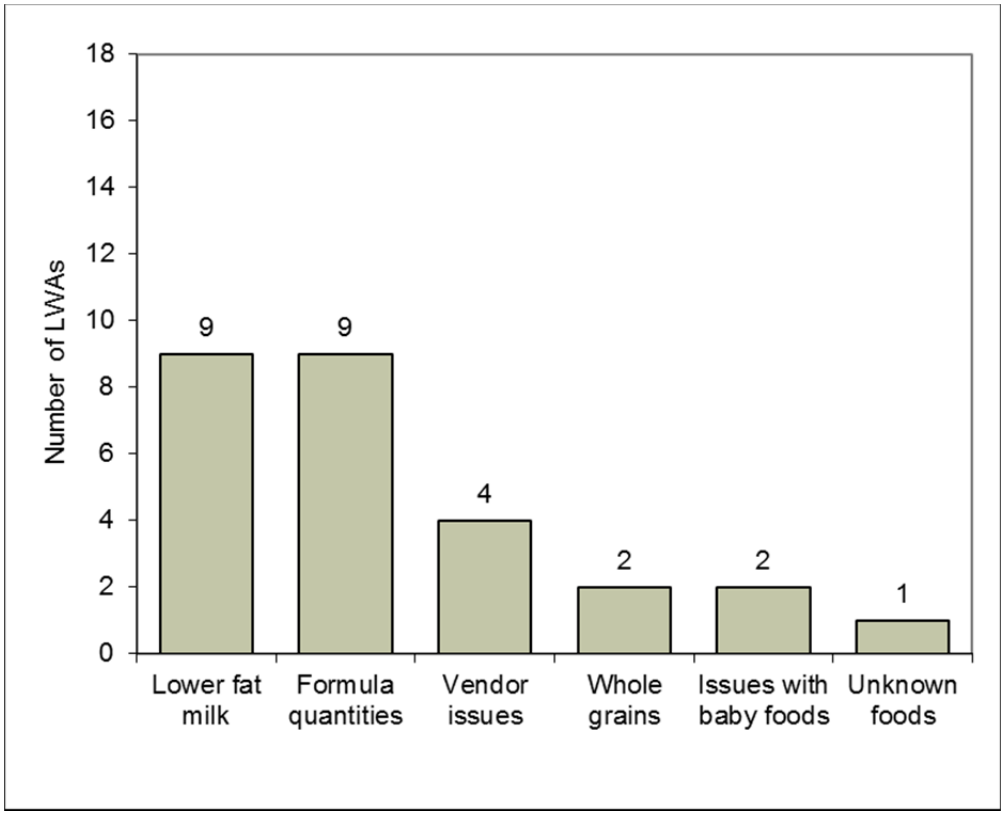
Exhibit 4.6 New Food Package Items That WIC Mothers Liked, as Reported by Local WIC Staff (Post-Implementation, 2010)



Sample: WIC staff interviews, 3-6 months after implementation of the Interim Rule, *n*=17.
Note: Numbers do not sum to 17 as local WIC staff could provide multiple responses.

One of the most widely noted participant concerns reported by LWA staff was the change from whole milk to lower fat milk for women and older children (see Exhibit 4.7). Staff also mentioned some WIC participants' concerns about maximum formula amounts (both the reduction of formula during the first month and as infants got older); the more stringent requirements for women to qualify for the partially breastfeeding category; problems with vendors (either new foods were not available, or market staff were not well enough educated and denied women foods that were newly allowable); and that some of the new foods were unknown to participants (e.g., bulgur wheat). The few complaints that State WIC staff reported receiving concerned the transition from whole milk to lower fat alternatives, participants' inability to buy white potatoes with the fruit and vegetable vouchers, and, in one case, a report that participants were frustrated by longer wait times in the clinics.

Exhibit 4.7 WIC Mothers' Concerns About New Food Packages, as Reported by Local WIC Staff (Post-Implementation, 2010)



Sample: WIC staff interviews, 3-6 months after implementation of the Interim Rule, *n*=17.
Note: Numbers do not sum to 17 as local WIC staff could provide multiple responses.

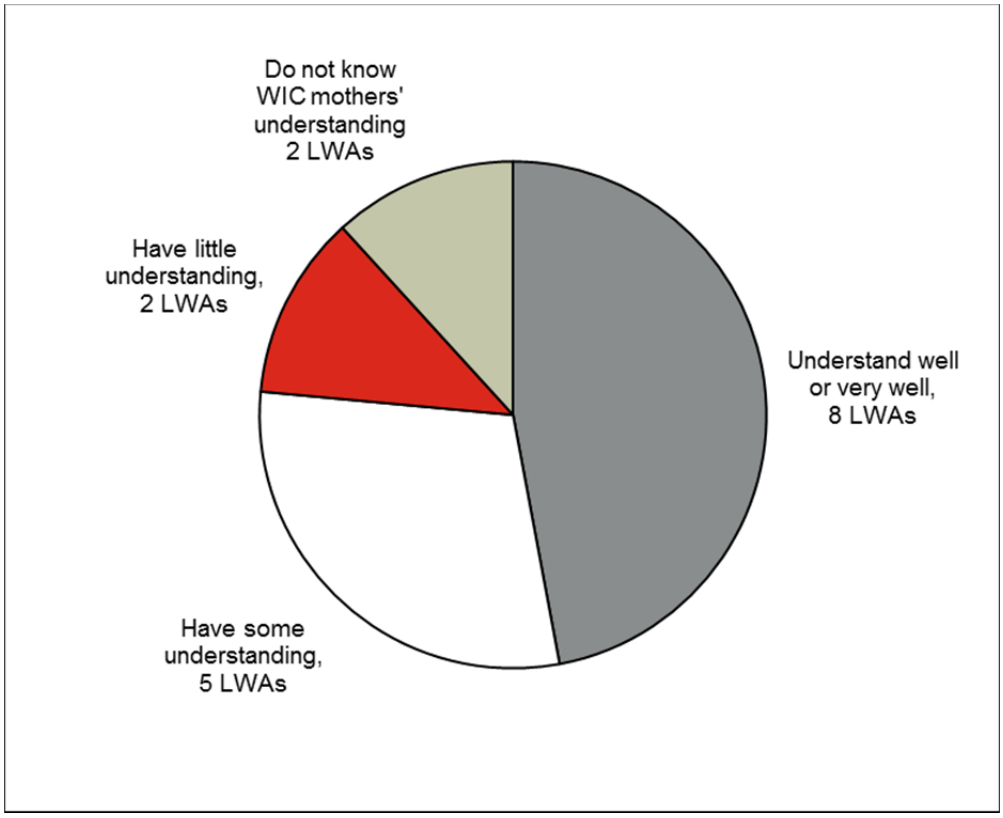
Almost two-thirds of LWA staff said that participant concerns had diminished over time while the remaining third, at the time of the post-implementation interviews, said the concerns had not yet diminished. At the State level, respondents during the post-implementation interview said it was too early to tell if there was any change in participant reaction over time, but a few said they did see fewer participants complaining about the lower fat milk and the formula amounts.

Staff from 11 of the 17 LWAs said they addressed participant concerns by providing the rationale for the food package changes and educating them about the health benefits of the changes. Many staff also reported having additional trainings with vendors to help clerks recognize newly allowable foods and told participants to bring their food books with them to the stores to show clerks the new foods. Some local WIC staff offered blind taste tests with different milk varieties (skim, 1%, 2% and whole) to demonstrate to them that the lower fat milks taste better than WIC participants might think. Additionally, LWA staff posted recipes and held food demonstrations to assist participants in becoming familiar with new foods.

LWA staff had different opinions about how well WIC participants understand the differences in food packages for themselves and for their infants. Staff from eight of the LWAs thought participants understood the different packages pretty well or very well. These staff cited the effectiveness of the education the clinics provide and the visual tools they use (Exhibit 4.8). One of those agencies specified that participants know the consequences of going outside the formula range on the partial breastfeeding

package. Five LWAs reported that participants have some, but not complete, understanding of the food package differences, and two reported that participants had very little understanding of food packages. For some participants, staff reported, the connection between mother and infant packages is not entirely understood. While participants generally understand that they would get more food if they breastfeed, they did not comprehend why they could not have the same types of foods if they chose to formula feed. Exclusively breastfeeding mothers were thought to have better understanding of the different packages. The remaining two LWAs could not say how well participants understood the packages.

Exhibit 4.8 WIC Mothers' Knowledge of Differences Between Partial and Full Breastfeeding Food Packages, as Reported by Local WIC Staff (Post-Implementation, 2010)



Sample: WIC staff interviews, 3-6 months after implementation of the Interim Rule, *n*=17.

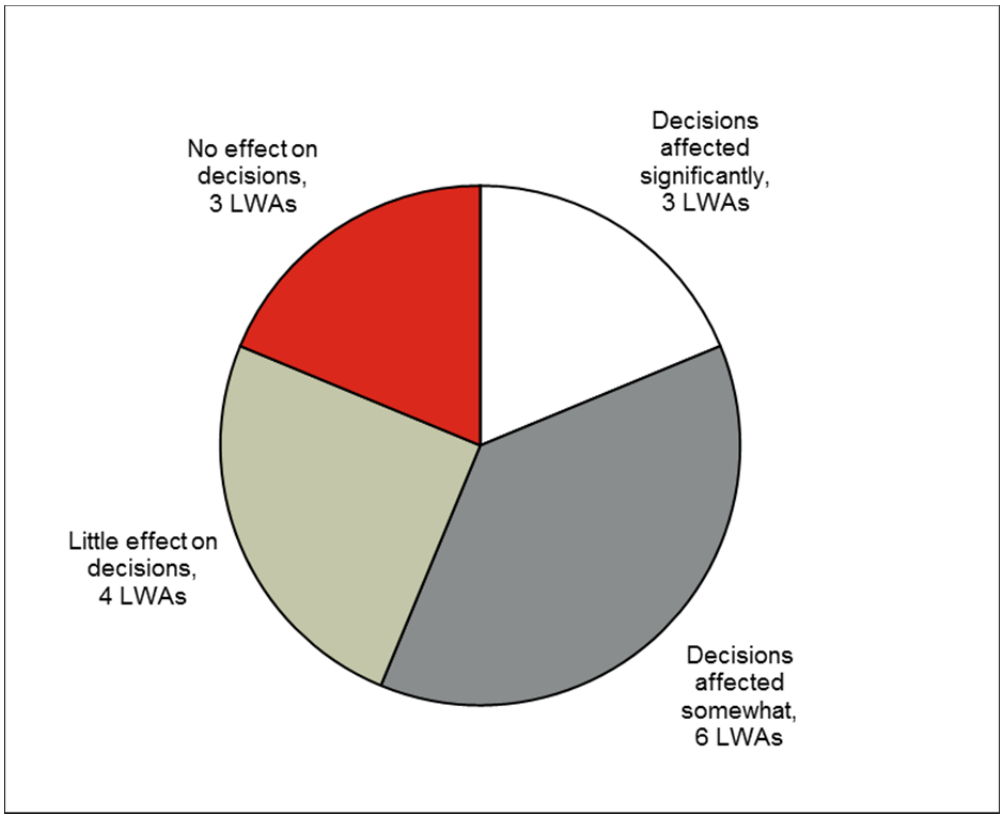
4.8.2 LWA Assessment of Package Choices and Breastfeeding Initiation

LWAs were asked whether they believed that new package options affected breastfeeding initiation. Actual WIC participant package choices are described in Chapter 7 and breastfeeding initiation is described in Chapter 8.

Fifteen agencies responded to the question; staff from these agencies most commonly said that package contents affect women's decisions somewhat (see Exhibit 4.9). Three LWAs thought the food package contents affected women's choices significant; six believed that food packages affected women's breastfeeding decisions somewhat; the remaining believed that food package options had little to no effect.

Staff from many LWAs pointed out other important influences on women's infant feeding decisions. Staff from four LWAs mentioned the general environment (e.g., hospital staff, family members) and knowledge about infant behavior and milk supply. One LWA said, "You could give them a buggyload of food and I just don't know how many more would breastfeed. It's a cultural challenge with this population." To some staff, the mother's individual motivation was viewed as the driving force behind breastfeeding above all other influences, especially for those who decide to exclusively breastfeed.

Exhibit 4.9 The Effect of Food Packages on WIC Mothers' Breastfeeding Decisions, as Reported by Local WIC Staff (Post-Implementation, 2010)



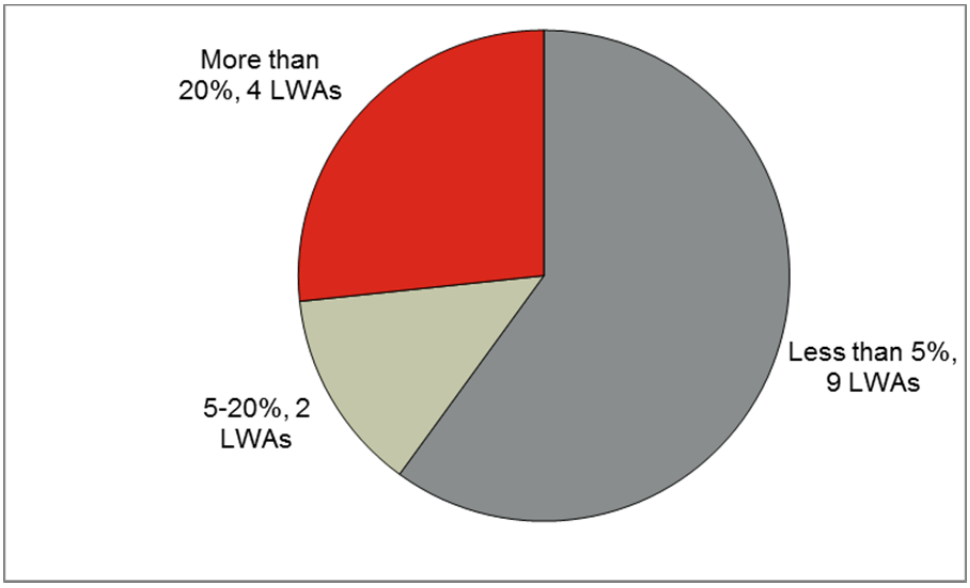
Sample: WIC staff interviews, 3-6 months after implementation of the Interim Rule, *n*=16. Data are missing from one LWA.

4.8.3 Local WIC Agency Assessment of Subsequent Package Decisions

LWAs described WIC food package changes after the initial package assignment. In particular, they were asked whether many women shift to packages that include more formula. Later, Chapter 7 discusses actual participant data on the frequency of transitions from one food package to another before and after the implementation of the Interim Rule.

LWAs provided estimates without referring to administrative data. Among the 15 LWAs that responded, staff from 9 reported that less than 5% of women changed food packages in the first month (See Exhibit 4.10). Only one of these agencies said there was a significant burden associated with participants switching packages. Four LWAs estimated that at least 20% of women changed food packages during the first month, and two of these agencies said there was a substantial administrative burden associated with switching these packages.

Exhibit 4.10 Perceived Frequency of Food Package Changes in the First Month Postpartum, as Reported by Local WIC Staff (Post-Implementation, 2010)



Sample: WIC staff interviews, 3-6 months after implementation of the Interim Rule, *n*=15. Data are missing from two LWAs.

Policies Related to Changing Food Packages

State and local agencies described their policies for women who want to change their food packages within the first month postpartum. Specifically, they spoke about situations in which mothers receive the full or partial breastfeeding package during the first month but then return to the LWA to obtain formula or more formula during the same month. LWAs' policies typically encourage and support continued breastfeeding. Later, Chapter 5 provides information from the participant survey about mothers' receipt of encouragement to breastfeed, and Chapter 9 estimates the duration of breastfeeding.

Seven States' policies required women to speak to a lactation support professional such as a lactation consultant, peer counselor, or breastfeeding educator before their packages could be changed. Five States restricted women's ability to exchange food packages depending on how many or which vouchers have been used already. One State discouraged switching packages unless there is a medical reason. One State issued formula even if the mother has already cashed the voucher for her own food package, even though this change increased the mother's benefits. Only one State had no policy, but encouraged mothers to breastfeed as long as possible. In that State, the WIC certifier does a new assessment with the participant and then the certifier decides on the food package.

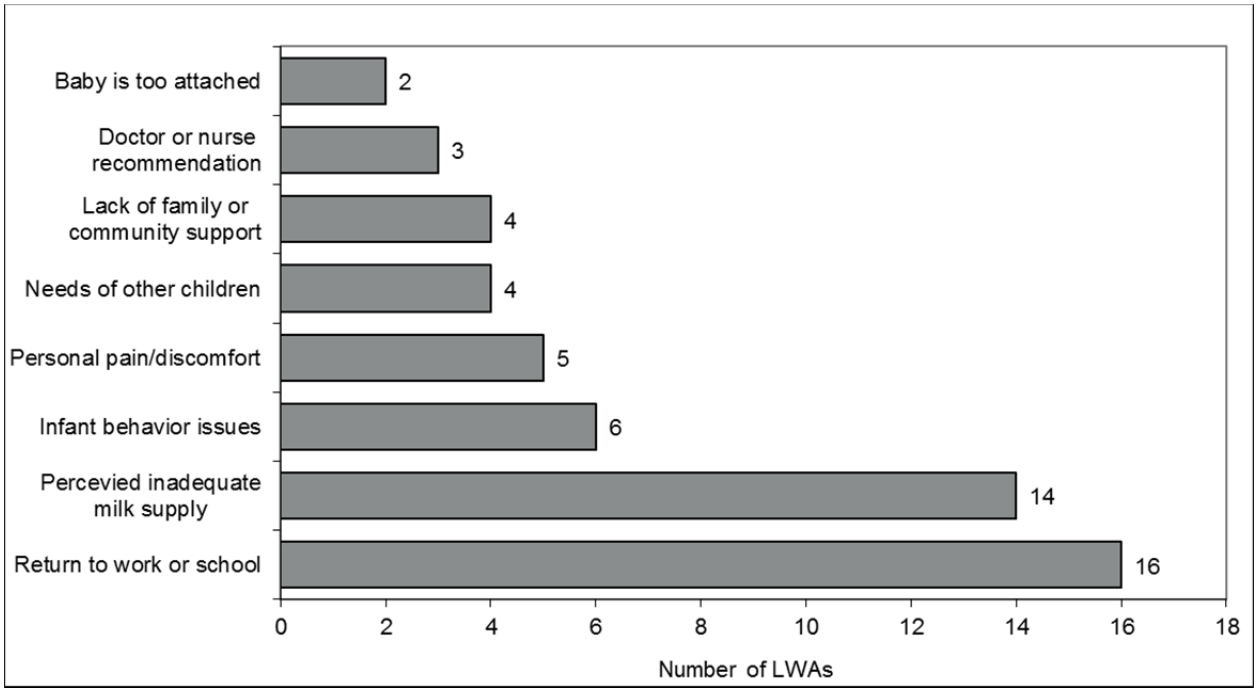
In addition to State policies, some LWAs also had their own policies regarding changing food packages. For women who wanted to change their food package, about half of the local agencies sought to address their concerns through counseling before issuing a new food package. If, after the consultation, mothers still wanted to change the food package, they could, following the State and local guidelines. Six local agencies restricted when the package change could occur based on how many or which of the woman's food vouchers had been used. One LWA did not allow women to switch food package categories within the first month postpartum, and another LWA would not add formula for one month if participants

initially certified as fully or partially breastfeeding. Three local agencies reported no policy on changing a woman's food package in the first month postpartum.

Practices in Making Food Package Decisions

The LWA staff interviews also addressed the effect of package assignment changes on breastfeeding duration. LWAs gave a range of reasons why women stop breastfeeding (Exhibit 4.11). The two most common responses were that participants were returning to work or school, and that participants perceived that they did not have a sufficient milk supply. About one third of LWAs said women's reasons included issues with infant behavior (e.g., the baby is always hungry, always eating, or always crying) or the women's pain/discomfort while breastfeeding. Other less commonly cited reasons included a perceived lack of support for breastfeeding, difficulty breastfeeding because of caring for other children, doctors' orders to increase the use of formula, and a perception that the infant was too attached.

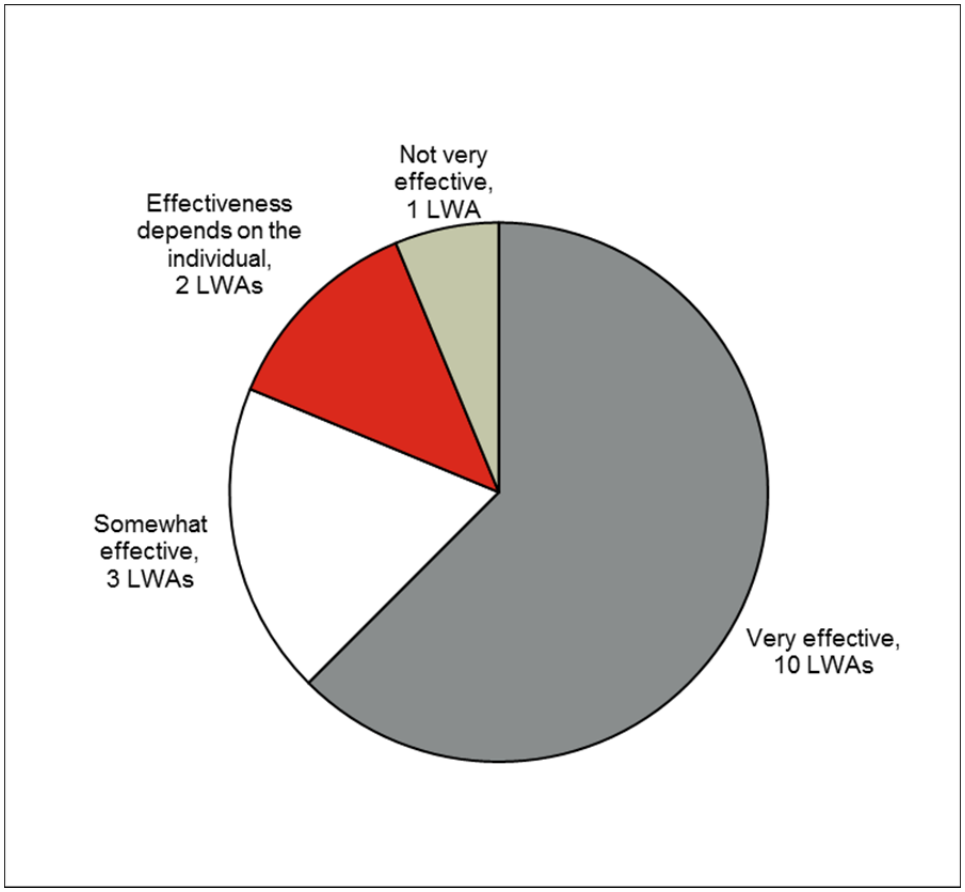
Exhibit 4.11 Reasons Why WIC Participants Stop Breastfeeding, as Reported by Local WIC Staff (Post-Implementation, 2010)



Sample: WIC staff interviews, 3-6 months after implementation of the Interim Rule, *n*=17. Data are missing from two LWAs.

Ten out of the LWAs believed that their steps to support breastfeeding were "very effective" (see Exhibit 4.12). Overall, six LWAs said that if the mother was set on formula feeding, there was nothing they could generally do to change her mind. One LWA did not comment on the effectiveness of the steps they take to help breastfeeding women with issues.

Exhibit 4.12 Effectiveness of Breastfeeding Assistance, as Reported by Local WIC Staff (Post-Implementation, 2010)



Sample: WIC staff interviews, 3-6 months after implementation of the Interim Rule, *n*=16. Data are missing from one LWA.

We will see that, in many cases, staff reports corroborate the participant experiences and outcomes reported later in Chapters 5 through 10. In other cases, staff reports differ from those of the survey respondents. Many reasons might explain such differences, including different perspectives, different reference periods for survey questions, and the fact that the staff interactions may not represent all participants. Local LWA staff and program participants themselves offer two complementary vantage points for assessing the impact of the Interim Rule on participant experiences and outcomes.

Chapter 5: Reported Influences on the Decision to Breastfeed

In this chapter, we present women's perceptions about the WIC food packages and the decision to breastfeed. The chapter draws on results from the participant surveys of WIC mothers who had initiated breastfeeding with infants aged 0-9 weeks. Looking backward to the previous chapter, these participant experiences and perceptions are compared to and contrasted with the results from WIC staff interviews (Section 4.7). Looking forward to subsequent chapters, these perceptions and experiences provide context for interpreting this study's main outcome estimates related to the issuance of WIC food packages (Chapter 7), breastfeeding initiation (Chapter 8), breastfeeding duration (Chapter 9) and intensity (Chapter 10).

This chapter is organized as follows:

- Section 5.1 describes factors that influence breastfeeding initiation.
- Section 5.2 addresses the impact of food packages on breastfeeding decisions.
- Section 5.3 discusses problems with breastfeeding initiation.
- Section 5.4 reports common reasons for introducing infant formula.

5.1 Factors that May Influence Breastfeeding Initiation

The breastfeeding initiation decision depends on mothers' beliefs, attitudes, and previous experience with breastfeeding (Section 5.1.1); it also depends on what information mothers have about breastfeeding (Section 5.1.2).

5.1.1 Mothers' Beliefs, Attitudes, and Experience

Beliefs and Attitudes

Exhibit 5.1 describes factors that influenced the survey respondent's breastfeeding initiation decision. For these mothers, who had infants aged 0-9 weeks and had initiated breastfeeding, concern about the infant's health was rated "important or very important" by the highest fraction of mothers (98.7%, post). Closeness to the infant was rated "important or very important" by the second-highest fraction (96.2%, post). By contrast, convenience was rated as "important or very important" by only 74.1% (post) of mothers. Because the participant survey was administered only to mothers who initiated breastfeeding, these responses cannot be compared to mothers who did not try to do so.

Exhibit 5.1 "Important" or "Very Important" Factors in the Decision of How to Feed their Infant

	Pre (%)	Post (%)	Diff (%)	DF [a]	Test Statistic [a]	p-value	
Burden on Self							
Convenience	78.8	74.1	-4.7	1	3.240	0.072	
Trouble-free	70.0	67.8	-2.2	1	0.229	0.632	
Going out socially without baby	33.5	22.8	-10.7	1	2.872	0.090	
Monitoring own consumption	80.9	81.1	0.2	1	0.004	0.951	
Being embarrassed in public	19.0	19.6	0.6	1	0.017	0.898	
Ease in commuting	46.2	41.8	-4.4	1	7.339	0.007	**
Losing weight	66.5	65.4	-1.1	1	0.128	0.720	
Concerns with Family							
Closeness to infant	97.8	96.2	-1.6	1	0.949	0.330	
Involvement of father or other family members	60.9	60.3	-0.6	1	0.007	0.931	
Concerns with infant							
Infant's health	97.9	98.7	0.8	1	1.742	0.187	
Monitoring infant's consumption	77.8	75.8	-2.0	1	4.000	0.035	*
	n=817	*n*=800					

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: 97.9% (pre) and 98.7% (post) of survey respondents reported that their concern for the infant's health was an "important" or "very important" factor in their decision about how to feed their infant.

Note: Mothers ranked each factor as "very important", "important", "somewhat important", and "not at all important". The fraction who reported the factors to be "important" or "very important" were combined for this Exhibit.

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001.

Previous Experience with Breastfeeding

We find that 47.3% of respondents reported that they had breastfed a baby before the current one, and 68.3% reported having been on WIC or having a family member who had been on WIC before (results not shown in table format). Furthermore, 70.0% of these mothers with infants aged 0-9 weeks who had breastfed before reported that previous experience with breastfeeding was a very important factor in their decision. [12]

Survey respondents reported being supported by people other than friends and family: 72.0% of them said they had someone other than a friend or family member help with breastfeeding when in the hospital for delivery (results not shown in table format). In addition, if mothers had questions or problems when first trying to breastfeed, 77.7% asked someone at the hospital, while 15.6% reported seeking help from a relative. Local WIC staff also reported that the support and advice of medical staff, family members, and friends are important factors in breastfeeding decisions (see Section 4.8).

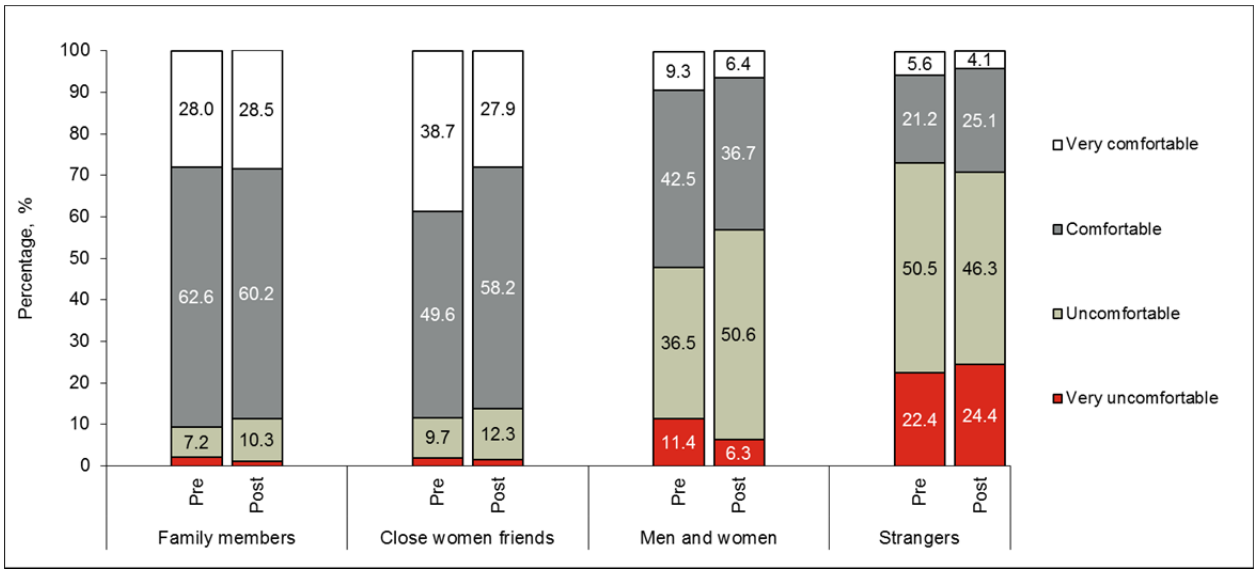
Comfort with Breastfeeding

Exhibit 5.2 presents respondents' ratings for each of the four statements about their comfort with a woman (breastfeeding in the presence of others. Nearly 90% (pre and post) of the mothers with infants aged 0-9 weeks reported being "comfortable" or "very comfortable" with a woman breastfeeding in the presence of family members and close women friends. Nearly half of respondents (43.1%, post) reported being "comfortable" or "very comfortable" with a woman breastfeeding in the presence of men and

[12] This percentage is reported for all mothers who were interviewed rather than only those who have had a baby previously. The survey does not allow us to identify first-time mothers and exclude them from estimates about previous breastfeeding experience.

women. Among all survey respondents, only 29.2 % (post) reported being "comfortable" or "very comfortable" with a woman breastfeeding in the presence of strangers (Exhibit 5.2); whereas this rate was 41.9% (post) among survey respondents who were exclusively breastfeeding at the time of the interview (Exhibit 5.3). In fact, respondents who were exclusively breastfeeding consistently expressed feeling higher comfort levels with a woman breastfeeding in the presence of others than women who were supplementing breastmilk with formula or exclusively formula feeding (Exhibit 5.3).

Exhibit 5.2 Reported Comfort Level with a Woman Breastfeeding in the Presence of Others



Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding, *n*=817 (pre) and *n*=800 (post).

Interpretation Guide: 28.0% (pre) and 28.5% (post) of survey respondents reported being "very comfortable" with women breastfeeding in the presence of family members.

Note: Mothers reported how comfortable they were with a woman breastfeeding in the presence of "family members", "close women friends", "men and women", and "strangers".

Exhibit 5.3 Percentage who Reported to be "Comfortable" or "Very Comfortable" with a Woman Breastfeeding in the Presence of Others, by Current Breastfeeding Intensity

	Pre (%)	Post (%)	Diff (%)	DF [a]	Test Statistic [a]	p-value	
Breastmilk Only							
In the presence of:							
Family members	95.6	93.5	-2.1	1	0.329	0.566	
Close women friends	96.5	89.5	-7.0	1	2.242	0.134	
Men and women	64.6	59.3	-5.3	1	0.237	0.626	
Strangers	44.6	41.9	-2.7	1	0.232	0.630	
	n=246	*n*=218					
Breastmilk and Formula							
In the presence of:							
Family members	86.5	88.1	1.6	1	0.044	0.835	
Close women friends	83.1	84.8	1.7	1	0.550	0.760	
Men and women	41.1	38.8	-2.3	1	0.194	0.660	
Strangers	22.2	26.4	4.2	1	2.617	0.106	
	n=358	*n*=365					
Formula Only							
In the presence of:							
Family members	93.4	85.9	-7.5	1	10.578	0.001	***
Close women friends	91.3	85.8	-5.5	1	0.688	0.407	
Men and women	61.9	39.1	-22.8	1	5.194	0.023	*
Strangers	23.1	24.9	1.8	1	0.038	0.845	
	n=210	*n*=217					

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: Of survey respondents who were feeding their infants breastmilk only, 44.6% (pre) and 41.9% (post) reported being "comfortable" or "very comfortable" with a woman breastfeeding in the presence of strangers.

Note: Mothers reported how comfortable they were with a mother breastfeeding in the presence of "family members", "close women friends", "men and women", and "strangers". Only mothers who reported being "comfortable" or "very comfortable" in each of the four situations were included in the analysis for this Exhibit.

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001.

5.1.2 Information about Infant Feeding

Mothers obtain information about infant feeding from many different sources, including family members, friends, medical providers, and WIC staff. WIC mothers with infants aged 0-9 weeks who had initiated breastfeeding were asked to rate the importance of information from several sources in their decision about how to feed their infant. Information from a doctor or nurse was rated important or very important by the largest fraction of mothers (90.3%, post) while information from WIC was reported to be important or very important by 85.4% (post) of mothers (see Exhibit 5.4).

Exhibit 5.4 Percentage who Reported Information from Various Sources to be "Important or Very Important" in Deciding How to Feed Their Infant

	Pre (%)	Post (%)	Diff (%)	DF [a]	Test Statistic [a]	p-value
Information from family members	74.0	71.8	-2.2	1	1.608	0.205
Information from friends	42.3	51.6	9.3	1	0.903	0.342
Information from doctor or nurse	87.3	90.3	2.4	1	2.307	0.129
Information from WIC	84.0	85.4	1.1	1	0.269	0.604
	n= 817	*n*=800				

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: 87.3% (pre) and 90.3% (post) of survey respondents reported that information from a doctor or nurse was "important" or "very important".

Note: Mothers ranked each source as "very important", "important", "somewhat important", and "not at all important". The fraction who reported the source to be "important" or "very important" were combined and reported in the Exhibit.

[a] Chi-square tests were conducted.

WIC Classes

More than three quarters of survey respondents (77.0% pre vs. 76.2% post, difference not statistically significant) decided before delivery how they wanted to feed their baby (see Exhibit 5.5). Of these mothers, 24.0% (post) reported to be exclusively breastfeeding their infants. This contrasts with 10.3% (post) of mothers who decided how to feed their infants at the hospital (see Exhibit 5.6). Therefore, WIC classes offered during pregnancy present an opportunity to inform women's breastfeeding and food package decisions. Respondents were about four months pregnant, on average, when they first received WIC and about six months pregnant when they learned about breastfeeding in a WIC class. Participation in WIC classes increased after implementation of the Interim Rule (39.8% pre and 48.5% post; $p<0.001$) (Exhibit 5.7). The percentage of WIC class attendees who reported discussing differences in the food packages increased slightly (76.9% pre to 80.5% post, difference is not statistically significant). Most WIC class attendees reported that the classes discussed proper positioning for breastfeeding (96.1% pre and 94.2% post), how to determine if the baby is getting enough breastmilk (83.2% pre and 81.5% post) and who to call in case of a problem (77.8% pre and 83.5% post). The classes also discussed storing breastmilk, establishing supply, obtaining a breast pump, and the benefits of feeding their infants breastmilk. Most mothers (81.1% pre and 83.2% post) reported that they were encouraged by WIC to breastfeed (result not shown in table format).

Exhibit 5.5 Timing of Decision about How to Feed Their Infant

	Pre (%)	Post (%)	Diff (%)	DF [a]	Test Statistic [a]	p-value
				2	5.022	0.081
Before birth	77.0	76.2	-0.8			
At hospital	19.9	16.2	-3.8			
After returning home	3.1	7.6	4.5			
	n=813	*n=798*				

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: 77.0% (pre) and 76.2% (post) of survey respondents decided how to feed their infant before the infant was born.

[a] A Chi-square test was conducted.

Exhibit 5.6 Current Breastfeeding Intensity, by Timing of Decision about How to Feed Their Infant

	Pre (%)	Post (%)	Diff (%)	DF [a]	Test Statistic [a]	p-value
Before Birth				2	0.153	0.927
Breastmilk only	22.5	24.0	1.5			
Breastmilk and formula	54.6	53.5	-1.1			
Formula only	22.8	22.5	-0.3			
	n=678	*n*=657				
At the Hospital				2	3.535	0.171
Breastmilk only	5.0	10.3	5.3			
Breastmilk and formula	41.5	55.1	13.6			
Formula only	53.5	34.5	-19.0			
	n=97	*n*=106				
After Returning Home				.	.	.
Breastmilk only	3.4	0.0	-3.4			
Breastmilk and formula	73.3	29.6	-43.7			
Formula only	23.4	70.4	47.0			
	n=35	*n*=35				

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: Of survey respondents who decided before the infant's birth how to feed their infant, 22.5% (pre) and 24.0% (post) fed the infant breastmilk only.

[a] Chi-square tests were conducted. Missing values indicate that the test could not be estimated.

Exhibit 5.7 Attendance and Content of WIC Classes

	Pre (%)	Post (%)	Diff (%)	DF [a]	Test Statistic [a]	p-value	
Attended WIC class where breastfeeding was discussed	39.8	48.5	8.7	1	17.390	<0.001	***
Average months in pregnancy when first took WIC class	5.8	6.2	0.4	609	-3.010	0.003	**
	n=711	*n* =711					
Topics covered in WIC class							
Proper positioning for breastfeeding	96.1	94.2	-1.9	1	1.195	0.274	
How to tell if the infant is getting enough breastmilk	83.2	81.5	-1.7	1	0.185	0.667	
Differences in the food you get from WIC depending on choice about breastfeeding	76.7	80.5	3.8	1	0.410	0.522	
Who to call if problems with breastfeeding occur	77.8	83.5	5.7	1	2.309	0.129	
	n =323	*n* =324					

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: 39.8% (pre) and 48.5% (post) of survey respondents attended a WIC class where breastfeeding was discussed. Of these mothers who took a WIC class, 96.1% (pre) and 94.2% (post) reported that proper positioning for breastfeeding was discussed.

[a] *t*-tests were conducted for continuous variables (average months in pregnancy) and Chi-square tests were conducted for all others. The *t*-statistic is the reported test statistic for *t*-tests and the Chi-square statistic is the reported test statistic for Chi-square tests. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001.

Local Hospital Practices

Hospitals' provision of free formula may influence mothers' decisions about how to feed their newborns. In the United States, many hospitals provide free formula to new mothers (see Section 1.3.1). In keeping with this fact, only 5 of 16 LWAs reported that few or no hospitals in their catchment area refrain from providing formula at hospital discharge (See Section 3.2). In addition, the practice may influence mothers who initiated breastfeeding to supplement with formula in the first few days after birth, before their milk supply has been established.

Exhibit 5.8 Percentage Receiving Formula from Hospital at Discharge, by Current Breastfeeding Intensity

	Pre (%)	Post (%)	Diff (%)	DF [a]	Test Statistic [a]	p-value
Breastmilk only	55.9 *n*=246	60.3 *n*=218	4.4	1	0.298	0.585
Breastmilk and formula	80.2 *n*=358	83.6 *n*=365	3.4	1	0.386	0.534
Formula only	91.1 *n*=209	85.7 *n*=217	-6.4	1	2.773	0.096
Overall	79.0 *n*=816	79.5 *n*=800	0.5	1	0.020	0.889

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: Of survey respondents who fed their infant breastmilk only, 55.9% (pre) and 60.3% (post) reported having received formula from the hospital at discharge.

[a] Chi-square tests were conducted.

Overall, 79.5% (post) of the survey respondents reported receiving formula when they left the hospital, but these reports varied by the respondents' current breastfeeding practices (Exhibit 5.8). Among mothers who reported feeding their infants only breastmilk at the time of the survey, 60.3% (post) reported receiving formula when leaving the hospital as compared with 85.7% (post) of mothers who were feeding their infants only formula at the time of the survey.

5.2 Reported Impact of Food Packages on Breastfeeding

In choosing a WIC food package, a mother might consider the amount of formula she could receive for her infant and the amount and types of food she, herself, would receive. Local WIC staff stressed the increased benefits to the mother if she chose less formula, and staff from 9 of 16 LWAs believed breastfeeding decisions were affected "somewhat" or "significantly" by food package options (see Section 4.8). Even more survey respondents agreed: 80.0% (post) reported that the food packages offered had either a "very important" or "somewhat important" impact on their decision about breastfeeding (see Exhibits 5.9a and 5.9b).[13] Mothers surveyed before the implementation of the Interim Rule reported the importance of the mother's food package only.

[13] Information about actual package choices is presented in Section 7.1.

Exhibit 5.9a Reported Impact of Mother's Package on the Decision to Breastfeed (Pre-Implementation, 2009)

	Percentage (%)
Very important	71.3
Somewhat important	13.6
Not very important	7.0
Not important at all	8.0
	n=780

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: 71.3% (pre) of survey respondents reported that the mother's food package received from WIC had a "very important" impact on their decision to breastfeed.

Exhibit 5.9b Reported Impact of Mother and Infant's Packages on the Decision to Breastfeed (Post-Implementation, 2010)

	Percentage (%)
Very important	60.8
Somewhat important	19.2
Not very important	9.7
Not important at all	10.2
	n=786

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: 60.8% (post) of survey respondents reported that the mother and infant food packages received from WIC had a "very important" impact on their decision to breastfeed.

Although survey respondents thought the food package options were important in their decision-making, responses to other survey questions suggest that they did not fully understand the food package contents. Only 47.5% (post) mothers knew that the mother's full breastfeeding package includes more food than the mother's full formula package (see Exhibit 5.10). Fewer mothers could identify the food items that differentiated the food packages. When asked about the food items that she would receive if she were partially breastfeeding as compared to formula feeding only, 73.1% (post) could not correctly identify any of the food items.

Exhibit 5.10 Knowledge of Mother and Infant Food Packages

	Pre (%)	Post (%)	Diff (%)	DF [a]	Test Statistic [a]	p-value	
Mother's Food Package							
Aware of any differences, %	62.5	62.6	0.6	1	1.344	0.511	
Knows that the full breastfeeding package has more food than the full formula package	48.3	47.5	-0.8	1	0.039	0.843	
Cannot identify any food item in the full breastfeeding package that is not in the full formula package	70.7	73.1	2.4	1	0.163	0.686	
Can identify all three food items in the full breastfeeding package that are not in the full formula package	5.3	2.5	-28	1	4.352	0.037	*
Infant's Food Package							
Aware of any differences, %	n/a	50.9					
Knows that much more formula is provided in the full formula package than the partial breastfeeding package during the birth month	n/a	13.4					
Knows that the full formula package has twice as much formula than the partial breastfeeding package for infants aged 2 - 6 months	n/a	15.2					
	n=817	*n*=800					

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: 48.3% (pre) and 47.5% (post) of survey respondents knew that the full breastfeeding package has more food than the full formula package.

Note: The food items included in the full breastfeeding package but not in the full formula package are canned fish, peanut butter and carrots.

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001.

In addition to not understanding the content or amounts in the maternal food packages, many survey respondents also did not fully understand the infant formula packages. After the implementation of the Interim Rule, only half (50.9%) of mothers reported being aware of a difference in the amount of formula in the full formula and partial breastfeeding packages (see Exhibit 5.9).

5.3 Problems with Breastfeeding

Approximately 53.7% (post) of the survey respondents reported problems when they first tried to breastfeed (see Exhibit 5.11). Such problems often contribute to decisions to either supplement breastmilk with formula or exclusively formula feed. Findings on actual breastfeeding duration and intensity are reported in Chapters 8 and 9 respectively.

The most commonly reported problem when respondents first tried to breastfeed was that the baby had trouble sucking or latching on. More than a third of the mothers with infants aged 0-9 weeks reported this problem both in the pre- and post-implementation periods (no statistically significant difference). Mothers also commonly reported that they did not have enough milk (12.4%, post) or that breastfeeding was too painful or uncomfortable (12.2%, post). In open responses, women alluded to other issues that may be

addressed by WIC education and program support. One woman reported that "the baby did not want to nurse" and another reported that she "didn't know if she was supposed to burp or not and how the pump worked." Respondents who only fed their infants formula were more likely to report the following problems: baby had trouble sucking/latching on (45.2%, post), did not have enough milk (17.5%, post), and too painful or uncomfortable (19.0%, post) (results not in table format).

Exhibit 5.11 Reported Having Questions or Problems with Breastfeeding Initiation

	Pre (%)	Post (%)	Diff	DF[a]	Chi-Square[a]	p-value	
Infant had trouble sucking or latching on	33.4	37.6	4.2	1	2.238	0.135	
Breastmilk alone did not satisfy infant	6.3	4.40	-1.9	1	0.816	0.366	
Infant not gaining enough weight	1.9	3.80	1.9	1	7.523	0.006	**
Did not have enough milk	14.7	12.4	-2.4	1	0.937	0.333	
Too painful or uncomfortable	22.8	12.2	-10.6	1	1.236	0.266	
No problems reported	55.4	53.7	-1.7	1	0.103	0.749	
	n=817	*n*=800					

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: 33.4% (pre) and 37.6% (post) of survey respondents reported that their infant had trouble sucking or latching on.

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001.

5.4 Common Reasons for Introducing Formula

Subsequent to breastfeeding initiation, mothers must make important decisions about whether to introduce infant formula and when to do so. Exhibit 5.12 presents common reasons respondents who fed their baby formula gave for this decision. Mothers could report more than one reason. The most common reasons were mothers' perception that she did not have enough milk or that the infant was not getting enough to eat (26.3%, post), the baby had trouble latching on (20.9% post), breastmilk alone did not satisfy the baby (17.6%, post), and breastfeeding was too painful or uncomfortable (11.4%, post). Some mothers may not be aware that breastmilk alone without supplementation is sufficient for most young infants.

Exhibit 5.12 Reasons Why Mothers Started Feeding Their Infant Formula

	Pre (%)	Post (%)	Diff	DF[a]	Chi-Square[a]	p-value	
Infant not gaining enough weight	1.5	2.2	-0.6	1	0.865	0.354	
Breastmilk alone did not satisfy infant	20.2	17.6	-2.5	1	0.151	0.697	
Infant had trouble sucking or latching on	19.6	20.9	0.7	1	0.087	0.768	
Mother didn't have enough milk for infant	26.5	26.3	-3.4	1	0.001	0.975	
Mother started a job or returned to work	5.4	9.9	-4.5	1	3.916	0.048	*
Mother needed to leave my baby for several hours at a time	12.3	6.9	2.1	1	3.045	0.081	
Breastfeeding was too inconvenient	3.4	0.8	3.5	1	3.141	0.076	
Breastfeeding was too painful or uncomfortable	15.2	11.4	-2.2	1	0.323	0.570	
Mother wanted someone else to feed infant	2.1	4.7	-0.1	1	6.349	0.012	*
Mother thought that difference between breastmilk and formula did not matter because infant was older	0.0	0.0	0.0	1	.	.	
	n=571	*n*=582					

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: Of survey respondents who started feeding their infants formula, 1.5% (pre) and 2.2% (post) reported that formula was introduced because the infant was not gaining enough weight.

Note: The sample for this Exhibit was restricted to mothers who were not feeding their infants only breastmilk at the time of the interview.

[a] Chi-square tests were conducted. Missing values indicate that the test could not be estimated. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001.

Mothers who were no longer breastfeeding at the time of the interview cited several reasons for the decision to begin formula. Compared to survey respondents who supplemented breastmilk with formula, mothers who had stopped breastfeeding entirely were more likely to report that the baby had trouble sucking or latching on (31.5% versus 15.2%), or breastfeeding being too painful or uncomfortable (21.0% versus 6.2%) in the post-implementation period. Mothers feeding their infants both breastmilk and formula were more likely to report a return to work (11.8% versus 6.4%, post) (Exhibit 5.13).

Most of these findings are consistent with reports from local WIC staff (see Section 4.8) about reasons why mothers introduce formula. However, local WIC staff in 16 of the 17 LWAs cited return to work or school as the most important reason that mothers begin using formula, while only 5.5% (post) of survey respondents indicated this reason for starting formula. One likely reason for this difference is that LWA staff may not be focusing only on the early weeks after birth, when mothers were surveyed. Return to work may become an increasingly common reason for introducing formula as infants get a little older.

Exhibit 5.13 Reasons Why Mothers Started Feeding Their Infant Formula, by Breastfeeding Intensity

	Pre (%)	Post (%)	Diff (%)	DF [a]	Test Statistic [a]	p-value	
Breastmilk and Formula							
Baby not gaining enough weight	1.3	2.8	1.4	1	3.372	0.066	
Breastmilk alone did not satisfy infant	26.4	21.7	-4.7	1	0.518	0.472	
Infant had trouble sucking or latching on	16.3	15.2	-1.0	1	0.055	0.814	
Mother didn't have enough milk	28.4	26.6	-1.7	1	0.227	0.634	
Mother started a job or returned to work	4.2	11.8	7.7	1	9.795	0.002	**
Mother needed to leave infant for several hours at a time	18.9	8.9	-9.9	1	2.461	0.117	
Breastfeeding was too inconvenient	2.6	0.6	-2.0	1	2.224	0.136	
Breastfeeding was too painful or uncomfortable	5.4	6.2	0.7	1	0.103	0.748	
	n= 358	*n= 365*					
Formula Only							
Baby not gaining enough weight	1.7	1.1	-0.6	1	0.272	0.602	
Breastmilk alone did not satisfy infant	9.3	10.2	0.9	1	0.018	0.895	
Infant had trouble sucking or latching on	25.8	31.5	5.7	1	0.480	0.488	
Mother didn't have enough milk	23.3	25.8	2.5	1	0.070	0.778	
Mother started a job or returned to work	7.8	6.4	-1.4	1	0.070	0.790	
Mother needed to leave infant for several hours at a time	0.3	3.1	2.8	1	3.570	0.059	
Breastfeeding was too inconvenient	5.0	1.1	-3.9	1	2.707	0.100	
Breastfeeding was too painful or uncomfortable	33.1	21.0	-12.1	1	0.657	0.418	
	n= 210	*n= 217*					

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: Of survey respondents feeding their infant both breastmilk and formula, 5.4% (pre) and 6.2% (post) reported breastfeeding to be too painful or uncomfortable.

Note: The sample for this Exhibit is restricted to mothers who were not feeding their infants only breastmilk.

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001.

Returning to Work

The participant surveys provided further detail about the prevalence of non-maternal child care and employment, as well as efforts to continue breastfeeding after returning to work. Almost a third of mothers (32.5%, post) reported that someone else took care of the baby for more than three hours at a time in the past week. By design, survey respondents had very young infants; the average infant age at the time of the interview was 4.6 weeks. Even so, 20.2% of the mothers surveyed before implementation and 13.3% of mothers surveyed after implementation were already back to work. This difference (p=.07) approached conventional levels for statistical significance. Among working mothers surveyed, 47.5% (post) reported their employer to be "very supportive" of breastfeeding and 27.4% reported their employer to be "somewhat supportive". Some working mothers (13.9%, post) reported breastfeeding during the workday, while other working mothers (34.3%, post) reported pumping and storing milk to feed the baby later. (Results in this paragraph are not reported in table format.)

Chapter 6: WIC Participation Patterns and Characteristics of WIC Mothers

Chapter 6 is the first of five chapters with results for the study's main outcomes. This chapter describes pre/post changes in WIC participation patterns and characteristics of WIC mothers (Domain 1). It uses data from both administrative records and participant surveys.

This analysis is helpful for two reasons. First, the main finding that participation patterns were unchanged offers reassurance that later estimates of pre/post differences reflect real changes in outcomes and not just changes in the characteristics of participants. Second, this analysis provides background information on the demographic and economic characteristics of WIC participants in advance of the main analyses for the remaining domains in Chapters 7-10.

The chapter is organized in two sections:

- Section 6.1. WIC participation patterns and characteristics of WIC mothers in the administrative records sample, and
- Section 6.2. Characteristics of WIC mothers in the participant survey sample.

6.1 WIC Mothers, Administrative Records

6.1.1 Characteristics of WIC Mothers with Infants in Birth Month

Based on administrative records, this section describes demographic and economic characteristics of WIC mothers with infants under age 1 month, both before and after implementation of the Interim Rule (see Exhibit 6.1). We find no major changes from the pre- to post-implementation period. While some pre/post differences in the characteristics of WIC mothers were statistically significant, these differences were small. Because the sample sizes in the administrative records are very large, it is possible for some results to be statistically significant and yet small in practical magnitude. We conclude that the population of mothers receiving WIC post-implementation was not different from the population being served before implementation of the Interim Rule.

Approximately half of WIC mothers with infants in the birth month are Hispanic (48.8%, post); approximately one-quarter are non-Hispanic black (25.0%, post); 10.7% are non-Hispanic white, and 5.7% are another race/ethnicity.

Fewer than a third of these WIC mothers were recorded in the administrative records as participating in SNAP (29.5%, post). Similar results for SNAP participation were found in WIC Participant Characteristics data for 2008 (USDA/FNS, 2010). That report suggested three reasons for this fairly low SNAP participation rate: (a) the administrative records are missing SNAP participation data for 6.2% of WIC participants, (b) constraints in WIC management information systems may lead to some undercounting SNAP participation, and (c) WIC participants may begin SNAP participation at a later date.[14]

[14] Despite the possibility of some underreporting in SNAP participation, later multivariate analyses use the administrative records as the source for the SNAP explanatory variable. Measurement error in this variable may

Nearly three quarters of WIC mothers indicated at certification that they were receiving Medicaid (72.9%, post), while only 5.1% of WIC mothers indicated that they were receiving TANF. Average household income, as a percentage of the Federal Poverty Level, was 65.3% (post) and average household size was four persons.

Exhibit 6.1 Comparison of WIC Mothers With Infants in Birth Month

	Pre	Post	Diff	DF [a]	Test Statistic [a]	p-value	
Race/Ethnicity				3	29.7	<0.001	***
		48.8%	-1.4%				
Hispanic	50.3%						
White	10.4%	10.7%	0.3%				
Black	22.9%	25.0%	2.1%				
Other	5.6%	5.7%	0.1%				
Program Participation							
TANF	5.2%	5.1%	-0.1%	1	0.428	0.513	
SNAP	29.0%	29.5%	0.5%	1	0.173	0.678	
Medicaid	73.8%	72.9%	-0.9%	1	0.264	0.608	
Income (% Federal Poverty Level)	66.7	65.3	-1.4	1	3.570	0.000	***
Household Size	4.0	4.0	0.0	1	-1.190	0.235	
	n=19,592	*n*=70,945					

Sample: Administrative records, all dyads with infants in birth month in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: 50.3% (pre) and 48.8% (post) of WIC mothers are Hispanic. The pre/post difference in race / ethnicity composition is statistically significant (p<0.001).

[a] *t*-tests were conducted for continuous variables (income and household size) and Chi-square tests were conducted for all others. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, ***p<0.001.

6.1.2 Patterns of Participation in the WIC Program

Patterns of participation in the WIC program also appeared to remain stable after implementation of the Interim Rule. Because the administrative records only include WIC participants, we cannot estimate either the percentage of eligible pregnant women or new mothers who enroll in WIC. However, we were able to estimate the post-partum WIC re-enrollment rate among pregnant WIC participants (Exhibit 6.2a). Specifically, we estimated the percentage of pregnant WIC participants with a due date in the following month who enrolled their newborn infant in WIC, became certified as breastfeeding or postpartum, or remained certified as pregnant after the birth of the newborn. This re-enrollment rate was not significantly different after the policy change, 86.1% (pre) and 85.3% (post).

cause bias in the corresponding coefficient estimate. However, because program participation is uncorrelated with time period (pre and post), our assessment is that this measurement error is unlikely to cause bias in the main estimates of pre/post changes.

Exhibit 6.2a WIC Re-Enrollment Rate Among Mothers Who Participated in WIC During Pregnancy

Pre (%)	Post (%)	Diff (%)	DF [a]	Test Statistic [a]	p-value
86.1 *n*=12,088	85.3 *n*=10,640	-0.8	1	0.209	0.647

Sample: Administrative records, pregnant mothers receiving WIC during analysis month 1 or 10 with due date or birth in the following month.

Interpretation Guide: Among mothers receiving WIC during pregnancy, 86.1% (pre) and 85.3% (post) re-enrolled in WIC after the birth of the infant.

[a] A Chi-square test was conducted.

Likewise, for WIC infants under two months of age, there was no change in the percentage with mothers who did not participate in WIC during pregnancy. About one quarter of WIC infants under age two months had mothers who did not participate in WIC when pregnant (Exhibit 6.2b).

Exhibit 6.2b Percentage of WIC Infants with Mothers who did not Participate in WIC during Pregnancy

Pre (%)	Post (%)	Diff (%)	DF [a]	Test Statistic [a]	p-value
25.6 *n*=21,969	24.5 *n*=18,038	-1.2	1	0.611	0.434

Sample: Administrative records, all dyads with infants in birth month in analysis months 2 or 3 (pre) and analysis months 11 or 12 (post), and infants aged 1 month in analysis month 3 (pre) and analysis month 12 (post).

Interpretation Guide: Among WIC infants under age 2 months, 25.6% (pre) and 24.5% (post) had mothers who did not participate in WIC when pregnant.

[a] A Chi-square test was conducted to determine if the difference was statistically significant.

Finally, for WIC infants, the age of first certification did not change, pre- and post-implementation (Exhibit 6.3). Most WIC infants were certified during their birth month: 84.0% (pre) and 83.4% (post).

Exhibit 6.3 Age When Infants Were First Certified, Overall

	Pre (%)	Post (%)	Diff (%)	DF [a]	Chi-Square [a]	p-value
Age (in months)						
Overall				6	4.748	0.577
0	84.0	83.4	-0.6			
1	11.2	11.9	0.7			
2 to 6	4.8	4.7	-0.3			
	n=72,753	*n*=71,997				

Sample: Administrative records, all dyads with infants aged 0-5 months in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: 84.0% (pre) and 83.4% (post) of WIC infants were certified during the birth month

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001.

6.2 WIC Mothers, Participant Survey

This section describes characteristics of WIC mothers who completed the participant survey and assesses differences in the characteristics of survey respondents before and after implementation of the Interim Rule. We conclude that there are no major differences. Again, the results of this analysis offers reassurance that any differences in outcomes reported in later chapters do not merely reflect differences in the characteristics of mothers who participated in the WIC program pre and post.

Demographic characteristics of the survey respondents were the same before and after implementation (Exhibit 6.4), with the exception of the percentage of WIC mothers missing data on household income. A greater percentage of WIC mothers were missing data on income after implementation of the Interim Rule (24.0%, pre versus 36.9%, post). Consistent with the results in Section 6.1, nearly half of survey respondents were Hispanic (46.8%, post), followed by non-Hispanic black (38.2%, post).

Exhibit 6.4 Characteristics of WIC Mothers, as Reported in the Participant Surveys

	Pre	Post	Diff	DF [a]	Test Statistic [a]	p-value	
Race/Ethnicity				3	0.253	0.839	
Hispanic	51.4%	46.8%	-4.6%				
White	8.3%	9.4%	1.1%				
Black	31.9%	38.2%	6.3%				
Other/Not reported	8.4%	5.6%	-2.8%				
SNAP Participation				2	1.421	0.491	
Yes	40.9%	48.2%	7.3%				
No	39.1%	27.7%	-11.4%				
Not reported	20.1%	24.1%	4.0%				
TANF Program Participation				2	0.663	0.729	
Yes	16.7%	12.6%	-4.1%				
No	63.2%	63.2%	0.0%				
Not reported	20.1%	24.1%	4.0%				
Employed	20.2%	13.3%	-6.9%	1	3.231	0.072	
Education level				4	6.407	0.171	
Less than high school	32.4%	28.6%	-3.9%				
High school degree	31.7%	37.4%	5.7%				
Some college	28.7%	28.4%	-0.4%				
College degree or more	7.0%	5.6%	-1.4%				
Not reported	0.2%	0.0%	-0.2%				
Income (% Federal Poverty Level) [b]	60.7	64.0	-5.8		1.23	0.217	
Household Income not Reported, % [b]	24.0%	36.9%	12.9%	1	4.504	0.034	*
Single Adult in Household	19.8%	14.5%	-5.4%	1	2.321	0.128	
	n=817	*n*=800					

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: 20.2% (pre) and 13.3% (post) of survey respondents were employed.

[a] *t*-tests were conducted for continuous variables (income) and Chi-square tests were conducted for all others. *t*-statistics are the reported test statistic for *t*-tests and the Chi-square statistic is the reported test statistic for Chi-square tests. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001. [b] Estimated from administrative records.

Fully 48.2% of participants in the survey reported SNAP participation (post), which is substantially larger than the 29.5% estimate obtained from the administrative records (see Section 6.1). As noted earlier, it is possible that the administrative records under-estimate SNAP participation among WIC participants. The percentage receiving SNAP in the sample increased from 40.9% (pre) to 48.2% (post), a change that is consistent with national trends but was not statistically significant (p-value = 0.491).

The average household income among survey respondents was 64.0% of the Federal Poverty Level (post). There were 14.5% of respondents (post) living in single adult households, and 13.3% (post) who were employed. One quarter of WIC mothers surveyed did not have a high school degree (28.6%, post); approximately one third had a high school degree (37.4%, post); another 28.4% (post) had some college education, and the remaining 5.6% had a college degree or more education.

Chapter 7: Food Packages and Infant Formula Amounts

Chapter 7 is the second of five chapters with results for the study's main outcomes. This chapter describes the study's main results for pre/post changes in food packages (Domain 2a) and infant formula amounts (Domain 2b). These outcomes are measured using administrative records. Because the administrative records offer very large sample sizes, some results in this chapter may be statistically significant even when they are small in practical magnitude, as will be noted in the accompanying discussion. Other results are both statistically significant and large in practical magnitude.

The key finding about WIC food package assignments is that, after implementation of the Interim Rule, the fraction of dyads with the partial breastfeeding package decreased, while the fraction with either the full breastfeeding or full formula package increased. The key finding about WIC infant formula amounts is that the average formula quantity did not decrease after implementation as hoped.

The results for WIC food package assignments (Domain 2a) are organized in five sections:

- 7.1. Pre/post comparison,
- 7.2. Pre/post comparison by stratum,
- 7.3. Trends over time,
- 7.4. Multivariate analysis, and
- 7.5. Transition dynamics.

The results for infant formula amounts (Domain 2b) are organized in three sections:

- 7.6. Pre/post comparison,
- 7.7. Trends over time, and
- 7.8. Transition dynamics.

7.1 Pre/Post Comparison, Package Assignments (Domain 2a)

To improve nutrition and promote breastfeeding, the Interim Rule made several changes to the WIC food packages (see Section 1.4). Among other changes, the amount of formula in the partial breastfeeding package was markedly reduced, limited to 45% of the maximum formula amount for infants aged 1-3 months. Women who requested more than this reduced amount would be issued the full formula package.

Based on analysis of administrative records, food packages issued to WIC mothers differed substantially from before to after implementation of the Interim Rule.

Mothers' Food Packages Issued During the Birth Month

First, among mother-infant pairs (or "dyads") with infants in their birth month (see Exhibit 7.1 and the first two columns of Exhibit 7.2), the mothers' food packages changed as follows:

- the percentage receiving the full breastfeeding package increased 7.3 percentage points from 9.8% (pre) to 17.1% (post);
- the percentage receiving the partial breastfeeding package decreased 10.9 percentage points from 24.7% (pre) to 13.8% (post);

- the percentage receiving the full formula package increased 8.0 percentage points from 20.5% (pre) to 28.5% (post).

In each LWA, the implementation date is at the start of analysis month 4, (i.e., the 4th of the 12 months for which we have administrative records). In these exhibits, the pre-implementation period is analysis months 1-2 and the post-implementation period is analysis months 5-12. Analysis months 3 and 4 were dropped as transitional months (see Chapter 2 for complete discussion of data and methods).

Exhibit 7.1 Food Packages Issued to Mothers with Infants in Birth Month

	Pre (%)	Post (%)	Diff (%)	DF [a]	Chi-Square [a]	p-value	
				5	20.9	<0.001	***
Full breastfeeding package	9.8	17.1	7.3				
Partial breastfeeding package	24.7	13.8	-10.9				
Full formula package	20.5	28.5	8.0				
Pregnant package [b]	33.1	29.1	-4.0				
Not receiving WIC [c]	11.4	10.8	-0.6				
Food package unknown	0.7	0.7	0.0				
	n=18,864	*n*=69,387					

Sample: Administrative records, all dyads with infants in birth month in analysis months 1-2 (pre) and analysis months 5-12 (post).

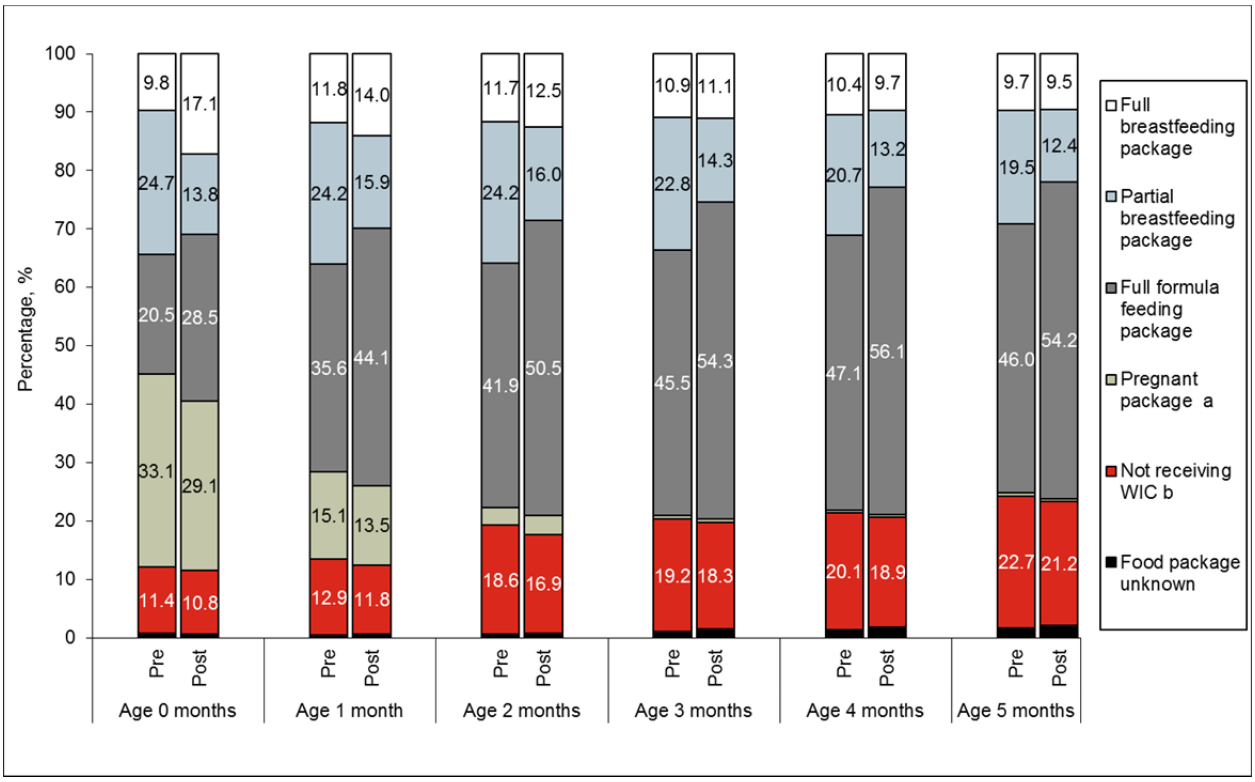
Interpretation Guide: Among dyads whose infants were in their birth month, 9.8% (pre) and 17.1% (post) received the full breastfeeding package as the mother's WIC food package. The overall changes in food packages issued were statistically significant (p<0.001).

[a] An overall Chi-square test was conducted. Stars indicate statistical significance of difference between pre and post: *p<0.05, **p<0.01, *** p<0.001. The row-specific pre/post differences were also statistically significant. [b] Mothers who have not recertified postpartum, but who have infants who have been certified. [c] Mothers with infants certified for WIC.

In Exhibits 7.1 and 7.2, there are some dyads with no mother record (the mother is "not receiving WIC"), and some dyads where the mother still received the pregnant package for a short time after the infant was born ("pregnant package"). Both conditions happen less frequently as the child gets older and more mothers receive a new postpartum WIC package of their own. The WIC package for mothers certified as pregnant has the same numbered designation as the package for mothers who are certified as partially breastfeeding (Package V in both cases). Nevertheless, we treat these as two separate categories, because they may be accompanied by different formula amounts and may have different breastfeeding outcomes.

After implementation, WIC mothers of infants in the birth month less commonly received the partial breastfeeding package, moving in greater numbers to the two more decisive package options: the full breastfeeding package and full formula package. The policy significance of this change in WIC package assignments depends on whether it is associated with changes in infant formula amounts and breastfeeding outcomes. Corresponding changes in actual formula amounts are discussed in Section 7.2, while breastfeeding outcomes are discussed in Chapters 8 to 10.

Exhibit 7.2 Food Packages Issued to New Mothers, by Age of Infant



Sample: Administrative records, all dyads with infants aged 0 to 5 months, *n*=129,606 (pre) and *n*=528,597 (post) in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: Among dyads whose infants were in their birth month, 9.8% (pre) and 17.1% (post) received the full breastfeeding package as the mother's WIC food package.

[a] Mothers with infants certified for WIC. [b] Mothers who have not recertified postpartum, but who have infants who have been certified.

Food Packages Issued when Infants are 1-5 Months Old

Among dyads with infants aged 1-5 months (Exhibits 7.2 and 7.3), the mothers' food packages changed as follows:

- the percentage receiving the full breastfeeding package as the mothers' WIC package increased from pre to post, for dyads with infants aged 1-2 months (there was no substantial pre/post change for dyads with infants aged 3-5 months old[15]);
- the percentage receiving the partial breastfeeding package as the mothers' WIC package decreased from pre to post, for all dyads with infants aged 1-5 months old; and
- the percentage receiving the full formula package as the mothers' WIC package increased from pre to post, for all dyads with infants aged 1-5 months old.

[15] The pre/post changes were statistically significant, even for dyads with infants aged 3-5 months old, because of the large sample sizes in this analysis. However, the changes in the full breastfeeding package for dyads with infants in this age group were smaller than a single percentage point, and too small to have practical significance.

Dyads with infants aged 1-2 months showed the same general pattern that was observed for dyads with infants in their birth month: greater use of the full breastfeeding package, less use of the partial breastfeeding package, and greater use of the full formula package. However, among dyads with infants 3-5 months old, the use of the full breastfeeding package was nearly the same before and after implementation of the change. Thus, the increased use of the full breastfeeding package after implementation was observed for dyads with infants aged 0-2 months old, but not for dyads with infants aged 3-5 months old.

Exhibit 7.3 Food Packages Issued to New Mothers, by Age of Infant

	Pre (%)	Post (%)	Diff (%)	DF [a]	Chi-Square [a]	p-value	
Age 1 Month				5	26.184	<0.001	***
Full breastfeeding package	11.8	14.0	2.2				
Partial breastfeeding package	24.2	15.9	-8.3				
Full formula package	35.6	44.1	8.6				
Pregnant package b	15.1	13.5	-1.6				
Not receiving WIC c	12.9	11.8	-1.1				
Food package unknown	0.5	0.7	0.2				
	n=21,896	*n*=83,845					
Age 2 Months				5	26.331	<0.001	***
Full breastfeeding package	11.7	12.5	0.8				
Partial breastfeeding package	24.2	16.0	-8.2				
Full formula package	41.9	50.5	8.6				
Pregnant package [b]	3.1	3.3	0.2				
Not receiving WIC [c]	18.6	16.9	-1.6				
Food package unknown	0.7	0.8	0.1				
	n=21,701	*n*=89,697					
Age 3 Months				5	23.272	0.000	***
Full breastfeeding package	10.9	11.1	0.2				
Partial breastfeeding package	22.8	14.3	-8.5				
Full formula package	45.5	54.3	8.8				
Pregnant package [b]	0.6	0.6	0.0				
Not receiving WIC [c]	19.2	18.3	-0.9				
Food package unknown	1.1	1.4	0.4				
	n=21,672	*n*=93,396					
Age 4 Months				5	17.047	0.004	**
Full breastfeeding package	10.4	9.7	-0.7				
Partial breastfeeding package	20.7	13.2	-7.5				
Full formula package	47.1	56.1	9.0				
Pregnant package [b]	0.4	0.4	0.0				
Not receiving WIC [c]	20.1	18.9	-1.2				
Food package unknown	1.4	1.7	0.4				
	n=22,477	*n*=95,359					
Age 5 Months				5	18.708	0.002	**
Full breastfeeding package	9.7	9.5	-0.2				
Partial breastfeeding package	19.5	12.4	-7.1				
Full formula package	46.0	54.2	8.1				
Pregnant package [b]	0.5	0.5	0.0				
Not receiving WIC [c]	22.7	21.2	-1.4				
Food package unknown	1.6	2.2	0.5				
	n=22,996	*n*=96,913					

Sample: Administrative records, all dyads with infants aged 0-5 months, *n*=110,742 (pre) and *n*=459,210 (post) in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: Among dyads whose infants were 1 month old, 11.8% (pre) and 14.0% (post) received the full breastfeeding package as the mother's WIC food package.

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001. [b] Mothers who have not recertified postpartum, but who have infants who have been certified. [c] Mothers with infants certified for WIC.

Food Packages Issued, by Mothers' WIC Status During Pregnancy

WIC staff have an opportunity to offer breastfeeding education and encouragement to mothers who participate in WIC during pregnancy. As noted in Chapter 5, the majority of women decide during pregnancy how they will feed their infant. For dyads whose infant was in the birth month, we investigated whether pre/post changes were more pronounced among mothers who participated in WIC during pregnancy, compared to mothers who did not.

Among dyads in which the mother participated in WIC during pregnancy, pre/post changes in food packages were pronounced (see Exhibits 7.4 and 7.5). These changes were qualitatively similar to those observed earlier in Exhibit 7.1. By contrast, among dyads in which the mother did not participate in WIC during pregnancy, there was not a statistically significant pre/post difference in the food packages issued during the birth month (p=0.15).

Even before implementation, dyads whose mother had previously been on WIC during pregnancy were more likely to receive the full breastfeeding package. This difference by prior WIC participation status grew further after implementation. After implementation, among dyads whose mother had not participated in WIC while pregnant, only 7.2% received the full breastfeeding package. By contrast, among dyads whose mother had participated in WIC while pregnant, 19.9% received the full breastfeeding package.

Exhibit 7.4 Food Packages Issued During the Birth Month, by Mother's WIC Status During Pregnancy

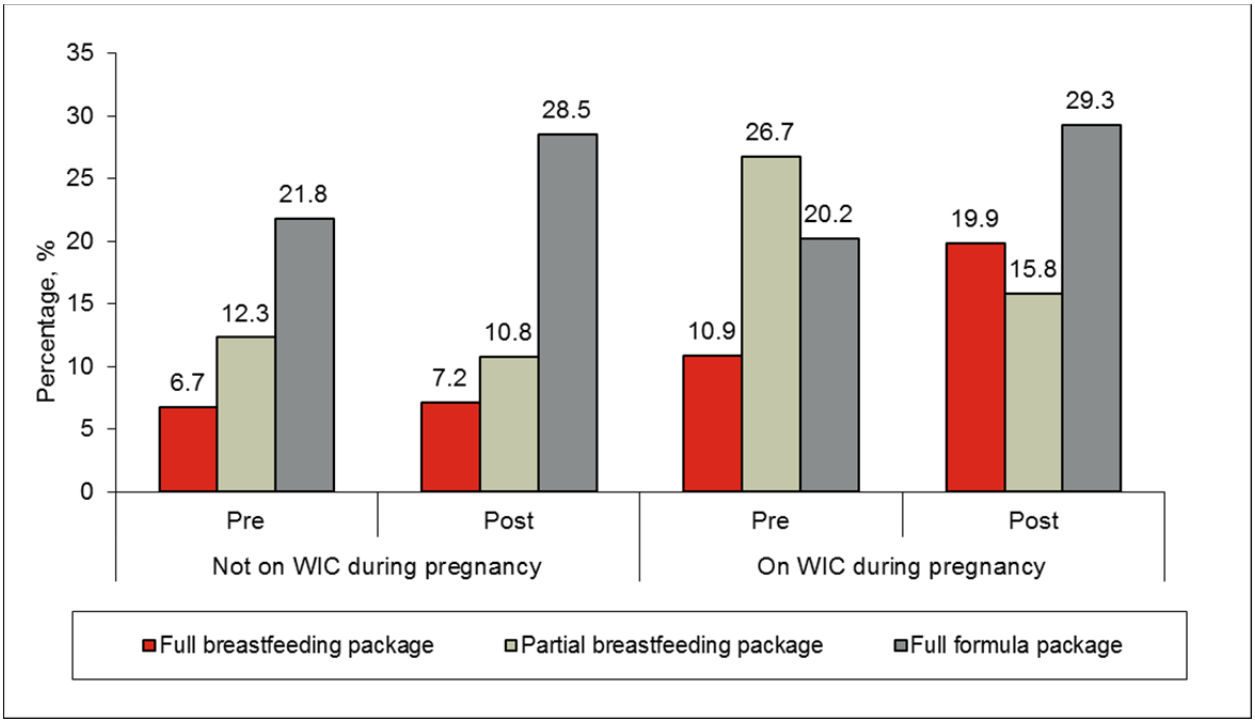
	Pre (%)	Post (%)	Diff (%)	DF [a]	Chi-Square [a]	p-value	
Not on WIC During Pregnancy				5	8.180	0.147	
Full breastfeeding package	6.7	7.2	0.4				
Partial breastfeeding package	12.3	10.8	-1.5				
Full formula package	21.8	28.5	6.7				
Pregnant package [b]	2.5	3.8	1.3				
Not receiving WIC [c]	55.3	49.1	-6.2				
Food package unknown	1.3	0.7	-0.6				
	n=4,864	*n*=3,584					
On WIC During Pregnancy				5	21.492	<0.001	***
Full breastfeeding package	10.9	19.9	9.0				
Partial breastfeeding package	26.7	15.8	-10.9				
Full formula package	20.2	29.3	9.1				
Pregnant package [b]	41.0	33.8	-7.2				
Not receiving WIC [c]	0.6	0.6	0.0				
Food package unknown	0.6	0.7	0.1				
	n=15,312	*n*=12,961					

Sample: Administrative records, all dyads with an infant in the birth month in analysis months 2-3 (pre) or analysis months 10-11 (post).

Interpretation Guide: Among dyads with infants in the birth month and mother who had been on WIC during pregnancy, 10.9% (pre) and 19.9% (post) received the full breastfeeding package as the mother's WIC food package.

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001. [b] Mothers who have not recertified postpartum, but who have infants who have been certified. [c] Mothers with infants certified for WIC.

Exhibit 7.5 Food Packages Issued During the Birth Month, by Mothers' WIC Status During Pregnancy



Sample: Administrative records, all dyads with an infant in the birth month in analysis months 2-3 (pre) or analysis months 10-11 (post).

Interpretation Guide: Among dyads whose infants were in the birth month and whose mother had been on WIC during pregnancy, 10.9% (pre) and 19.9% (post) received the full breastfeeding package as the mother's WIC food package.

7.2 Pre/Post Comparison by Strata, Package Assignments

This subsection presents results for WIC food package outcomes, cross-tabulated separately for each of the stratification categories that were used in selecting the 17 LWAs. (Section 2.1 provides details on the stratification variables.)

The first stratification variable was the predominant race and ethnicity of pregnant WIC participants served by the LWA (Exhibit 7.6). Compared with the other strata, LWAs that were predominantly Hispanic differed in several respects. This stratum had the highest estimated rate of receiving the full breastfeeding package and the largest estimated pre/post change in receipt of this package. Among dyads with infants aged 0-1 months, in LWAs that were predominantly Hispanic, 18.0% (pre) and 29.5% (post) received the full breastfeeding package as the mothers' food package.

For the three main maternal food packages, the direction of change post-implementation was the same in each stratum as in the full sample: the percentage receiving the partial breastfeeding package decreased, while the percentages receiving the full breastfeeding and full formula packages increased.

The second stratification variable was the region of the country (Exhibit 7.7). Compared with the other strata, LWAs in the West differed in several respects. This stratum had the highest estimated rate of receiving the full breastfeeding package and the largest estimated pre/post change in receipt of this package. Among dyads

with infants aged 0-1 months, in LWAs in the West, 17.7% (pre) and 34.7% (post) received the full breastfeeding package as the mothers' food package.

For the three main maternal food packages, some of the key pre/post changes noted in Section 7.1 were observed only in some regions and not others. In particular, for LWAs in the Midwest and the South, there was no increase in the percentage receiving the full breastfeeding package.

Exhibit 7.6 Food Packages Issued to Mothers with Infants Aged 0 or 1 Month, by Predominant Race/Ethnicity Strata

	Pre (%)	Post (%)	Diff (%)	DF [a]	Chi-Square [a]	p-value	
Predominantly Hispanic Stratum				5	16.554	0.005	**
Full breastfeeding package	18.0	29.5	11.5				
Partial breastfeeding package	27.4	13.5	-13.9				
Full formula package	36.4	42.3	5.9				
Pregnant package [b]	16.5	12.9	-3.6				
Not receiving WIC [c]	1.5	1.4	-0.1				
Food package unknown	0.1	0.3	0.2				
	n=17,849	*n*=65,201					
Predominantly White Stratum				5	27.426	<0.001	***
Full breastfeeding package	14.7	17.2	2.5				
Partial breastfeeding package	23.2	14.4	-8.8				
Full formula package	22.4	30.0	7.6				
Pregnant package [b]	11.1	10.8	-0.3				
Not receiving WIC [c]	24.4	25.9	1.5				
Food package unknown	4.1	1.7	-2.4				
	n=4,456	*n*=16,258					
Predominantly Black Stratum				5	402.328	<0.001	***
Full breastfeeding package	3.1	5.0	1.9				
Partial breastfeeding package	39.2	24.4	-14.8				
Full formula package	33.3	54.4	21.1				
Pregnant package [b]	11.0	5.1	-5.9				
Not receiving WIC [c]	12.1	10.4	-1.7				
Food package unknown	1.4	0.8	-0.6				
	n=2,099	*n*=8,285					
Diverse Stratum				5	43.074	<0.001	***
Full breastfeeding package	5.8	7.0	1.2				
Partial breastfeeding package	22.1	15.5	-6.5				
Full formula package	24.0	34.1	10.1				
Pregnant package [b]	30.5	27.4	-3.2				
Not receiving WIC [c]	17.2	15.2	-2.0				
Food package unknown	0.3	0.7	0.4				
	n=16,356	*n*=63,488					

Sample: Administrative records, all dyads with infants aged 0 or 1 month in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: In LWAs that were predominantly Hispanic, among dyads whose infants were 0 or 1 month old, the percentage whose mother received the full breastfeeding package increased from 18.0% (pre) to 29.5% (post).

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001. [b] Mothers who have not recertified postpartum, but who have infants who have been certified. [c] Mothers with infants certified for WIC.

Exhibit 7.7 Food Packages Issued to Mothers with Infants Aged 0 or 1 Month, by Site Census Region Strata

	Pre (%)	Post (%)	Diff (%)	DF [a]	Chi-Square [a]	p-value	
Midwest Stratum				5	20.439	<0.001	***
Full breastfeeding package	4.4	3.6	-0.8				
Partial breastfeeding package	18.2	12.3	-6.0				
Full formula package	22.1	31.8	9.7				
Pregnant package [b]	34.7	32.0	-2.7				
Not receiving WIC [c]	20.1	19.3	-0.8				
Food package unknown	0.4	0.9	0.5				
	n=5,577	*n*=22,060					
South Stratum				5	21.680	<0.001	***
Full breastfeeding package	11.2	10.5	-0.7				
Partial breastfeeding package	24.7	18.7	-6.1				
Full formula package	25.5	41.3	15.8				
Pregnant package [b]	23.4	17.2	-6.2				
Not receiving WIC [c]	14.0	11.8	-2.3				
Food package unknown	1.1	0.5	-0.6				
	n=20,245	*n*=76,255					
West Stratum				5	56.149	<0.001	***
Full breastfeeding package	17.7	34.7	17.0				
Partial breastfeeding package	30.4	13.8	-16.6				
Full formula package	38.6	38.8	0.2				
Pregnant package [b]	11.6	10.9	-0.7				
Not receiving WIC [c]	1.6	1.4	-0.2				
Food package unknown	0.2	0.4	0.2				
	n=14,442	*n*=53,212					
Northeast Stratum				5	115.876	<0.001	***
Full breastfeeding package	0.6	4.8	4.2				
Partial breastfeeding package	57.1	48.7	-8.4				
Full formula package	7.5	20.4	13.0				
Pregnant package [b]	10.5	3.9	-6.6				
Not receiving WIC [c]	18.8	11.5	-7.3				
Food package unknown	5.6	10.7	5.0				
	n=496	*n*=1,705					

Sample: Administrative records, all dyads with infants aged 0 or 1 month in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: In LWAs in the West, among dyads whose infants were 0 or 1 month old, the percentage whose mother received the full breastfeeding package increased from 17.7% (pre) to 34.7 (post).

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001. [b] Mothers who have not recertified postpartum, but who have infants who have been certified. [c] Mothers with infants certified for WIC.

The third stratification variable was based on the fraction of the caseload receiving the partial breastfeeding package estimated with earlier 2006 WIC PC data (Exhibit 7.8). As one would expect, the percentage receiving the partial breastfeeding package was highest in the "high stratum." However, the percentage receiving the partial breastfeeding package in our administrative records for the pre-implementation period (in 2009) was approximately equal in the "medium stratum" and "low stratum." Furthermore, because these cross-tabulations are based on an intermediate package status (the partial breastfeeding package), there is no expected pattern in the percentage receiving the full breastfeeding package or the full formula package. This issue causes no problems for our sampling weights or our results for the full sample, but it means that we were unable to give a meaningful interpretation to the results disaggregated by partial breastfeeding strata, as was done for the previous two stratification variables. Hence, as indicated in Section 2.1, analyses in

Chapters 8 to 10 that present results disaggregated by stratification variables will use just the first two of the three stratification variables.

Exhibit 7.8 Food Packages Issued to Mothers with Infants Aged 0 or 1 Month, by Site Partial Breastfeeding Rate Strata

	Pre (%)	Post (%)	Diff (%)	DF [a]	Chi-Square [a]	p-value	
High Stratum				5	22.325	<0.001	***
Full breastfeeding package	12.6	19.8	7.1				
Partial breastfeeding package	34.5	19.3	-15.3				
Full formula package	32.0	45.3	13.3				
Pregnant package [b]	16.7	12.4	-4.3				
Not receiving WIC [c]	4.0	3.1	-0.9				
Food package unknown	0.1	0.2	0.1				
	n=23,231	*n*=87,231					
Medium Stratum				5	14.549	0.013	*
Full breastfeeding package	4.0	4.4	0.4				
Partial breastfeeding package	14.0	11.0	-3.0				
Full formula package	20.4	26.3	5.9				
Pregnant package [b]	37.3	34.7	-2.6				
Not receiving WIC [c]	23.2	22.6	-0.6				
Food package unknown	1.2	1.1	-0.1				
	n=9,862	*n*=37,225					
Low Stratum				5	32.653	<0.001	***
Full breastfeeding package	29.0	39.2	10.2				
Partial breastfeeding package	14.1	9.4	-4.8				
Full formula package	42.5	39.1	-3.4				
Pregnant package [b]	3.4	4.4	1.0				
Not receiving WIC [c]	10.1	6.8	-3.4				
Food package unknown	0.8	1.1	0.3				
	n=7,667	*n*=28,776					

Sample: Administrative records, all dyads with infants aged 0 or 1 month in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: In LWAs in the "high stratum" (which had a high rate in earlier 2006 data of assigning the partial breastfeeding package), among dyads whose infants were 0 or 1 month old, the percentage whose mother received the full breastfeeding package increased from 12.6% (pre) to 19.8% (post).

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001. [b] Mothers who have not recertified postpartum, but who have infants who have been certified. [c] Mothers with infants certified for WIC.

7.3 Trends Over Time, Package Assignments

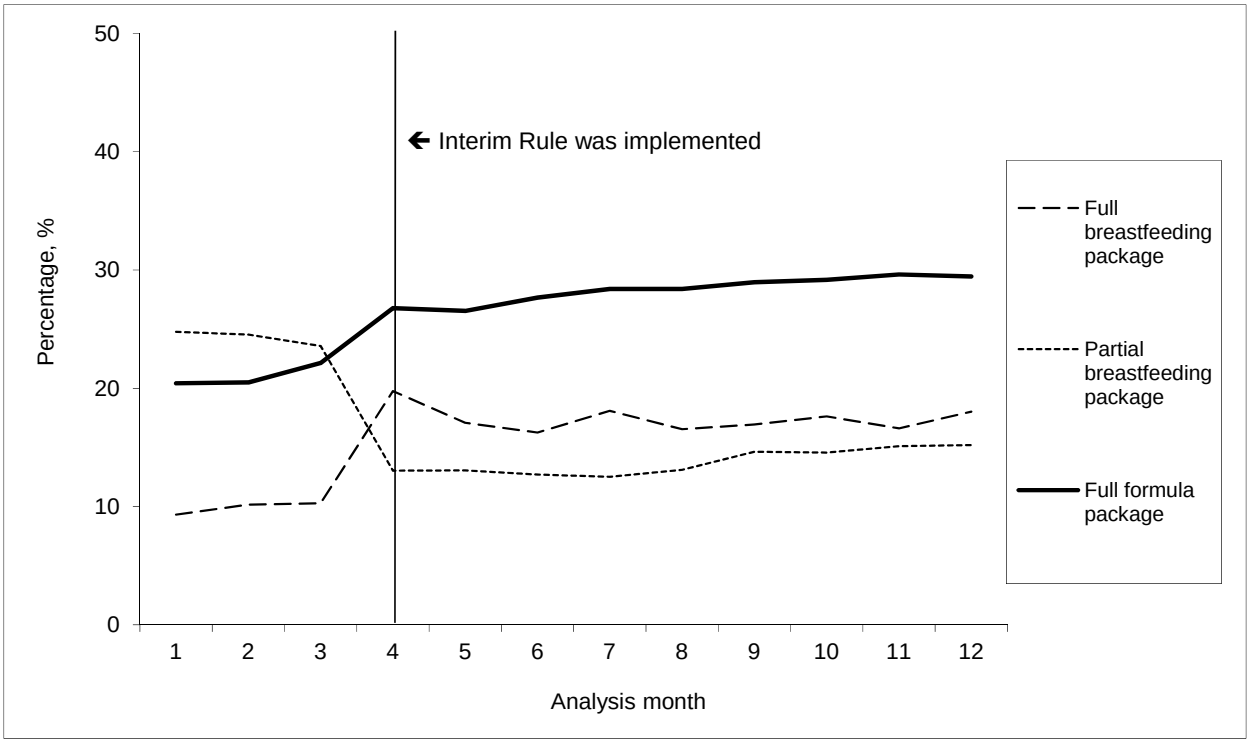
This section investigates whether changes in package assignments happened suddenly at the formal implementation date or gradually over a longer period. The States and LWAs prepared over several months prior to the official date of change to the new packages. During that period, WIC staff began introducing information about the upcoming change to WIC mothers. Furthermore, shifts in food package assignments may have continued during the months after implementation, as WIC staff learned to accommodate the change.

For dyads with infants in the birth month, Exhibit 7.9 indicates that there was a sharp change in food package assignments during the month that the Interim Rule was implemented. The x-axis of this exhibit follows the same numbering convention as earlier exhibits: analysis months 1-3 are before the formal implementation date, and analysis months 4-12 are after the formal implementation date. The percentage of dyads receiving

the full breastfeeding package as the mothers' food package increased from 10.3% in analysis month 3 to 19.7% in analysis month 4.

Some changes may have already happened before our observation window opened, or continued after the observation window closed. Nevertheless, the sharp change observed in Exhibit 7.9 at the formal implementation date provides reassurance about characterizing analysis months 1-2 as pre-implementation and analysis months 5-12 as post-implementation.

Exhibit 7.9 Food Packages Issued to Mothers during the Birth Month, by Analysis Month



Sample: Administrative records, all dyads with an infant in the birth month in all analysis months.

Interpretation Guide: The percentage of dyads in the birth month receiving the full breastfeeding package as the mothers' food package increased from 10.3% in analysis month 3 (pre) to 19.7% in analysis month 4 (post).

Note: The Interim Rule was implemented in analysis month 4.

7.4 Multivariate Analysis, Package Assignments

In addition to the implementation of the Interim Rule, many other factors also influence a WIC dyad's food package. We used a multivariate logistic regression analysis to investigate how the probability of receiving particular WIC packages was related to several explanatory variables.

A multivariate logistic regression model shows how a change in an explanatory variable is associated with a change in the odds that an outcome occurs, while holding constant other explanatory variables. This section investigates explanatory variables that are associated with the odds of receiving the full breastfeeding package and the full formula package, respectively. Section 2.4 provides further explanation of the methodology and Appendix C provides further detail on interpretation.

In the multivariate analysis below, WIC mothers' race and ethnicity is significantly related to the food package issued. As background for interpreting these multivariate results, Exhibit 7.10 provides descriptive statistics showing mothers' WIC packages by race and ethnicity category, for dyads with an infant in the birth month. The probability of receiving the full breastfeeding package increased most for Hispanic mothers, from 11.5% (pre) to 24.5% (post). The probability of receiving this package increased least for non-Hispanic black mothers, from 5.3% (pre) to 7.4% (post).

Exhibit 7.10 Food Packages Issued to Mothers with Infants in Birth Month by Mother's Race/Ethnicity

	Pre (%)	Post (%)	Diff (%)	DF	Chi-Square [a]	p-value	
Hispanic				5	21.674	<0.001	***
Full breastfeeding package	11.5	24.5	13.0				
Partial breastfeeding package	29.6	14.6	-15.0				
Full formula package	20.0	28.0	8.0				
Pregnant package [b]	34.4	29.2	-5.2				
Not receiving WIC [c]	4.0	3.0	-1.0				
	n=9,827	*n*=34,884					
White				5	25.005	0.000	***
Full breastfeeding package	18.9	22.2	3.3				
Partial breastfeeding package	23.2	18.5	-4.7				
Full formula package	25.1	33.1	8.0				
Pregnant package [b]	25.1	21.8	-3.3				
Not receiving WIC [c]	5.9	3.5	-2.4				
	n=2,729	*n*=10,155					
Black				5	24.041	0.000	***
Full breastfeeding package	5.3	7.4	2.1				
Partial breastfeeding package	22.5	14.9	-7.6				
Full formula package	24.3	34.7	10.4				
Pregnant package [b]	41.7	38.2	37.7				
Not receiving WIC [c]	5.7	4.2	-1.5				
	n=4,489	*n*=17,381					
Other				5	39.531	<0.001	***
Full breastfeeding package	7.0	9.9	2.9				
Partial breastfeeding package	21.7	12.0	-9.7				
Full formula package	24.9	34.5	9.6				
Pregnant package [b]	42.1	39.8	39.8				
Not receiving WIC [c]	4.0	3.2	-0.8				
	n=961	*n*=3,621					

Sample: Administrative records, all dyads with infants in the birth month in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: Among Hispanic mothers, 11.5% (pre) and 24.5% (post) were issued the full breastfeeding package.

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001. [b] Mothers who have not recertified postpartum, but who have infants who have been certified. [c] Mothers with infants certified for WIC.

For the multivariate analysis, summary odds ratios for the main results are presented in this section, and the underlying logistic regression coefficients and standard errors are presented in Appendix D. Each coefficient in Exhibits 7.11 and 7.12 shows the relationship between the explanatory variable named in the row of the table and the odds of occurrence for the outcome named in the title of the table (i.e., predictors of receiving the full breastfeeding package or the full formula package). An odds ratio significantly greater than one means the explanatory variable is associated with greater odds that the outcome occurred; an odds ratio significantly less than one means the explanatory variable is associated with lower odds that the outcome

occurred. Results are presented first for the full sample (in the left column), and second separately for the pre- and post-implementation periods (in the two columns to the right).

Exhibit 7.11 Predictors of Receiving the Full Breastfeeding Package in the Birth Month

	Odds Ratios			
	Full Sample [a] Pre and Post		Separately by Time Period [b] Pre	Post
Post-implementation	2.564 ***		--	--
Race/Ethnicity (Ref= Hispanic)				
White	1.600		3.443	1.389 ***
Black	0.686 ***		1.259	0.622 ***
Other	0.802 ***		1.484	0.723 ***
Income (% Federal Poverty Level)	1.002 **		1.001	1.002
Program Participation				
SNAP	0.763 ***		0.899	0.745
TANF	0.888 *		0.566	0.946 **
Household Size	1.013		1.077	1.003 **
	n=77,123			

Sample: Administrative records, all dyads with infants in the birth month in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: All else equal, the odds of receiving the full breastfeeding package were 2.564 times as large in the post-implementation period as in the pre-implementation period. All else equal, in the pre-implementation period, the odds of receiving the full breastfeeding package were 3.443 times as large for non-Hispanic white mothers as for mothers who were Hispanic or had missing data for race/ethnicity.

[a] Both time periods were estimated using a single model with an indicator for the post-implementation period. The explanatory variables include fixed effects for LWAs. Stars indicate statistical significance of the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001. [b] Both time periods were estimated using a single model with interaction terms for the post-implementation period. A full tabulation of regression coefficients is available in Exhibit D.1.

First, consider factors that may affect the odds of having the full breastfeeding package (logistic regression coefficients in Exhibit D.1 and summary odds ratios in Exhibit 7.11). As one would expect from the earlier results (Exhibit 7.1), dyads in the post-implementation period were estimated to be more likely to have the full breastfeeding package, compared to dyads in the pre-implementation period (*OR* = 2.564). Compared to the reference category (Hispanic or missing race/ethnicity), non-Hispanic black respondents were less likely to have the full breastfeeding package (*OR* = 0.686), controlling for all other explanatory variables in the model. Higher income respondents were more likely to have the full breastfeeding package (*OR* = 1.002 for each percentage point increase in income relative to the poverty standard), controlling for other explanatory variables. Participants in SNAP were less likely than nonparticipants to have this WIC food package (*OR* = 0.763), controlling for other explanatory variables in the model.

Most of the odds ratios in Exhibit 7.11 differed pre- and post-implementation, as designated by the stars in the right-most column. For example, because the fraction receiving the full breastfeeding package increased most rapidly for dyads with a Hispanic mother, the gap between Hispanic and non-Hispanic white dyads was narrowed, from *OR* = 3.443 (pre) to *OR* = 1.389 (post). This pre/post change in odds ratios was statistically significant. By contrast, for the SNAP participation variable, there was no significant change in the odds ratio. SNAP participants were less likely than nonparticipants to receive the full breastfeeding package, both before implementation (*OR* = 0.899) and after implementation (*OR* = 0.745), and this pre/post difference was not statistically significant.

Second, consider factors that may affect the probability of being assigned the full formula package (logistic regression coefficients in Exhibit D.2 and summary odds ratios in Exhibit 7.12). As one would expect from the earlier results (Exhibit 7.1), mother-infant dyads in the post-implementation period were significantly more likely to have the full formula package (*OR* = 1.443), compared to dyads in the pre-implementation period. To interpret this result quantitatively, holding other factors constant, the estimated odds that WIC dyads in the post-implementation period would receive the full formula package were 1.443 times the estimated odds for WIC dyads in the pre-implementation period. Higher income WIC mothers were less likely to have the full formula package (*OR* = 0.998 for each percentage point increase in income relative to the poverty standard). Participants in TANF (*OR* = 1.276) and larger households (*OR* = 1.037) were more likely to have the full formula package.

Exhibit 7.12 Predictors of Receiving the Full Formula Package in the Birth Month

	Odds Ratios			
	Full Sample [a] Pre and Post		Separately by Time Period [b] Pre	Post
Post-implementation	1.443	***	--	--
Race/Ethnicity (Ref= Hispanic)				
White	1.325	***	1.350	1.297
Black	1.294	***	1.459	1.344 ***
Other	1.498	***	1.086	1.483
Income (% Federal Poverty Level)	0.998	***	0.997	0.998
Program Participation				
SNAP	1.322	***	1.408	1.302
TANF	1.276	***	1.639	1.201 **
Household Size	1.037	***	1.030	1.038
	n=77,123			

Sample: Administrative records, all dyads with infants in the birth month in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: All else equal, the odds of receiving the full formula package were 1.443 times as large in the post-implementation period as in the pre-implementation period. All else equal, in the pre-implementation period, the odds of receiving the full formula package were 1.325 times as large for non-Hispanic white mothers as mothers who were Hispanic or were missing race/ethnicity data.

[a] Both time periods were estimated using a single model with an indicator for the post-implementation period. The explanatory variables include fixed effects for LWAs. Stars indicate statistical significance of the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001. [b] Both time periods were estimated using a single model with interaction terms for the post-implementation period. A full tabulation of regression coefficients is available in Exhibit D.2.

7.5 Transition Dynamics, Package Assignments

How do the food packages issued to WIC dyads change over the time they participate? What percent of WIC dyads continue with the same package from one month to the next? While Section 7.1 showed the frequency of having each WIC package, questions about changes from one package to another require an investigation into transition dynamics for food packages.

Exhibits 7.13a and 7.13b report transition frequencies showing the rate at which dyads move from one package to another. Each row of the table shows the breastfeeding package when the infant is *t* months old, and each column shows the package in the following month when the infant is *t*+1 months old. The table cells show the percentage of dyads from each row package that move to each column package. Cells

indicating that the same package was issued when the infant is *t* months old and *t*+1 months old are shaded in grey. Because the pre-implementation period had just three analysis months, the rows of the table include just dyads whose infants were 0, 1, or 2 months old. A small number of dyads with a valid mothers' WIC package at time *t* had no valid WIC package data field in time *t*+1 and hence were coded as "food package unknown."

Before implementation, dyads shift more slowly out of the full breastfeeding package. Of those dyads with the fully breastfeeding package in the birth month, 11.2% move to the partial breastfeeding package in the next month. After implementation, a greater percentage of dyads appear to shift away from the fully breastfeeding package after the first month of the infant's life. Of those dyads with the full breastfeeding package when the infant age is 0 months, 21.7% move to the partial breastfeeding package in the next month and 18.6% move to the full formula package. These pre/post changes in the transition probabilities for infants aged 0 months were statistically significant ($p<.01$).

This analysis of transition dynamics helps explain a pattern noted in Exhibit 7.3: dyads with infants in their birth month had increased use of the full breastfeeding package post-implementation, but dyads with older infants aged 3-5 months did not have increased use of the full breastfeeding package post-implementation. After implementation, more dyads initially choose the full breastfeeding package, but later they shift more quickly out of this package into the partial breastfeeding and full formula package. This pattern is what one would expect if those who were induced to switch to the full breastfeeding package were only weakly attached to that status, and hence did not have long durations before moving to a different package.

Exhibit 7.13a Transitions of Mother's Food Package Issued by Age of Infant (Pre-Implementation, 2009)

Mother's food package when infant age = 0 (*n*=8,407)	Mother's food package when infant age = 1						
	Full breastfeeding package, %	Partial breastfeeding package, %	Full formula package, %	Pregnant package, % [a]	Food package unknown, %	Not receiving WIC, % [b]	Total, %
Full breastfeeding package	79.6	11.2	8.2	0.0	0.7	0.4	100.0
Partial breastfeeding package	1.9	73.3	23.4	0.0	0.3	1.1	100.0
Full formula package	0.0	0.4	98.9	0.0	0.1	0.6	100.0
Pregnant package [a]	8.1	13.0	26.6	49.4	0.1	2.9	100.0
Food package unknown	0.0	26.4	66.9	0.0	6.7	0.0	100.0
Mother's food package when infant age = 1 (*n*=9,882)	**Mother's food package when infant age = 2**						
	Full breastfeeding package, %	Partial breastfeeding package, %	Full formula package, %	Pregnant package, % [a]	Food package unknown, %	Not receiving WIC, % [b]	Total, %
Full breastfeeding package	88.7	5.0	4.9	0.0	0.8	0.6	100.0
Partial breastfeeding package	1.0	86.6	11.2	0.0	0.2	1.0	100.0
Full formula package	0.0	0.2	98.6	0.0	0.4	0.8	100.0
Pregnant package [a]	8.4	10.9	23.8	20.7	0.0	36.2	100.0
Food package unknown	6.9	10.2	43.1	0.0	36.6	3.2	100.0
Mother's food package when infant age = 2 (*n*=9,132)	**Mother's food package when infant age = 3**						
	Full breastfeeding package, %	Partial breastfeeding package, %	Full formula package, %	Pregnant package, % [a]	Food package unknown, %	Not receiving WIC, % [b]	Total, %
Full breastfeeding package	87.9	5.7	4.2	0.1	1.7	0.4	100.0
Partial breastfeeding package	1.0	86.6	10.7	0.1	0.8	0.8	100.0
Full formula package	0.0	0.2	97.8	0.1	1.0	0.8	100.0
Pregnant package [a]	7.1	8.0	16.7	17.7	0.0	50.5	100.0
Food package unknown	7.5	4.2	22.0	0.0	56.8	9.6	100.0

Sample: Administrative records, all dyads with infants aged 0 to 2 months in analysis month 1 (pre).

Interpretation Guide: Among dyads receiving the full breastfeeding package during the infant's birth month, 11.2% moved to the partial breastfeeding package and 8.2% moved to the full formula package in the next month.

[a] Mothers who have not recertified postpartum, but who have infants who have been certified. [b] Mothers with infants certified for WIC.

Exhibit 7.13b Transitions of Mother's Food Package Issued by Age of Infant (Post-Implementation, 2010)

Mother's food package when infant age = 0 (*n*=7,727)	Mother's food package choice when infant age = 1						
	Full breastfeeding package, %	Partial breastfeeding package, %	Full formula package, %	Pregnant package, % [a]	Food package unknown, %	Not receiving WIC, % [b]	Total, %
Full breastfeeding package	58.5	21.7	18.6	0.0	0.3	0.8	100.0
Partial breastfeeding package	3.8	64.6	30.4	0.0	1.0	0.2	100.0
Full formula package	0.4	1.0	97.9	0.0	0.4	0.3	100.0
Pregnant package [a]	8.1	10.6	35.0	42.8	0.0	3.5	100.0
Food package unknown	2.5	6.1	59.5	0.0	31.9	0.0	100.0
Mother's food package when infant age = 1 (*n*=9,574)	**Mother's food package choice when infant age = 2**						
	Full breastfeeding package, %	Partial breastfeeding package, %	Full formula package, %	Pregnant package, % [a]	Food package unknown, %	Not receiving WIC, % [b]	Total, %
Full breastfeeding package	82.9	7.7	7.9	0.0	0.9	0.7	100.0
Partial breastfeeding package	2.2	82.8	13.5	0.0	0.5	1.0	100.0
Full formula package	0.1	0.5	98.5	0.0	0.5	0.4	100.0
Pregnant package [a]	4.1	6.5	25.0	27.4	0.3	36.7	100.0
Food package unknown	6.6	8.9	46.0	0.0	34.0	4.6	100.0
Mother's food package when infant age = 2 (*n*=9,767)	**Mother's food package choice when infant age = 3**						
	Full breastfeeding package, %	Partial breastfeeding package, %	Full formula package, %	Pregnant package, % [a]	Food package unknown, %	Not receiving WIC, % [b]	Total, %
Full breastfeeding package	84.1	6.9	7.5	0.0	1.4	0.2	100.0
Partial breastfeeding package	1.2	82.2	15.4	0.0	0.5	0.6	100.0
Full formula package	0.1	0.1	97.4	0.0	1.3	0.9	100.0
Pregnant package [a]	1.5	2.0	19.1	16.1	0.9	60.4	100.0
Food package unknown	3.9	4.4	21.6	3.1	58.8	8.1	100.0

Sample: Administrative records, all dyads with infants aged 0-2 months in analysis month 10 (post).

Interpretation Guide: Among dyads receiving the full breastfeeding package during the infant's birth month, 21.7% moved to the partial breastfeeding package and 18.0% moved to the full formula package in the next month.

[a] Mothers who have not recertified postpartum, but who have infants who have been certified. [b] Mothers with infants certified for WIC.

7.6 Pre/Post Comparison, Infant Formula Amounts (Domain 2b)

This section presents results for infant formula amounts. These results help in the interpretation of this chapter's earlier results for WIC food package assignments. The increased use of the full formula package, at the expense of the partial breastfeeding package, could be interpreted in two ways, depending on how responsive mothers' infant formula amounts and breastfeeding decisions are to WIC package incentives (Section 1.7):

- *Perhaps dyads are being reclassified from the partial breastfeeding category to the full formula category, even without a change in infant formula amounts.* The results in Exhibit 7.3 could reflect the new classification of mothers who require more than 45% of the maximum formula amount. These WIC mothers would have been classified as partial breastfeeding cases before implementation and full formula cases after implementation.
- *Perhaps dyads are choosing the full formula package over the partial breastfeeding package in order to acquire higher formula amounts in the full formula package.* The change in packages issued could reflect the decreased attractiveness of the partial breastfeeding package relative to other packages, including the full formula package. In this case, the WIC package results in Exhibit 7.3 indicate an unintended consequence of the policy change, encouraging more mothers to choose the full formula package over the partial breastfeeding package.

To distinguish between these two interpretations, we need to know whether infant formula amounts changed, particularly for dyads that were affected by the new rules for the partial breastfeeding package.

7.6.1 Pre/Post Changes in Mean Infant Formula Amounts

First, we estimated changes in mean infant formula amounts in fluid ounces (Exhibit 7.14). For dyads with infants in the birth month, the overall mean amount of formula distributed per dyad did not decrease after implementation. On the contrary, there was a small but statistically significant increase in the mean formula amount from 546.8 fluid ounces (pre) to 559.6 fluid ounces (post).

Exhibit 7.14 Mean Infant Formula Amount (Ounces) Received During the Birth Month, Overall and by Mother's Food Package

	Pre	Post	Diff	Test Statistic [a]	p-value	
Overall	546.8	559.6	12.8	-4.36	<0.001	***
Mother's Food package:						
Full breastfeeding package	66.6	24.1	-42.5	10.62	<0.001	***
Partial breastfeeding package	410.4	446.1	35.7	-6.54	<0.001	***
Full formula feeding package	816.6	783.1	-33.5	14.46	<0.001	***
Pregnant package [b]	587.6	677.6	90.0	-17.89	<0.001	***
Not receiving WIC [c]	677.6	710.8	33.2	-4.32	<0.001	***
	n=17,597	*n*=62,427				

Sample: Administrative records, all dyads with infants in the birth month in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: The average formula assignment during the birth month increased from 546.8 ounces to 559.6 ounces (p<0.001).

[a] *t*-tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001. [b] Mothers who have not recertified postpartum, but who have infants who have been certified.

[c] Mothers with infants certified for WIC.

7.6.2 Pre/Post Changes in Infant Formula Amount Categories, Overall

Second, we measured pre/post changes using a categorical variable for infant formula amounts, using category boundaries that are based on the new limits on the partial breast feeding package after implementation. The new limits on infant formula, for the partial breastfeeding package, are 104 ounces for infants in their birth month and 364 ounces for infants aged 1-3 months.

Hence, as explained in Chapter 2, for infants in the birth month, the categories are:

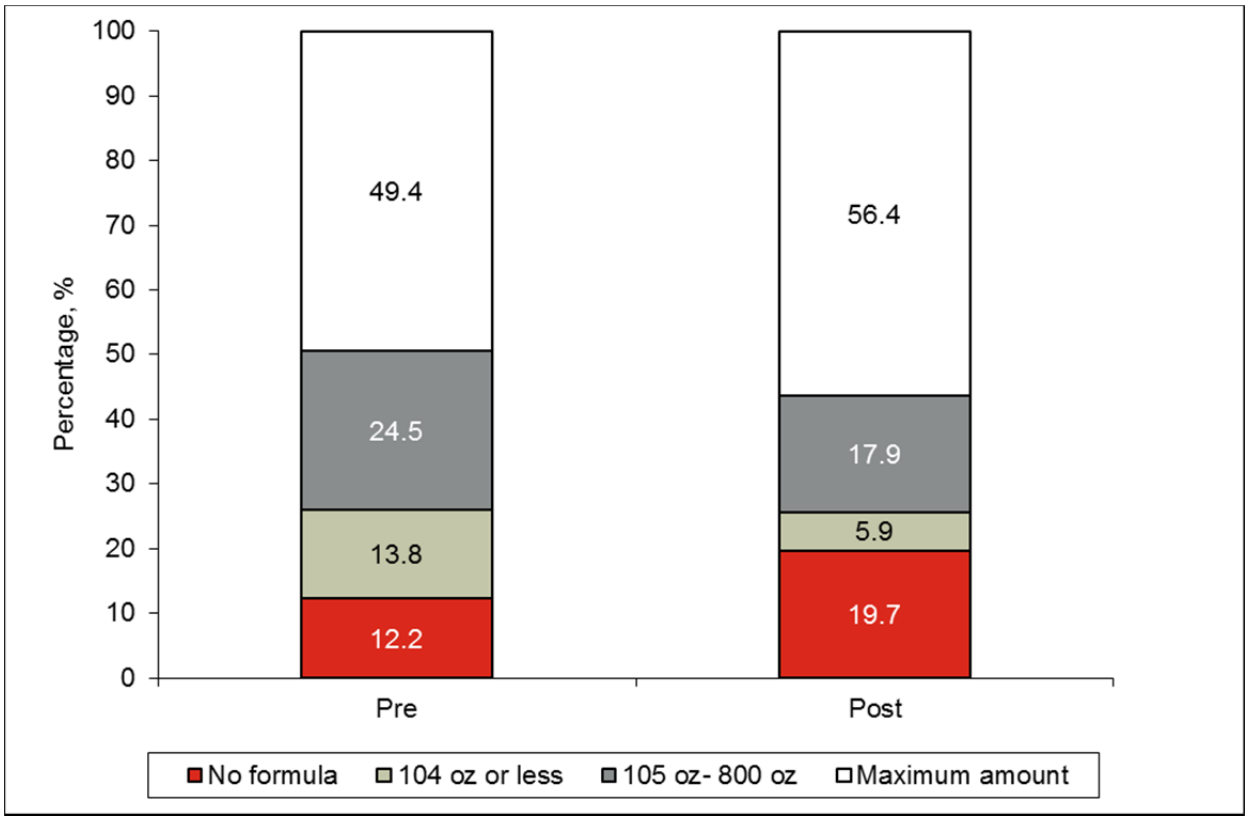
- no formula,
- low formula (> 0 ounces and <= 104 ounces),
- high formula but less than maximum (> 104 ounces and <= 800 ounces),
- maximum or nearly maximum formula amount (> 800 ounces).

For infants aged 1-3 months, the categories are:

- no formula,
- low formula (> 0 ounces and <= 364 ounces),
- high formula but less than maximum (> 364 ounces and <= 800 ounces),
- maximum or nearly maximum formula amount (> 800 ounces).

Exhibit 7.15a shows changes in this variable for dyads with infants in the birth month. The percentage receiving no formula increased from 12.2% (pre) to 19.7% (post), which is consistent with objectives of the Interim Rule. However, simultaneously, the percentage receiving the maximum formula amount increased from 49.4% (pre) to 56.4% (post). Just as the earlier results for WIC food packages showed a shift toward greater use of the full breastfeeding and full formula packages (Section 7.1), Exhibit 7.15a shows a shift toward greater receipt of either no formula or the maximum formula amount.

Exhibit 7.15a Infant Formula Amounts (Ounces) Issued for Infants in the Birth Month



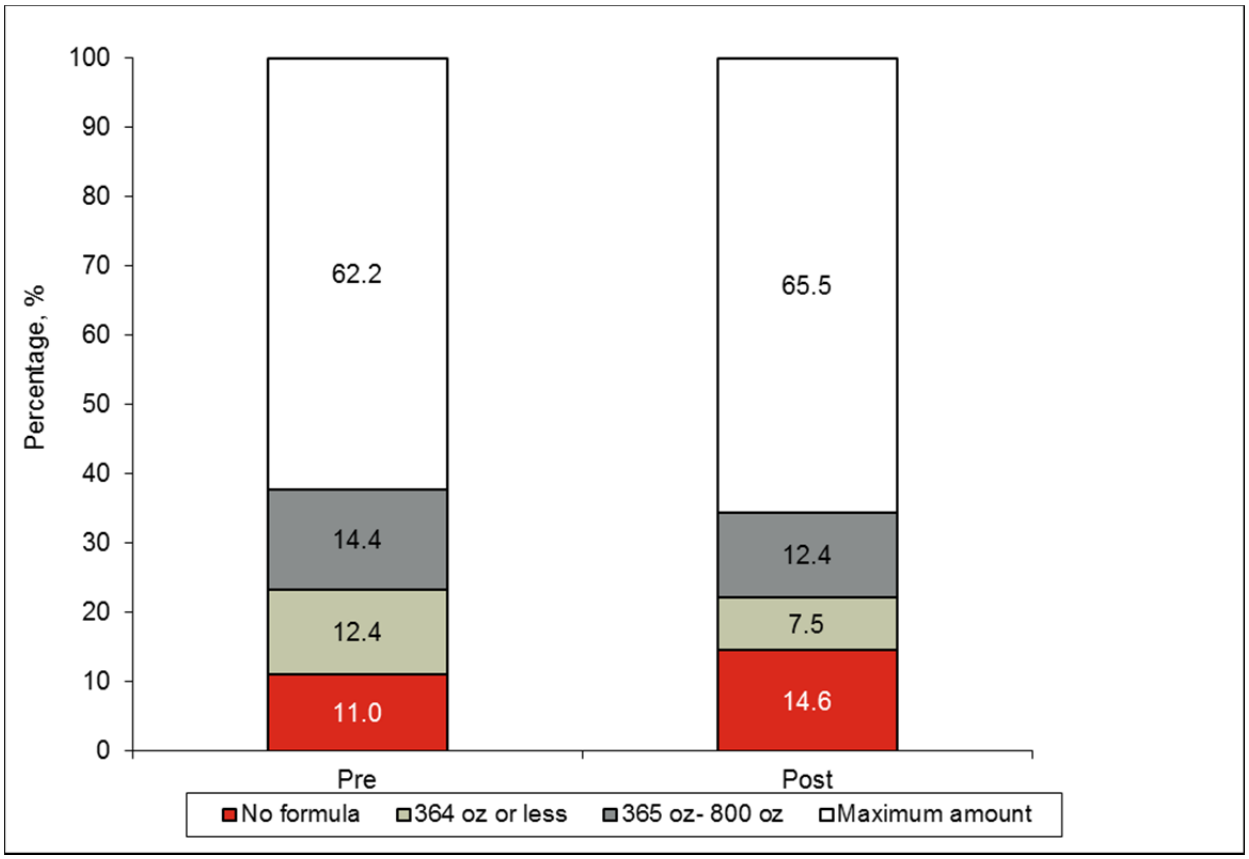
Sample: Administrative records, all dyads with infants in the birth month in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: Among dyads with infants in the birth month, the percentage that receives the maximum amount of formula increased from 49.4% (pre) to 56.4% (post).

Notes: Infant formula amounts are expressed as four categories: (1) no formula; (2) 104 ounces, the post-implementation partial breastfeeding limit for the birth month, or less; (3) more than the post-implementation partial breastfeeding limit of 104 ounces but less than 800 ounces; (4) 800 ounces or more. The actual formula amount provided to a dyad could range from 0-806 ounces in the pre-implementation period and from 0-884 ounces in the post-implementation period (see Exhibit 1.1).

Exhibit 7.15b, similarly, shows changes in this variable for dyads with infants aged one month old. For these infants, the percentage receiving no formula increased from 11.0% (pre) to 14.6% (post), which is consistent with objectives of the Interim Rule. Simultaneously, the percentage receiving the maximum formula amount increased from 62.2% (pre) to 65.5% (post).

Exhibit 7.15b Infant Formula Amounts Issued for Infants Aged 1 Month



Sample: Administrative records, all dyads with infants aged 1 month in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: Among dyads with infants aged one month old, the percentage that receives the maximum amount of formula increased from 62.2% (pre) to 65.5% (post).

Notes: Infant formula amounts are expressed as four categories: (1) no formula; (2) less than or equal to 364 ounces, the post-implementation partial breastfeeding limit for infants aged 1 month or less; (3) more than the post-implementation partial breastfeeding limit of 364 ounces but less than 800 ounces; (4) 800 ounces or more.

7.6.3 Pre/Post Changes in Infant Formula Amount Categories, by Food Package

Third, to investigate whether changes in package assignments are responsible for the observed changes in infant formula amounts, we repeated the analysis in Exhibit 7.15b, but disaggregated by WIC food package assignment. The results are presented in Exhibit 7.16.

Exhibit 7.16 Formula Amounts Issued to Infants Aged 1 Month, by Mother's Food Package

	Pre (%)	Post (%)	Diff (%)	DF	Chi-Square [a]	p-value	
Full Breastfeeding Package				3	28.653	<0.001	***
No formula	80.4	93.1	12.6				
364 oz or less	4.3	3.1	-1.2				
365 - 800 oz	3.7	1.9	-1.8				
Maximum amount	11.6	1.9	-9.6				
	n= 3,487	*n*= 15, 109					
Partial Breastfeeding Package				3	1.289	0.752	
No formula	0.6	1.0	0.4				
364 oz or less	41.4	36.4	-5.0				
365 - 800 oz	33.2	40.4	7.2				
Maximum amount	24.7	22.2	-2.6				
	n= 5,048	*n*= 12,889					
Full Formula Package				3	13.409	0.004	**
No formula	0.1	0.2	0.1				
364 oz or less	1.6	1.0	-0.6				
365 - 800 oz	3.9	6.5	2.6				
Maximum amount	94.5	92.3	-2.2				
	n=7,749	*n*= 37,261					
Pregnant Package [b]				3	7.841	0.049	*
No formula	3.8	3.2	-0.6				
364 oz or less	3.8	3.5	-0.4				
365 - 800 oz	17.6	11.3	-6.3				
Maximum amount	74.8	82.0	7.2				
	n=2,216	*n*= 6,526					
Not Receiving WIC [c]				3	41.109	<0.001	***
No formula	2.9	3.4	0.5				
364 oz or less	3.4	2.0	-1.3				
365 - 800 oz	14.3	10.4	-3.9				
Maximum amount	79.4	84.1	4.7				
	n= 1,868	*n*= 6,456					
Food Package Unknown				3	.	.	
No formula	2.8	3.7	0.9				
364 oz or less	41.4	14.6	-26.8				
365 - 800 oz	25.8	16.7	-9.1				
Maximum amount	30.0	65.0	35.0				
	n=59	*n*=302					

Sample: Administrative records, all dyads with infants aged 1 month in analysis months 1-2 (pre) and analysis months 5-12 (post).

Interpretation Guide: Among mothers with infants aged 1 month who were issued the full breastfeeding package, there was an increase in the percentage of infants receiving no formula, 80.4% (pre) and 93.1% (post).

Notes: Infant formula amounts are expressed as four categories: (1) no formula; (2) less than or equal to 364 ounces, the post-implementation partial breastfeeding limit for the ages 1-3 months; (3) more than the post-implementation partial breastfeeding limit of 364 ounces but less than 800 ounces; (4) 800 ounces or more. The actual formula amount provided to a dyad could range from 0 to 806 ounces pre-implementation and from 0 to 884 ounces post-implementation.

[a] Chi-square tests were conducted. Missing values indicate that the test could not be estimated. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001. [b] Mothers who have not recertified postpartum, but who have infants who have been certified. [c] Mothers with infants certified for WIC.

Our main interest in this exhibit is to determine the package choices of dyads whose pre-implementation infant formula amounts exceeded the new limits. The first column of Exhibit 7.16 shows pre-

implementation data. Before implementation, among dyads receiving the partial breastfeeding package, 42.0% (including those that received no formula and those that received a formula amount of 364 oz or less) met the new limits anyway and hence would be unaffected by the policy change. The remainder of the partial breastfeeding package dyads – including 24.7% who received the maximum formula amount and another 33.2% whose formula amount exceeded 364 fluid ounces – may have to make some sort of change after implementation. After implementation, they might be reclassified as full formula cases, perhaps even increasing their formula amount; or they might respond to changing incentives by shifting to the full breastfeeding category; or they might remain as partial breastfeeding cases but with a lower infant formula amount than before.

We noted earlier that the percentage of all dyads receiving the full formula package did indeed increase from 20.5% (pre) to 28.5% (post). The new information in Exhibit 7.16 is that, after implementation, the distribution of formula amounts did not change greatly among dyads receiving the full formula package. Post-implementation, 92.3% of dyads receiving the full formula package received the maximum formula amount, almost the same as pre-implementation. This evidence indicates that former recipients of the partial breastfeeding package were not merely reclassified as full formula cases, while holding unchanged their infant formula amount. When they converted to the full formula package, they also began receiving the higher infant formula amounts typical of other recipients of this package.

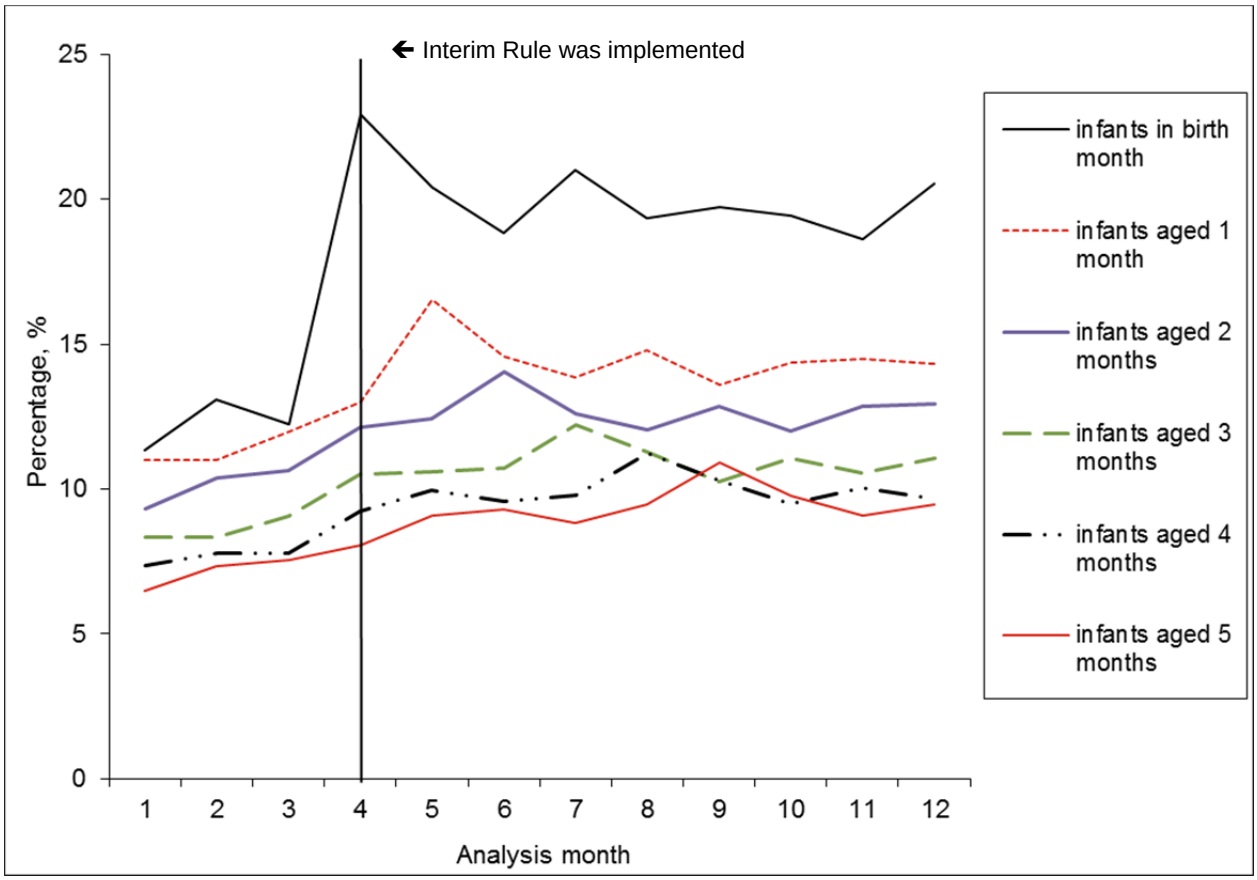
A second finding from Exhibit 7.16 is that some dyads classified in the partial breastfeeding package category continued to receive infant formula amounts greater than 364 fluid ounces after implementation. Of these dyads, 22.2% received the maximum formula amount and another 40.4% received an infant formula amount greater than 364 fluid ounces. It is possible that, over time these percentages may fall as LWAs more completely implement the new rules.

7.7 Trends Over Time, Infant Formula Amounts

As with the WIC package amounts in Section 7.3, we studied trends over time in infant formula amounts, to see whether changes happened suddenly or gradually. Exhibit 7.17 displays the percentage of all dyads receiving no formula, disaggregated by infant age. Recall that the formal implementation date is at the start of analysis month 4.

The exhibit shows strong evidence of a sharp change at the formal implementation date. For dyads with infants in the birth month, there is a substantial jump in receipt of no formula at analysis month 4. For dyads with older infants, there is an echo of this jump exactly as one might expect if the change most strongly affected the cohort of dyads whose newborn infants were enrolled in analysis month 4. The peak in the time trend is observed when this cohort of infants reached age 1 month in analysis month 5, when this cohort reached age 2 months in analysis month 6, age 3 months in analysis month 7, and so forth.

Exhibit 7.17 Percentage of Infants with No Formula Issued from WIC, by Age of Infant

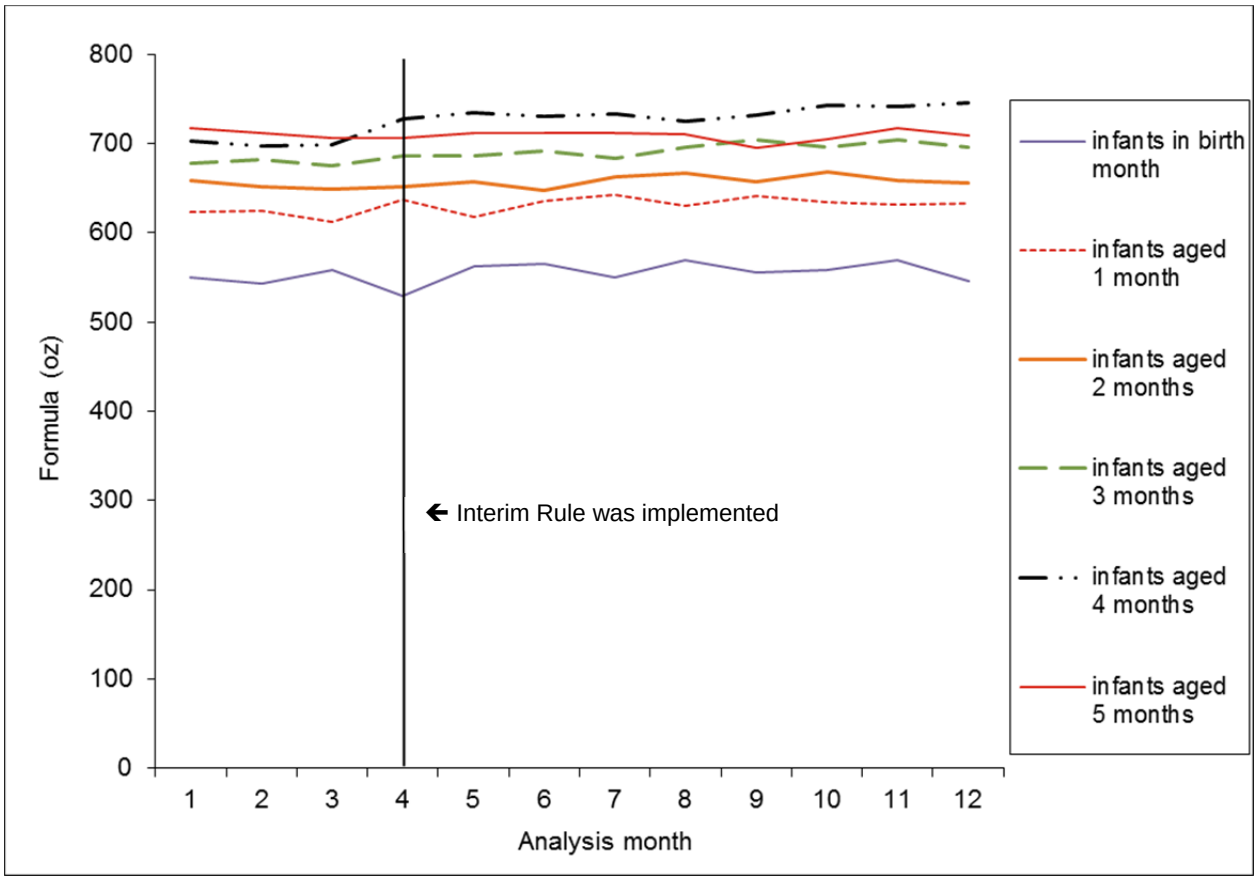


Sample: Administrative records, all dyads with infants aged 0-5 months in all analysis months.

Interpretation Guide: There is a sharp increase in the percentage of infants receiving no formula between analysis month 3 (pre) and analysis month 4 (post), when the Interim Rule was implemented.

Exhibit 7.18 uses a similar approach to present trends over time in the mean infant formula amount. Recall from Section 7.7 that the mean infant formula amount did not change greatly from pre-implementation to post-implementation. Hence, the time trends in mean infant formula amount are quite flat. After implementation, more dyads received no formula and more dyads also received the maximum formula amount; the net effect is very little change in mean infant formula amounts.

Exhibit 7.18 Mean Amount of Formula (Ounces) Issued, by Age of Infant



Sample: Administrative records, all dyads with infants aged 0-5 months in all analysis months.

Interpretation Guide: There is little change in the mean amount of formula received between analysis month 3 and analysis month 4.

7.8 Transition Dynamics, Infant Formula Amounts

Along with these package transitions, there were changes in how quickly dyads started receiving a package with any positive amount of formula. A discrete-time hazard model was used to examine at what age infants who receive no formula from WIC in the birth month switch to a package with any formula. For the pre-implementation period, the analytic sample included only infants born during analysis month 1 who were receiving no formula from WIC. For the post-implementation period, the analytic sample included infants born during analysis month 10 who were receiving no formula from WIC. The amount of formula that these infants received during the first three months of life (analysis months 1-3 for pre-implementation and analysis months 10-12 for post-implementation) was examined to determine if and when initially exclusively breastfed infants began receiving formula.

Among infants who received no formula from WIC when first certified during the birth month, less than 1 percent began receiving formula from WIC before the end of the birth month (0.4% pre and 0.4% post; see Exhibit 7.19). Among infants who continue to receive no formula from WIC through the birth month, the percentage who receive formula from WIC for the first time at age 1 month was 24.4% (pre) and 39.1% (post). Among those infants who continue to receive no formula from WIC during the second

month of life, the percentage that begin receiving formula at age 2 months was 14.7% (pre) and 15.8% (post). The pre/post differences were not quite statistically significant at conventional levels (p=.066).

Exhibit 7.19 Estimated Hazard and Survival Probabilities for Infants Switching from "No Formula" to "Any Amount of Formula"

	Estimated Hazard Probabilities		Estimated Survival Probabilities	
	Pre (%)	Post (%)	Pre (%)	Post (%)
Birth			100.0	100.0
During birth month	0.4	0.4	99.6	99.6
Age 1 month	24.4	39.1	75.3	60.6
Age 2 months	14.7	15.8	64.3	51.0
	n=1,194	*n*=1,678		

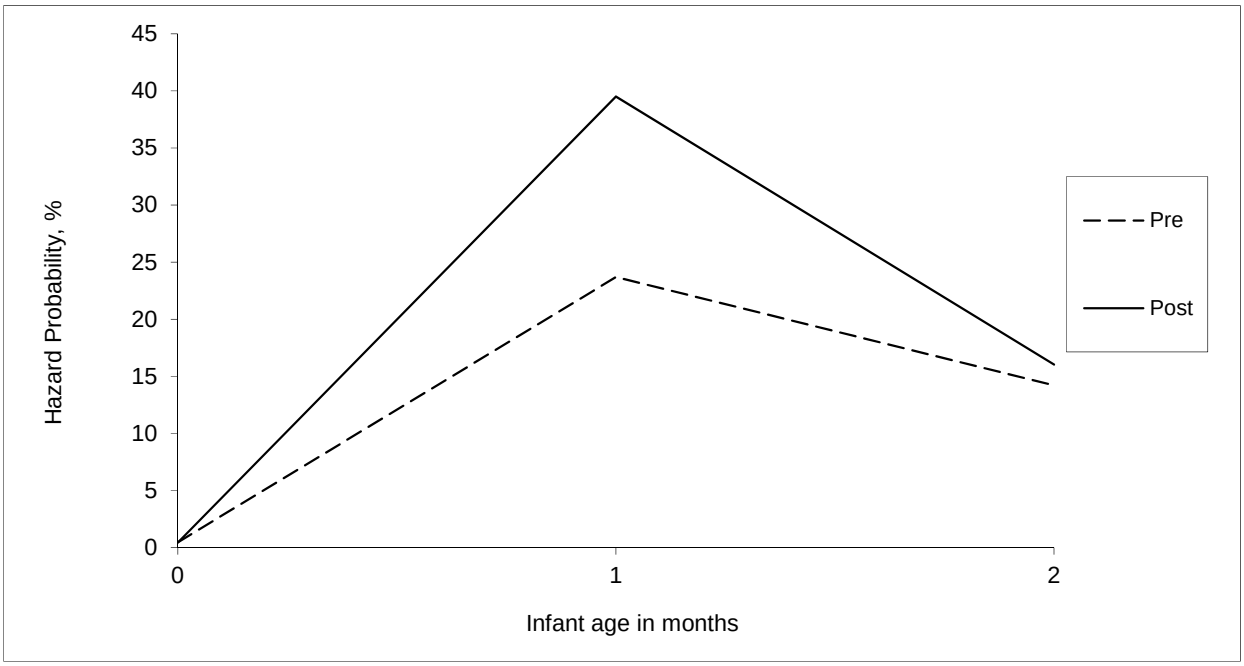
Sample: Administrative records, dyads certified for WIC with an infant in the birth month who receives no formula in analysis month 1 (pre) and analysis month 10 (post).

Interpretation Guide: Among infants who received no formula from WIC continuously through the birth month, the percentage who begin receiving formula at age 1 month was 24.4% (pre) and 39.1% (post). The percentage of infants who received no formula through the end of age 2 months was 64.3% (pre) and 51.0% (post).

Note: The difference between pre and post is not statistically significant (χ^2 = 7.19, df=3, p=.066).

Exhibit 7.20 is a graphical depiction of these estimated hazard probabilities. It indicates that, both before and after implementation of the Interim Rule, a sizeable percentage of infants who receive no formula from WIC during the birth month begin receiving formula for the first time in the next month. However, the risk of obtaining formula for the first time after two months of no formula from WIC is lower.

Exhibit 7.20 Estimated Hazard Functions for Switching from "No Formula" to "Any Amount of Formula," by Age of Infant



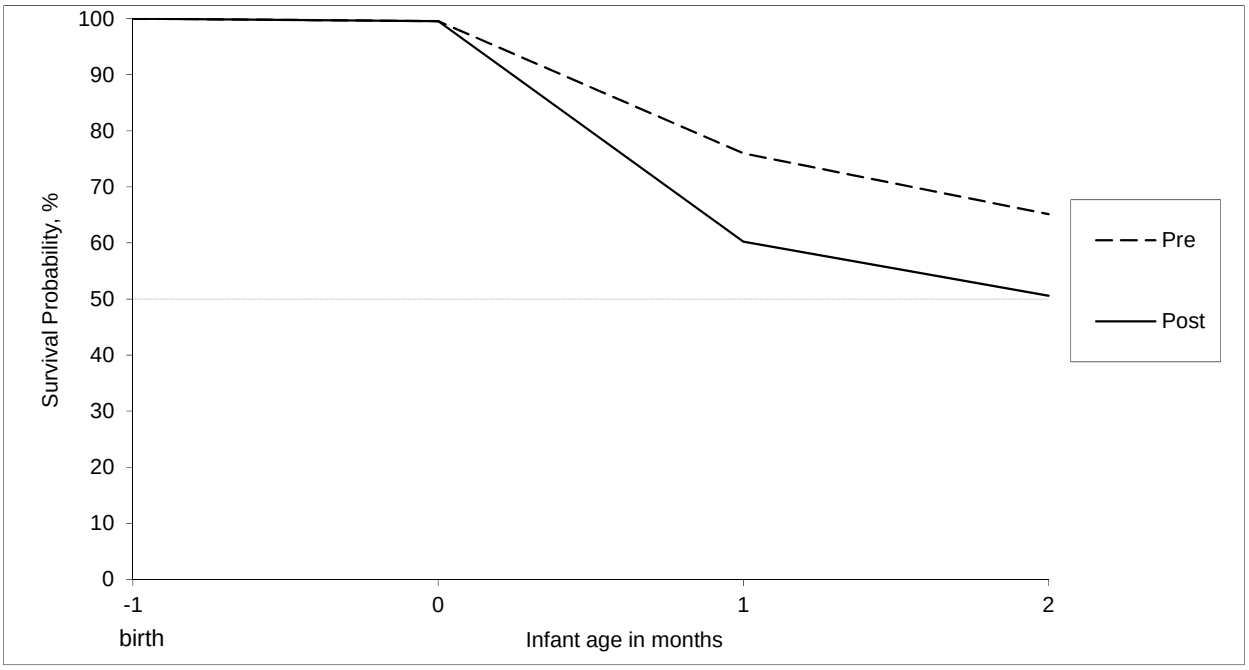
Sample: Administrative records, dyads certified for WIC with an infant in the birth month who receives no formula in analysis month 1 (pre) and analysis month 10 (post), *n*=2,872 (1,194 [pre] and 1,678 [post]).

Note: The difference between pre and post was not statistically significant (χ^2 = 6.52, df=3, p=.09).

Interpretation Guide: Among infants who received no formula from WIC continuously through the birth month, the percentage who begin receiving formula at age 1 month was 24.4% (pre) and 39.1% (post).

The right-most columns of Exhibit 7.19 show the percentage of infants who continue to receive no formula at each age. For example, at age 2 months, this percentage is lower after the Interim Rule: 64.3% (pre) and 51.0% (post). In other words, the percentage who have begun receiving formula from WIC at age 2 months is 35.7% (pre) and 49.0% (post). Exhibit 7.21 is a graphical depiction of the estimated survival probabilities. The pre/post difference in switching from not receiving formula to receiving a formula package is borderline statistically significant (χ2=6.52, df=3, p=.09).

Exhibit 7.21 Estimated Survival Functions for Switching from "No Formula" to "Any Amount of Formula," by Age of Infant



Sample: Administrative records, dyads certified for WIC with an infant in the birth month who receives no formula in analysis month 1 (pre) and analysis month 10 (post), *n*=2,872 (1,194 [pre] and 1,678 [post])..

Note: The difference between pre and post is not statistically significant (χ^2 = 6.52, df=3, p=.09).

Interpretation Guide: Among infants who received no formula from WIC continuously through the birth month, the percentage who received no formula through the end of age 2 months was 64.3% (pre) and 51.0% (post).

After implementation of the Interim Rule, fewer dyads received the partial breastfeeding package and more dyads received the full breastfeeding package in the birth month. In the post-implementation period, it seems likely that the group receiving the full breastfeeding package includes a larger fraction of dyads with a comparatively low long-term propensity for exclusive breastfeeding, compared to the pre-implementation period. Also, dyads receiving the full breastfeeding package may be supplementing with formula obtained from other sources, especially during the birth month. Hence, after implementation, it is understandable that dyads that began with the full breastfeeding package in the birth month tended to move more rapidly into one of the other packages in the subsequent months.

Chapter 8: Breastfeeding Initiation

Chapter 8 is the third of five chapters with results for the study's main outcomes. This chapter describes the study's main results for pre/post changes in breastfeeding initiation. It uses data from administrative records. A key result is that overall initiation rates changed very little.

Breastfeeding initiation was defined using two measures from the infant certification fields in the administrative records: (a) whether the infant is currently being breastfed and (b) whether the infant was ever previously breastfed. A dyad was defined as not having initiated breastfeeding if the infant was not currently being breastfed, was not recorded as being breastfed in an adjacent month, and had not ever previously been breastfed.

This chapter is organized as follows:

- 8.1. Pre/post comparison,
- 8.2. Pre/post comparison by stratum,
- 8.3. Trends over time, and
- 8.4. Multivariate analysis.

8.1 Pre/Post Comparison, Breastfeeding Initiation

We found that the rate of breastfeeding initiation did not change from before to after implementation of the Interim Rule (Exhibit 8.1, first row). As a percentage of all dyads with an infant, the initiation rate was 65.5% (pre) and 65.1% (post).

Exhibit 8.1 Breastfeeding Initiation, Overall and by Mother's Food Package

	Pre (%)	Post (%)	Diff (%)	DF [a]	Chi-Square [a]	p-value [a]	
Overall	65.5	65.1	-0.4	1	0.307	0.580	
Mother's Food Package:							
Full breastfeeding package	99.6	99.3	-0.3	1	4.444	0.035	*
Partial breastfeeding package	96.5	96.5	0.1	1	0.017	0.895	
Full formula feeding package	46.7	55.4	8.7	1	12.812	<0.001	
Pregnant package [b]	67.3	64.8	-2.5	1	-6.258	0.012	
Not receiving WIC [c]	47.7	45.8	-1.9	1	1.213	0.271	
	n= 80,658	*n*= 77,534					

Sample: Administrative records, all dyads with infants aged 0-5 months in analysis month 2 (pre) and analysis month 10 (post).

Interpretation Guide: The breastfeeding initiation rate was 65.5% (pre) and 65.1% (post).

[a] Chi-square tests indicate pre/post differences. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001. Missing values indicate that the test could not be estimated. [b] Mothers who have not recertified postpartum, but who have infants who have been certified. [c] Mothers with infants certified for WIC.

This breastfeeding initiation rate of 65.1% is similar to and slightly lower than estimates for WIC participants from the CDC's 2007 National Immunization Survey. According to that survey, the percentage that ever breastfed was 67.5% for WIC participants, 77.5% for eligible nonparticipants, and 84.6% for ineligible nonparticipants. The Healthy People 2010 goal for the nation was 75%.

It is notable that, while mothers' food package categories did change, the breastfeeding initiation rate did not change (see Chapter 7). These contrasting findings are reconciled by the results in the lower rows of Exhibit 8.1, which shows the initiation rate by breastfeeding package. Unsurprisingly, the breastfeeding initiation rate is essentially 100% for dyads where the mother received the full breastfeeding package, and nearly this high for dyads where the mother received the partial breastfeeding package. Therefore, the post-implementation shift from the partial breastfeeding package to the full breastfeeding package could have at most a small effect on breastfeeding initiation rates. The shift from the partial breastfeeding package to the full formula package is more important. This increase in the percentage of dyads where the mother received the full formula package was accompanied by an increase in the initiation rate within this category, from 46.7% (pre) to 55.4% (post).

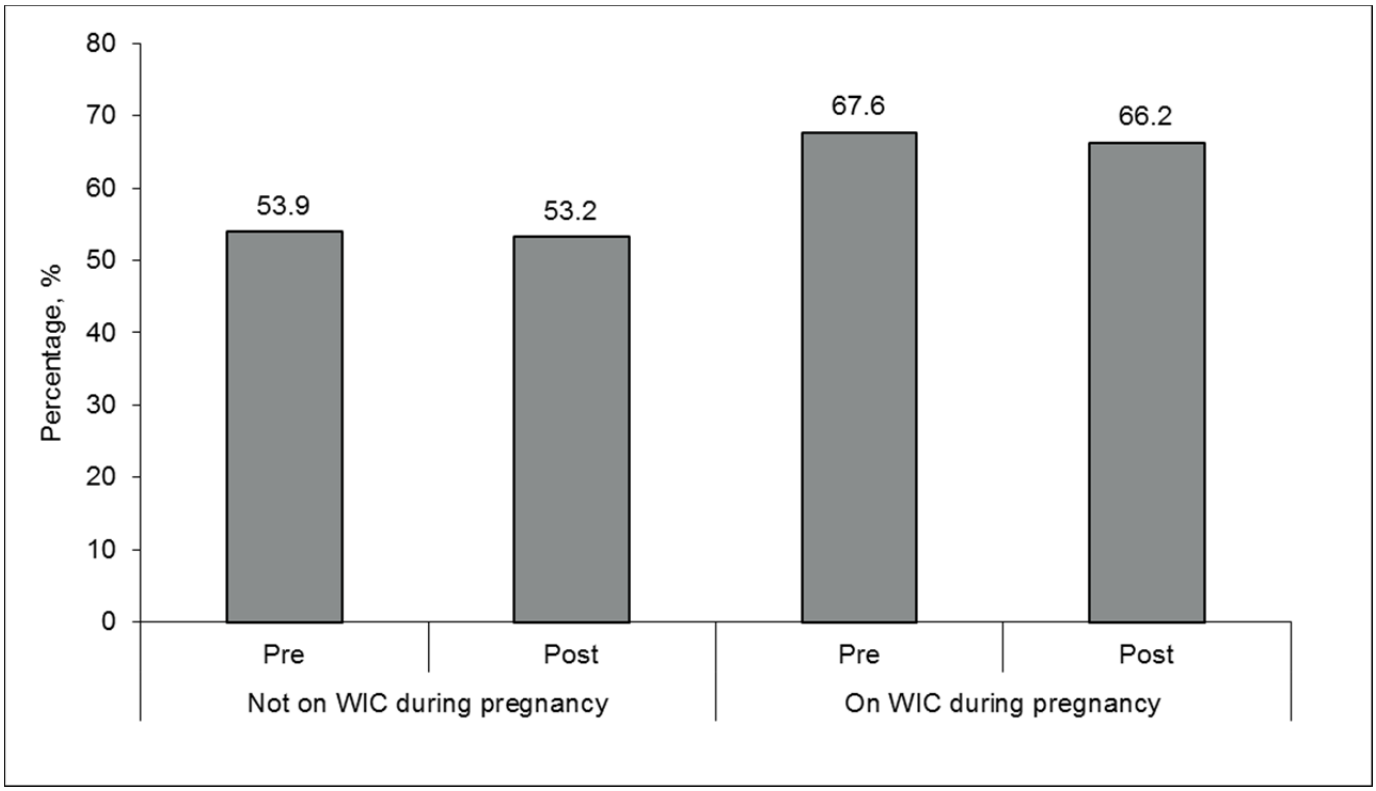
Here is one plausible interpretation. It may be comparably easy to change WIC package assignments but comparatively difficult to use package changes as a mechanism for increasing breastfeeding initiation rates. Under this interpretation, some dyads shifted from the partial breastfeeding package to the full formula package without changing their likelihood of initiating breastfeeding. This shift changed the composition of the full breastfeeding category, but it did not change the overall breastfeeding initiation rate as a percentage of all dyads. As a consequence, package assignments changed after implementation, while the overall breastfeeding rate in the top row of Exhibit 8.1 remained constant.

We considered another possible interpretation. If increased use of the full formula package reduced breastfeeding initiation, but this trend were offset by increases in WIC participation by mothers with a high propensity for breastfeeding, the overall initiation rate might still have remained quite constant. However, we checked for and did not observe evidence of changes in WIC participation patterns (Chapter 6). Hence, we find it more likely that the changes in WIC package assignments simply did not have a large effect on breastfeeding initiation rates.

Breastfeeding Initiation, by Mother's WIC Status During Pregnancy

The breastfeeding initiation rate differed according to whether the mother in the dyad had previously been on WIC while pregnant (Exhibits 8.2a and 8.2b). Among dyads with an infant in the birth month and a mother who had not been on WIC during pregnancy, 53.9% (pre) and 53.2% (post) initiated breastfeeding. By contrast, among dyads with an infant in the birth month and a mother who had been on WIC during pregnancy, 67.6% (pre) and 66.2% (post) initiated breastfeeding. The pre/post changes are not statistically significant, but the differences across prior participation status while pregnant are statistically significant ($p<.01$).

Exhibit 8.2a Breastfeeding Initiation, by Mother's WIC Status During Pregnancy



Sample: Administrative records, all dyads with infants aged 0-5 months in analysis month 2 (pre) and analysis month 10 (post).

Interpretation Guide: Among dyads with an infant in the birth month and a mother who had been on WIC during pregnancy, 67.6% (pre) and 66.2% (post) initiated breastfeeding.

Exhibit 8.2b Breastfeeding Initiation by Mother's WIC Status during Pregnancy

	Pre (%)	Post (%)	Diff (%)	DF [a]	Chi-Square [a]	p-value
Not on WIC During Pregnancy	53.9	53.2	0.7	1	0.285	0.593
On WIC During Pregnancy	67.6	66.2	-1.4	1	1.047	0.306
	n= 19,200	*n*=16,189				

Sample: Administrative records, all dyads with an infant in the birth month in analysis month 2 or 3 (pre) or analysis month 10 or 11 (post).

Interpretation Guide: Among dyads with an infant in the birth month and a mother who had been on WIC during pregnancy, 67.6% (pre) and 66.2% (post) initiated breastfeeding.

[a] Chi-square tests were conducted.

8.2 Pre/Post Comparison by Stratum, Breastfeeding Initiation

We cross-tabulated WIC breastfeeding initiation outcomes separately for two of the stratification categories that were used in selecting the 17 LWAs (Exhibit 8.3).[16] The breastfeeding initiation rate was highest in the predominantly Hispanic race/ethnicity stratum and in the South region. Within each stratum, as in the full sample results presented in Section 8.1, the pre/post change in breastfeeding initiation rate was not statistically significant.

Exhibit 8.3 Differences in Breastfeeding Initiation Rate, by Site Characteristics

	Pre (%)	Post (%)	Diff (%)	DF	Chi-Square [a]	p-value	
Racial/Ethnic Composition Strata							
Predominantly Hispanic	69.4	68.5	-0.9	1	0.137	0.711	
Predominantly white	66.8	64.1	-2.7	1	3.205	0.073	
Predominantly black	62.0	66.9	4.9	1	20,784	<0.001	***
Diverse	63.0	63.0	0.0	1	0.003	0.957	
	n=80,658	*n*=77,534					
Region Strata							
Midwest	61.8	61.7	-0.1	1	0.065	0.799	
South	70.3	69.4	-0.9	1	0.797	0.372	
West	67.5	67.8	0.3	1	0.012	0.913	
Northeast	65.6	63.6	-2.0	1	0.761	0.383	
	n=80,658	*n*=77,534					

Sample: Administrative records, all dyads with infants aged 0-5 months in analysis month 2 (pre) and analysis month 10 (post).

Interpretation Guide: The breastfeeding initiation rate decreased from 69.5% (pre) to 68.5% (post) in predominantly Hispanic sites, but the difference was not statistically significant (p=0.711).

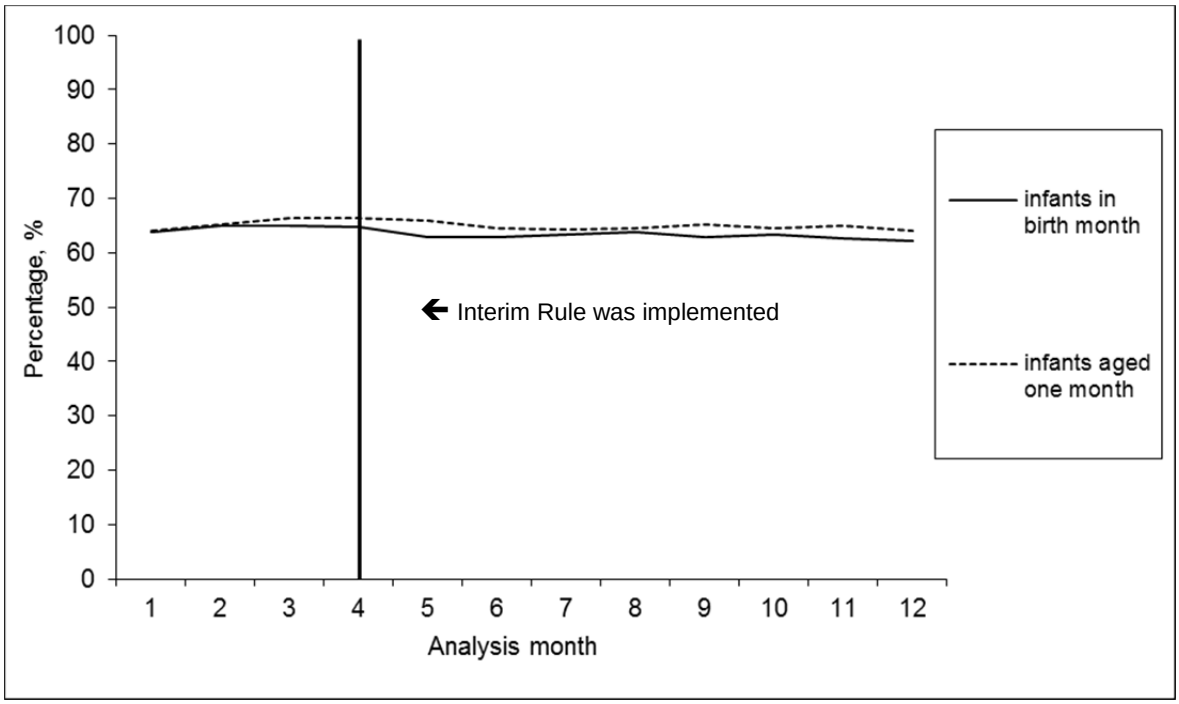
[a] Chi-square tests were conducted. Stars indicate statistical significance of differences: *p<0.05, **p<0.01, *** p<0.001. Overall differences by region were statistically significant (χ^2=9.805, df=3, p=0.020). Differences by racial/ethnic composition were not statistically significant.

8.3 Trends Over Time, Breastfeeding Initiation

This section investigates whether there were any changes in breastfeeding initiation rates, across all 12 analysis months (analysis months 1-3 before the formal implementation date, and analysis months 4-12 after the formal implementation date). As one would expect from the pre/post comparison reported earlier, the time trends in breastfeeding initiation were quite flat during the study period (Exhibit 8.4).

[16] As noted in Chapter 2 and in Section 7.2, the frequencies for mothers' food packages in the pre-implementation period (2009) did not match expectations for the third stratification variable, based on the receipt of the partial breastfeeding package in WIC PC data three years earlier (2006). This issue caused no problems for sampling weights or results for the full sample, but it limits our ability to interpret results disaggregated by the third stratification variable. Hence, here and in later sections, disaggregated results use just the first two of the three stratification variables.

Exhibit 8.4 Breastfeeding Initiation Rate, by Analysis Month



Sample: Administrative records, all dyads with infants in birth month or aged one month in all analysis months.
Interpretation Guide: The breastfeeding initiation rate was steady in the months before and after implementation.
Note: The Interim Rule was implemented in analysis month 4.

8.4 Multivariate Analysis, Breastfeeding Initiation

Other individual and household characteristics may affect the odds of breastfeeding initiation (logistic regression coefficients in Exhibit D.3 in Appendix D and summary odds ratios in Exhibit 8.5). Compared to the reference category (Hispanic or missing race/ethnicity data), non-Hispanic black WIC mothers were less likely to initiate breastfeeding (*OR* = 0.497), controlling for income, participation in other programs, and household size. Higher income WIC dyads were more likely to initiate breastfeeding (*OR* = 1.003 for each percentage point increase in income relative to the poverty standard), controlling for other variables in the model. Participants in SNAP were less likely than nonparticipants to initiate breastfeeding (*OR* = 0.681), controlling for race/ethnicity, income, household size, and TANF participation. To interpret the odds ratio for SNAP participation quantitatively, this result means that, all else constant, the estimated odds of initiating breastfeeding for SNAP participants were 0.681 times the odds for nonparticipants.

Exhibit 8.5 Predictors of Breastfeeding Initiation

	Odds Ratios			
	Full Sample [a] Pre and Post		Separately by Time Period [b] Pre	Post
Post-Implementation	0.987		--	--
Race/Ethnicity				
White	0.654	***	0.638	0.668
Black	0.497	***	0.478	0.515
Other	0.607	*	0.561	0.649
Income (% Federal Poverty Level)	1.003	***	1.003	1.004
Program Participation				
SNAP	0.681	***	0.664	0.697
TANF	0.991		0.954	1.030
Household Size	0.989		0.979	0.979 *
	n= 136,814			

Sample: Administrative records, all dyads with infants aged 0-5 months in analysis month 2 (pre) and analysis month 10 (post). The explanatory variables include fixed effects for LWAs.

Interpretation Guide: Compared to the reference category (Hispanic or missing race/ethnicity data), the odds of initiating breastfeeding were 0.498 times as large for dyads with non-Hispanic black mothers.

[a] Both time periods were estimated using a single model with an indicator for the post-implementation period. Stars indicate statistical significance of the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001. [b] Both time periods were estimated using a single model with interaction terms for the post-implementation period. Stars indicate statistical significance of the pre/post difference in the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001. Full tabulation of regression coefficients is available in Exhibit D.3.

The estimated coefficient for the post-implementation period indicates no change in breastfeeding initiation rate after implementation (*OR* = 0.987), holding other factors constant. This finding is consistent with the earlier simple descriptive estimates (Exhibit 8.1). Also, there was little difference from pre- to post-implementation in the odds ratios for the explanatory variables (Exhibit 8.4, two columns at right).

Chapter 9: Breastfeeding Duration

Chapter 9 is the fourth of five chapters with results for the study's main outcomes. This chapter contains this study's results for pre/post changes in breastfeeding duration. These outcomes are measured using the participant surveys of mothers who had initiated breastfeeding. For all survey respondents, we calculated the number of weeks that the infant was breastfed from birth until either the mother stopped breastfeeding or, if mothers were still breastfeeding, the week that the survey was conducted.

The main result from this chapter's pre/post comparisons is a small but statistically significant increase in breastfeeding duration post-implementation. The pre/post difference was negligible in magnitude and not statistically significant in multivariate models.

Because the participant surveys (with 817 observations before and 800 observations after implementation) have much smaller samples than the administrative records (with more than 10,000 observations in each time period), some results in this chapter may not be statistically significant even when the point estimates are large in practical magnitude. Where appropriate, the accompanying discussion notes this distinction between statistical significance and practical magnitude.

The chapter is organized as follows:

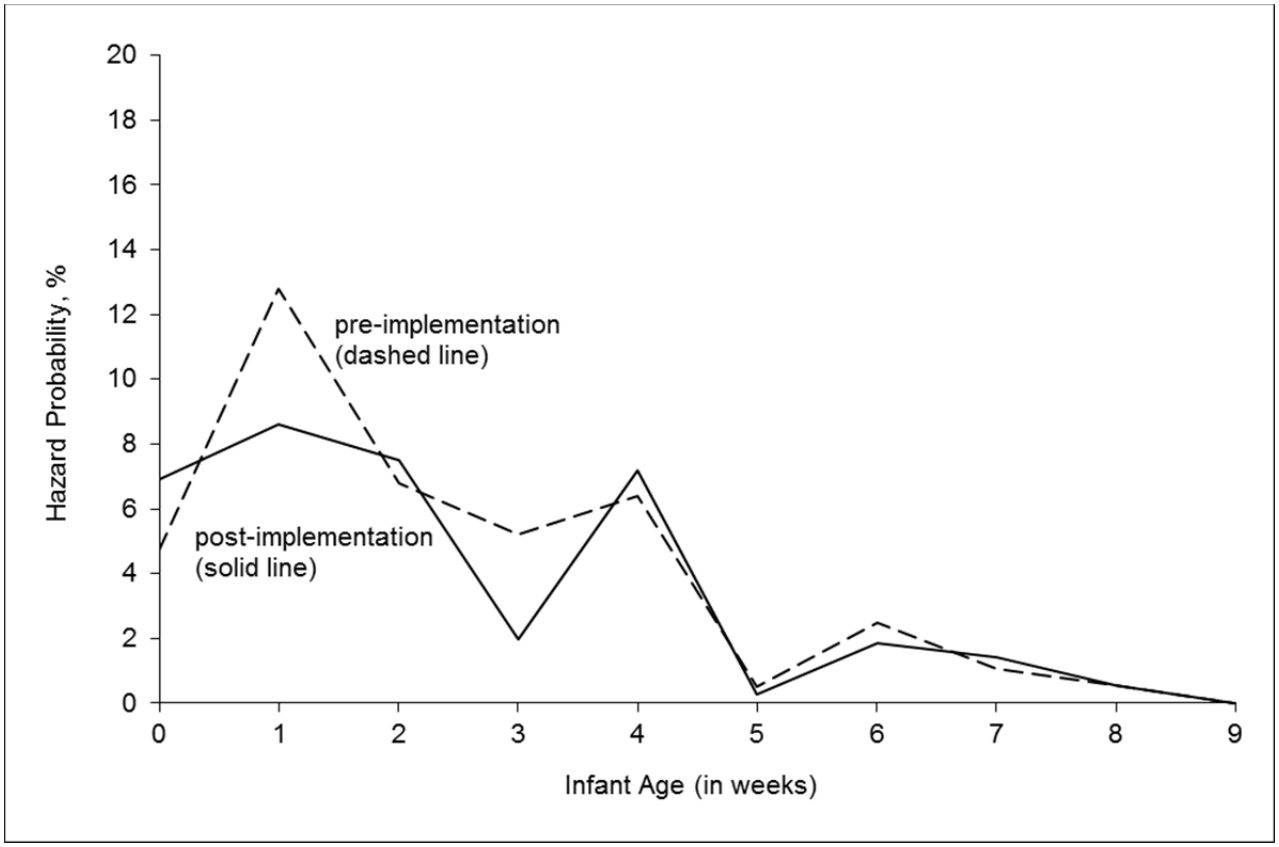
- 9.1. Pre/post comparison, hazard analysis,
- 9.2. Pre/post comparison, breastfeeding for four weeks,
- 9.3. Pre/post comparison by stratum, breastfeeding for four weeks, and
- 9.4. Multivariate analysis, breastfeeding for four weeks.

9.1 Pre/Post Hazard Analysis of Breastfeeding Duration

The hazard analysis investigates the dynamics of continuing or stopping breastfeeding over the first nine weeks of the infant's life. This analysis finds a statistically significant but small increase in breastfeeding duration post-implementation.

In Exhibit 9.1, the hazard probability shows the probability of stopping breastfeeding during each week after the infant's birth, as a percentage of survey respondents who were still breastfeeding at the start of the week. For infants less than 7 days old, the age is 0 weeks, for infants between 7 and 13 days old, the age is 1 week, and so forth. The dashed line shows the pre-implementation hazard probabilities, and the solid line shows the post-implementation hazard probabilities. Based on a chi-square test, we reject the null hypothesis of no pre/post difference at each week of infant age ($\chi^2 = 392.52$, df=10, $p<0.001$). As Exhibit 9.1 illustrates, there are pre/post differences in the hazard probabilities during some of the first few weeks after birth. Although we did not conduct formal hypothesis tests for week-by-week differences, the estimates in the figure indicate a decreased probability of stopping breastfeeding when infants are 1 week old and 3 weeks old.

Exhibit 9.1 Estimated Hazard Function of Mothers Who Stopped Breastfeeding in a Given Week Postpartum



Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: Looking at the intercepts on the vertical axis, among survey respondents, who initiated breastfeeding, the percentage that quit during the first week of the infant's life was 4.7% (pre) and 6.9% (post). Among those who continued breastfeeding through the first week of the infant's life, 12.8% (pre) and 8.6% (post) quit breastfeeding when the infant was age 1 week.

Note: There is a statistically significant pre/post difference in the overall shape of the hazard function (χ^2 =392.52, df=10, p<0.001). The notable pre/post differences in hazard probabilities for infants aged 1 week and aged 3 weeks appear to drive the overall difference.

The first two columns of Exhibit 9.2 present the same hazard probabilities. Among survey respondents who initiated breastfeeding, the percentage that quit during the first week of the infant's life increased from 4.7% (pre) to 6.9% (post). Among those survey respondents who continued breastfeeding throughout the time the infant was 0 weeks old, the percentage that quit breastfeeding when the infant was 1 week old decreased from 12.8% (pre) to 8.6% (post).

Exhibit 9.2 Estimated Pre- and Post-Implementation Hazard Probabilities and Survival Probabilities for Breastfeeding Duration

Infant Age (in weeks)	Estimated Hazard Probabilities, % [a]		Estimated Survival Probabilities for Infants Ever Breastfed, % [b]		Estimated Survival Probabilities for All Infants, % [c]	
	Pre	Post	Pre	Post	Pre	Post
Birth			1.0	1.0	64.7	64.7
0	4.7	6.9	95.3	93.1	61.6	60.2
1	12.8	8.6	83.1	85.1	53.7	55.0
2	6.8	7.5	77.4	78.7	50.1	50.9
3	5.2	2.0	73.4	77.1	47.5	49.9
4	6.4	7.2	68.7	71.6	44.5	46.3
5	0.5	0.3	68.4	71.4	44.2	46.2
6	2.5	1.9	66.7	70.1	43.1	45.3
7	1.1	1.4	65.6	69.1	42.7	44.7
8	0.6	0.6	65.6	68.7	42.4	44.4
9	0.0	0.0	65.6	68.7	42.4	44.4
	n=817	*n*=800	*n*=817	*n*=800		

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

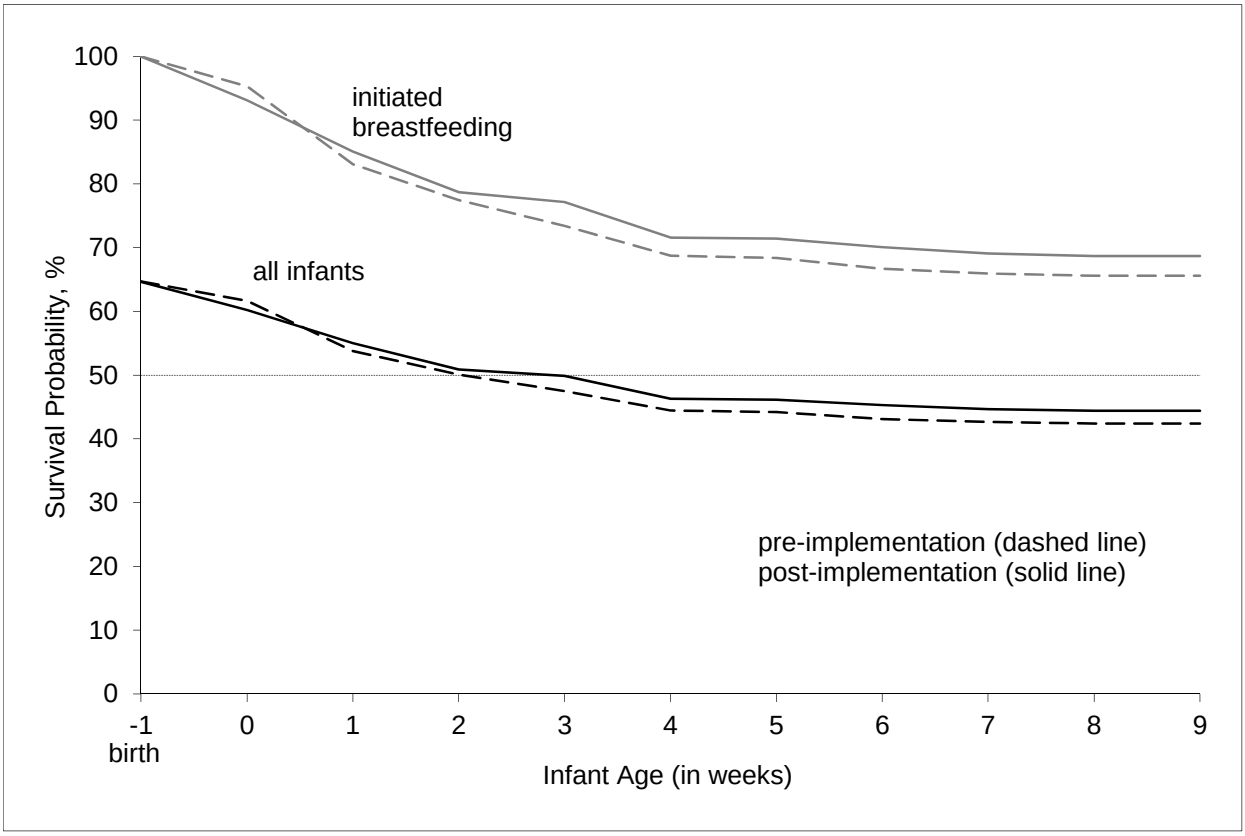
Interpretation Guide: Among survey respondents, who initiated breastfeeding, the percentage that quit during the first week of the infant's life was 4.7% (pre) and 6.9% (post). Among survey respondents, who initiated breastfeeding, the percentage still breastfeeding when infants were nine weeks old was 65.6% (pre) and 68.7% (post). Among all infants, the percentage whose mothers breastfed continuously for 9 weeks was 42.4% (pre) and 44.4% (post).

[a] *Hazard probabilities* indicate the probability that survey respondents stop breastfeeding their infants in a specified week, given continuous breastfeeding to that point. [b] *Survival probabilities* indicate the proportion of infants who continue to be breastfed through a given week. [c] Estimates not conditional on breastfeeding initiation. There is a statistically significant difference in the duration of breastfeeding post-implementation compared to pre-implementation (χ^2 = 392.52, df=10, p<0.001), with a lower risk of stopping breastfeeding post-implementation when infants are age 1 week and age 3 weeks. An estimate of initiation from the administrative records is also used for the estimated survival probabilities for all infants.

The second two columns of Exhibit 9.2 show the "survival probability," which is the probability that the survey respondent is still breastfeeding her infant at each infant age in weeks, throughout the participant survey's observation window of ages 0-9 weeks. The survival probability is illustrated graphically in Exhibit 9.3. The survival probability is computed from the hazard probabilities in the first two columns of Exhibit 9.2.[17] The hypothesis test reported earlier, finding a statistically significant pre/post change in the hazard profile (χ^2 = 392.52, df=10, p<0.001), also implies a statistically significant pre/post change in the survival probability profile. As with the hazard rates, we did not conduct separate hypothesis tests for statistical significance at each week of duration. The survival probability estimates indicate that, among survey respondents who have initiated breastfeeding, the percentage still breastfeeding when infants are age 9 weeks, was 65.6% (pre) and 68.7% (post). This small pre/post difference in survival probabilities suggests that the pre/post differences in hazard probabilities, though statistically significant, do not translate into large overall pre/post differences in breastfeeding duration. Both before and after implementation, more than two thirds of WIC dyads who initiate breastfeeding continue to do so for at least 9 weeks.

[17] The survival probability for week *t* equals the product of the survival probability for week (*t-1)* and one minus the hazard probability for week *t*.

Exhibit 9.3 Estimated Survival Function of Survey Respondents Who are Still Breastfeeding in a Given Week Postpartum (Pre- and Post-Implementation, 2009-2010)



Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: Among survey respondents, who initiated breastfeeding, the percentage still breastfeeding when infants were nine weeks old was 65.6% (pre) and 68.7% (post). Among all infants, the percentage whose mothers breastfed continuously for 9 weeks was 42.4% (pre) and 44.4% (post).

Notes: An estimate of initiation from the administrative records is also used for the estimated survival probabilities for all infants. Black lines indicate the survivor function only for all mothers. Grey lines indicate the function for breastfeeding initiators. There is a statistically significant pre/post difference in the overall shape of the hazard function (χ^2 =392.52, df=10, p<0.001), from which the survival function is calculated.

Using the estimated breastfeeding initiation rates from Section 8.1, we also estimated the survival probabilities for all infants, whether they had initiated breastfeeding or not. This estimation required an adjustment for the fact that only mothers who initiated breastfeeding were interviewed. In the last two columns of Exhibit 9.2, we estimate the percentage of *all* infants that are breastfeeding at each age in weeks. For all infants, the percentage still being breastfed at 9 weeks of age was 42.4% (pre) and 44.4% (post). Because the breastfeeding initiation rate (65%) was nearly the same before and after implementation, this adjustment does not alter our conclusion about changes in breastfeeding duration. Both the conditional and unconditional duration analyses indicate that the fraction of dyads still breastfeeding when infants are age 9 weeks is 2-3 percentage points higher post-implementation.

9.2 Pre/Post Comparison, Breastfeeding for Four Weeks

In addition to the hazard analysis, we also computed the fraction of survey respondents who continued breastfeeding for at least four weeks after the infant's birth (Exhibit 9.4, top panel). The reason for using this second approach was to have a more easily interpretable outcome variable for use in multivariate analyses in Section 9.4 below. The probability that an initiator continued breastfeeding through four weeks increased from 73.1% (pre) to 81.9% (post). This change was barely statistically significant at conventional levels (p-value = 0.048). After adjusting for breastfeeding initiation rate, the probability of breastfeeding for at least four weeks among all infants increased from 47.9% (pre) to 53.4% (post).

It is worthwhile to comment on the differences between Exhibit 9.4 and the survival analysis in Exhibit 9.2. The survival analysis is based on all survey respondents. All respondents who were interviewed at a point when they had information on infants in the first week of life were used to estimate the first weekly hazard, Then, all respondents with information on infants in the second week of life were used to estimate the second weekly hazard, and so forth. In Exhibit 9.4, only respondents with an infant at least 4 weeks old (60% of the total sample of respondents) are used to estimate the survival probability for four weeks of breastfeeding.

Exhibit 9.4 Duration of Breastfeeding for at Least Four Weeks

	Pre (%)	Post (%)	Diff	DF	Chi-Square [a]	p-value	
Overall							
Among breastfeeding initiators:	73.1	81.9	8.8	1	3.908	0.048	*
Among all WIC dyads:	47.9	53.4	5.5		.	.	
	n=478	*n*=486					

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding, and were surveyed when infants were aged 4 weeks or older.

Interpretation Guide: Among survey respondents who initiated breastfeeding and were issued the full breastfeeding package, the percentage that breastfed their infant continuously for at least 4 weeks was 85.9% (pre) and 80.4% (post), a difference that is not statistically significant..

Note: The sample for this exhibit was restricted to mothers with an infant aged 4 weeks or older. An estimate of initiation from the administrative records is also used for the estimated duration for all infants.

[a] Chi-square statistics report pre/post differences. Missing values indicate that the test could not be estimated. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, ***p<0.001. [b] Mothers who have not recertified postpartum, but who have infants who have been certified. [c] Mothers with infants certified for WIC.

9.3 Pre/Post Comparison by Stratum, Breastfeeding for Four Weeks

Exhibit 9.5 presents estimates of duration by the first two site stratification variables (LWA region and LWA predominant race/ethnicity). We did not have an expectation in advance that pre/post differences would be greater in certain strata. These exhibits include a large number of hypothesis tests (seven tests in Exhibit 9.5), and the p-values in the right-most column are not adjusted for multiple comparisons, so it is likely that some differences classified as statistically significant simply reflect sampling variation ("Type I" error). Thus, the apparently significant changes should be interpreted with care.

Breastfeeding duration did not vary by these site characteristics, but some differences over time within strata were noted. The probability of breastfeeding for at least four weeks decreased from 78.0% (pre) to 73.9% (post) in the predominantly non-Hispanic white stratum (p<0.001), increased from 73.8% (pre) to 81.5% (post) in the predominantly diverse or non-Hispanic black stratum (p<0.001), and increased from

67.2% (pre) to 77.4% (post) in the Midwest stratum (p<0.001). Because of the multiple comparisons issue, we think of these divergent results within strata as merely exploratory.

Exhibit 9.5 Differences in Duration of Breastfeeding for at Least Four Weeks, by Site Characteristics

	Pre (%)	Post (%)	Diff	DF	Chi-Square [a]	p-value	
Racial/Ethnic Composition Strata							
Predominantly Hispanic	71.6	83.7	12.1	1	1.597	0.206	
Predominantly white	78.0	73.9	-4.1	1	5.291	0.021	*
Diverse or predominantly black	73.8	81.5	7.7	1	11.197	0.001	***
	n=478	*n*=486					
Region Strata							
Midwest	67.2	77.4	10.2	1	10.864	0.001	***
South	81.3	79.7	-1.6	1	0.333	0.564	
West	70.3	88.3	18.0	1	.	.	
Northeast	[b]	[b]					
	n=478	*n*=486					

Sample: Participant surveys, mothers with infants aged 0-9 weeks who initiated breastfeeding and were surveyed when infants were aged 4 weeks or older.

Interpretation Guide: In predominantly Hispanic LWAs, among survey respondents, who initiated breastfeeding, the percentage who breastfed their infant for at least four weeks was 71.6% (pre) and 83.7% (post).

Note: The sample for this exhibit was restricted to mothers with an infant aged 4 weeks or older.

[a] Chi-square statistics report pre/post differences. Missing values indicate that the test could not be estimated. Stars indicate statistical significance of differences: *p<0.05, **p<0.01, *** p<0.001. Overall differences by predominant race/ethnicity and region were not statistically significant. [b] Percentages not reported because sample size was less than 50.

9.4 Multivariate Analysis, Breastfeeding for Four Weeks

A mother's decision about how long to breastfeed depends on many factors. In this section, we use a multivariate logistic regression model to investigate how the odds of reaching four weeks of duration were related to several explanatory variables (Exhibit 9.6).

Holding other factors constant, the estimated odds of breastfeeding for at least four weeks were 1.156 times as high after implementation as before implementation. For ease of interpretation, we estimated the average probabilities that correspond to this odds ratio.[18] The average probability of reaching four weeks of duration was 76.3% (pre) and 77.2% (post). The negligible increase in the odds of reaching four weeks of breastfeeding duration is not statistically significant (p=0.698). While the univariate results provided weak evidence for an impact on duration (p=0.048), these multivariate results suggest that small changes in other explanatory variables could be responsible. Taking both sets of results together, the preponderance of evidence suggests that the Interim Rule had at most small impacts on breastfeeding duration.

Non-Hispanic black respondents had lower odds than Hispanic respondents of breastfeeding for at least four weeks (*OR*=0.394). The odds of breastfeeding for at least four weeks was much higher for respondents with at least some college education than for respondents with no college education

[18] For each observation in the sample, we used the logistic regression coefficients to forecast the predicted probability of reaching four weeks of duration under the pre-implementation and post-implementation scenarios. Then we took the weighted sample average of these predictions.

(*OR*=2.768, p<0.05). Respondents on TANF had lower odds than respondents not receiving TANF of breastfeeding for at least four weeks (*OR*=0.132, p<0.01).

Exhibit 9.6 Predictors of Breastfeeding for at Least Four Weeks

	Odds Ratios			
	Full Sample [a] Pre and Post		Separately by Time Period [b] Pre	Post
Post-implementation	1.156		—	—
Race/Ethnicity (Ref=Hispanic)				
White	0.463		0.336	0.541
Black	0.394		0.283	0.429
Other/Not reported	1.358		1.129	1.568
Some College or More	2.768	**	3.187	2.280
Employed	1.296		1.343	0.904
Income (% Federal Poverty Level)	1.001		1.004	0.997
Missing Income	1.963		4.632	0.915
Program Participation				
SNAP	1.763		4.241	0.859
TANF	0.132	***	0.189	0.126
Not reported	1.078		1.169	0.968
Single Adult in Household	0.443		0.187	1.315
	n=961			

Sample: Participant surveys, mothers who initiated breastfeeding and were surveyed with infants were aged 4 weeks or older. The explanatory variables include fixed effects for LWAs.

Interpretation Guide: The odds of breastfeeding for at least four weeks was 0.394 times as large for non-Hispanic black mothers as for Hispanic mothers.

[a] Both time periods were estimated using a single model with an indicator for the post-implementation period. Stars indicate statistical significance of the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001. [b] Both time periods were estimated using a single model with interaction terms for the post-implementation period. Stars indicate statistical significance of the pre/post difference in the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001. A full tabulation of regression coefficients is available in Exhibit D.4.

Chapter 10: Breastfeeding Intensity

Chapter 10 is the last of the five chapters with results for the study's main outcomes. This chapter presents descriptive findings about differences over time in breastfeeding intensity, and also reviews findings from the multivariate analysis. It uses data from the participant surveys.

The participant surveys asked mothers to report what they had fed the infant in the last 24 hours:

- breast milk only,
- mostly breast milk with some formula,
- breast milk and formula about equally,
- mostly formula with some breast milk, or
- formula only.

Mothers who reported that they were no longer giving the infant breastmilk were categorized as "formula only". This five-level measure was validated against self-reported frequency of breastfeeding and formula amounts (Section 2.3.1). That validation analysis offered some reassurance that the mother's self-reported intensity was strongly related to infant feeding practices. The breastfeeding intensity domain relies on mothers' self-reports.

The main result in this chapter is that there were no significant differences in breastfeeding intensity in the post-implementation period as compared with the pre-implementation period.

The chapter is organized as follows:

- Section 10.1. Pre/post comparison,
- Section 10.2. Pre/post comparison by stratum, and
- Section 10.3. Multivariate analysis.

10.1 Pre/Post Comparison, Breastfeeding Intensity

Exhibit 10.1 shows the relative frequency of several levels of breastfeeding intensity, conditional on having initiated breastfeeding. There were no statistically significant differences in intensity before and after implementation, based on a chi-square statistic for pre/post changes in the five categories jointly ($p=0.600$).[19] Overall, 18.3% (pre) and 20.0% (post) of breastfeeding initiators responded that they gave breastmilk only, while 29.0% (pre) and 28.1% (post) responded that they gave formula only. The rest reported intermediate levels of breastfeeding intensity.

[19] For the test of pre/post differences, the "breastmilk only" category was combined with the "mostly breastmilk" category, because of the small number of respondents indicating that they fed infants "breastmilk only" in the past 24 hours.

Exhibit 10.1 Intensity of Breastfeeding, Overall

	Pre (%)	Post (%)	Diff	DF	Chi-Square [a]	p-value
				4	2.755	0.600
Breastmilk only	18.3	20.0	1.7			
Mostly breastmilk and some formula	24.9	23.2	-1.7			
Breastmilk and formula equally	16.1	14.2	-1.9			
Mostly formula and some breastmilk	11.7	14.5	2.8			
Formula only	29.0	28.1	-0.9			
	n=814	*n*=800				

Sample: Participant surveys, mothers with an infant aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: 18.3% (pre) and 20.0% (post) of mothers who initiated breastfeeding fed their infants only breastmilk. These differences were not statistically significant.

[a] A Chi-square test was conducted.

Exhibit 10.2 presents results by mother's food package. Sample sizes disaggregated by mother's food package choice are small, and the p-values in the right-most column are not adjusted for multiple comparisons, so these results should be interpreted with care. Among mothers choosing the full breastfeeding package, the exhibit shows a decline in the proportion who reported feeding their infant only breastmilk from 67.1% (pre) to 39.0% (post), but it should be noted that these estimates are based on small sample sizes. It is not clear why 2.8% (pre) and 15.2% (post) of these survey respondents receiving the full breastfeeding package would report feeding formula only to the infant. It is possible that this post-implementation figure reflects temporary difficulties in package assignment during the early post-implementation months. For mothers receiving the full formula package, there was a decline in the proportion who reported feeding their infant only formula from 88.6% (pre) to 55.5% (post). Changes in intensity level within these two package choices were statistically significant at conventional levels, with no adjustment for multiple comparisons ($p<0.001$). However, because of the small sample sizes and the multiple comparisons issue, we think of these estimated differences as merely exploratory.

Exhibit 10.2 Intensity of Breastfeeding, by Mother's Food Package

	Pre (%)	Post (%)	Diff	DF	Chi-Square [a]	p-value	
Full Breastfeeding Package				4	24.591	<0.001	***
Breastmilk only	67.1	39.0	-28.1				
Mostly breastmilk and some formula	15.2	38.8	23.6				
Breastmilk and formula ~ equally	3.6	5.4	1.7				
Mostly formula and some breastmilk	11.2	1.5	-9.7				
Formula only	2.8	15.2	12.4				
	n=97	*n*=78					
Partial Breastfeeding Package				4	21.027	0.000	***
Breastmilk only	24.8	8.3	-16.5				
Mostly breastmilk and some formula	25.4	18.5	-7.0				
Breastmilk and formula ~ equally	24.0	17.8	-6.2				
Mostly formula and some breastmilk	14.6	45.3	30.7				
Formula only	11.1	10.2	-1.0				
	n=154	*n*=113					
Full Formula Package				3	41.394	<0.001	***
Breastmilk only	0.0	1.2	1.2				
Mostly breastmilk and some formula	2.2	12.4	10.2				
Breastmilk and formula ~ equally	7.7	14.2	6.5				
Mostly formula and some breastmilk	1.5	16.7	15.1				
Formula only	88.6	55.5	-33.0				
	n=52	*n*=70					
Pregnant Package [b]				4	9.033	0.060	
Breastmilk only	15.4	24.6	9.2				
Mostly breastmilk and some formula	27.4	26.0	-1.4				
Breastmilk and formula ~ equally	19.0	12.6	-6.5				
Mostly formula and some breastmilk	12.4	12.7	0.4				
Formula only	25.8	24.1	-1.7				
	n=303	*n*=299					
Not receiving WIC [c]				4	11.752	0.019	*
Breastmilk only	14.2	14.2	-0.1				
Mostly breastmilk and some formula	32.8	17.8	-14.9				
Breastmilk and formula ~ equally	12.5	18.2	5.7				
Mostly formula and some breastmilk	13.6	15.4	1.8				
Formula only	26.9	34.4	7.5				
	n=208	*n*=239					

Sample: Participant surveys merged with administrative records, mothers with an infant aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: Among survey respondents receiving the full breastfeeding package, the proportion who reported feeding their infant only breastmilk declined from 67.1% (pre) to 39.0% (post).

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post: *p<0.05, **p<0.01, *** p<0.001. [b] Mothers who have not recertified postpartum, but who have infants who have been certified. [c] Mothers with infants certified for WIC.

10.2 Pre/Post Comparison by Stratum, Breastfeeding Intensity

Exhibits 10.3, 10.4, and 10.5 present estimates of breastfeeding intensity by the site stratification variables. Most estimates of pre/post changes were not statistically significant, and there was no correction for the multiple comparisons issue (see Exhibits 10.4 and 10.5). Breastfeeding intensity increased in the West stratum and decreased in the Midwest stratum (p<0.05) between the pre-implementation and post-implementation periods (Exhibit 10.5). Because of the multiple comparisons issue and the small sample sizes, this disaggregated comparison is merely exploratory.

Exhibit 10.3 Intensity of Breastfeeding, by Site Characteristics

	Breastmilk Only	Mostly Breastmilk and Some Formula	Breastmilk and Formula Equally	Mostly Formula and Some Breastmilk	Formula Only	DF	Chi-square [a]	p-value	
Racial/Ethnic Composition Strata						8	127.053	<0.001	***
Predominantly Hispanic, %	19.8	28.8	8.6	14.2	28.5				
Predominantly white, %	44.6	14.4	6.8	6.3	28.0				
Diverse or predominantly black, %	15.4	21.1	22.1	12.7	28.8				
	n=464	*n*=346	*n*=188	*n*=189	*n*=427				
Region Strata						12	176.951	<0.001	***
Midwest, %	11.2	16.8	25.5	11.8	34.7				
South, %	17.6	26.7	12.7	16.2	26.8				
West, %	27.1	27.2	9.5	10.5	25.7				
Northeast, %	14.9	17.5	21.9	19.1	26.6				
	n=464	*n*=346	*n*=188	*n*=189	*n*=427				

Sample: Participant surveys merged with administrative records, mothers with an infant aged 0-9 months who initiated breastfeeding.

Interpretation Guide: There are significant differences in breastfeeding intensity across all the strata in the analysis. For example, 27.1% of mothers in sites located in the west fed their infants only breastmilk only as compared with 11.2% of mothers in sites located in the midwest.

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences: *p<0.05, **p<0.01, *** p<0.001.

Exhibit 10.4 Intensity of Breastfeeding, by Predominant Race/Ethnicity Strata

	Pre (%)	Post (%)	Diff	DF	Chi-Square [a]	p-value
Predominantly Hispanic				4	2.805	0.591
Breastmilk only	18.5	21.8	3.3			
Mostly breastmilk and some formula	29.0	28.6	-0.4			
Breastmilk and formula about equally	10.2	6.5	-3.7			
Mostly formula and some breastmilk	13.3	15.4	2.1			
Formula only	29.0	27.8	-1.2			
	n=249	*n*=251				
Predominantly White				4	2.996	0.559
Breastmilk only	46.2	42.6	-3.7			
Mostly breastmilk and some formula	15.3	13.3	-2.0			
Breastmilk and formula about equally	6.9	6.6	-0.3			
Mostly formula and some breastmilk	5.8	6.8	1.0			
Formula only	25.8	30.7	0.3			
	n=223	*n*=218				
Diverse or Predominantly Black				4	1.863	0.761
Breastmilk only	14.5	16.3	1.8			
Mostly breastmilk and some formula	21.9	20.2	-1.8			
Breastmilk and formula about equally	23.2	20.8	-2.4			
Mostly formula and some breastmilk	10.9	14.7	3.8			
Formula only	29.4	28.0	-1.3			
	n=342	*n*=331				

Sample: Participant surveys, mothers with an infant ages 0-9 weeks who initiated breastfeeding.

Interpretation Guide: Among survey respondents in sites that were predominantly Hispanic, the proportion who reported feeding their infant only breastmilk was 18.5% (pre) and 21.8% (post); the change was not statistically significant (p=0.1781).

[a] Chi-square tests were conducted. The overall difference across strata is statistically significant (χ^2=127.053, df=8, p<0.0001). Overall difference by region is statistically significant (χ^2=176.951, df=.12, p<0.001).

Exhibit 10.5 Intensity of Breastfeeding, by Region Strata

	Pre (%)	Post (%)	Diff	DF	Chi-Square [a]	p-value	
Midwest				4	14.916	0.005	**
Breastmilk only	12.5	9.7	-2.8				
Mostly breastmilk and some formula	19.9	13.3	-6.7				
Breastmilk and formula about equally	27.2	23.6	-3.6				
Mostly formula and some breastmilk	6.9	17.4	10.6				
Formula only	33.5	36.0	-2.5				
	n=98	*n*=95					
South				4	1.960	0.743	
Breastmilk only	15.7	19.7	4.0				
Mostly breastmilk and some formula	28.2	25.0	-3.2				
Breastmilk and formula about equally	12.9	12.5	-0.4				
Mostly formula and some breastmilk	17.6	14.6	-3.0				
Formula only	25.5	28.2	2.7				
	n=375	*n*=367					
West				4	81.690	<0.001	***
Breastmilk only	25.1	29.9	4.8				
Mostly breastmilk and some formula	25.2	30.0	4.8				
Breastmilk and formula about equally	10.9	7.6	-3.3				
Mostly formula and some breastmilk	9.6	11.8	2.2				
Formula only	29.2	20.7	-8.5				
	n=286	*n*=282					
Northeast				4	8.236	0.083	
Breastmilk only	24.0	7.2	-16.8				
Mostly breastmilk and some formula	21.8	13.9	-7.9				
Breastmilk and formula about equally	20.6	23.0	2.4				
Mostly formula and some breastmilk	12.8	24.4	11.7				
Formula only	20.9	31.5	10.6				
	n=55	*n*=56					

Sample: Participant surveys, mothers with an infant aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: Among mothers in sites located in the Midwest, the proportion who reported feeding their infant only breastmilk declined from 12.5% (pre) to 19.7% (post).

[a] Chi-square tests were conducted. Stars indicate statistical significance of differences between pre and post. *p<0.05, **p<0.01, *** p<0.001. Overall differences are statistically significant (χ^2=176.951, df=12, p<0.001).

10.3 Multivariate Analysis, Breastfeeding Intensity

In this section, the multivariate logistic regression analysis measures the relationship between explanatory variables and (a) the odds of feeding the infant "mostly or only breastmilk" and (b) the odds of feeding the infant "formula only".

Holding other factors constant, there was no change post-implementation in the odds of feeding the infant mostly or only breastmilk (*OR*=0.923) (Exhibit 10.6). These multivariate results agree with the simpler descriptive pre/post comparison in Section 10.1. Survey respondents with at least some college education had higher odds than respondents with less education of feeding infants mostly or only breastmilk (*OR*=2.530, p<0.01).

Holding other factors constant, the odds of feeding the infant formula only were 1.15 times higher after implementation than before implementation (*OR*=1.153), but the pre/post change was not statistically significant (Exhibit 10.7). Survey respondents with at least some college education had lower odds than respondents with less education of feeding infants formula only (*OR*=0.537, p<0.01).

Exhibit 10.6 Predictors of "Mostly or Only Breastmilk" Intensity Level

	Odds Ratios			
	Full Sample [a] Pre and Post		Separately by Time Period [b] Pre	Post
Post-implementation	0.923		—	—
Race/Ethnicity (Ref= Hispanic)				
White	0.635		0.762	0.545
Black	0.603		0.624	0.564
Other/Not reported	1.144		1.024	1.191
Some College or More	2.530	***	0.359	0.129 *
Employed	0.636		0.690	0.674
Income (% Federal Poverty Level)	1.005		1.004	1.006
Missing Income	1.260		2.179	0.804
Program Participation				
SNAP	1.510		1.067	1.140
TANF	0.408	*	0.770	0.593
Not reported	1.108		0.770	1.264
Single Adult in Household	0.662		0.655	0.620
	n=1,610			

Sample: Participant surveys, mothers with an infant aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: All else equal, mothers with some college education were more likely (OR=2.530) to feed their infants mostly or only breastmilk. This finding is statistically significant (p<0.001).

[a] Both time periods were estimated using a single model with an indicator for the post-implementation period. The explanatory variables include fixed effects for LWAs. Stars indicate statistical significance of the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001. [b] Both time periods were estimated using a single model with interaction terms for the post-implementation period. A full tabulation of regression coefficients is available in Exhibit D.5.

Exhibit 10.7 Predictors of "Mostly or Only Formula " Intensity Level

	Odds Ratios			
	Full Sample [a] Pre and Post		Separately by Time Period [b] Pre	Post
Post-implementation	1.153		—	—
Race/Ethnicity (Ref= Hispanic)				
White	1.675	*	2.192	2.442
Black	2.264	**	2.829	1.768
Other/Not reported	0.952		1.305	0.533
Some College or More	0.537	**	0.344	0.831
Employed	1.394	*	1.272	1.412
Income (% Federal Poverty Level)	0.992	**	0.996	0.991
Missing Income	0.528		0.501	0.552
Program Participation				
SNAP	0.808		0.768	0.774
TANF	2.106	*	2.942	2.011
Not reported	1.018		1.222	0.749
Single Adult in Household	1.458		1.458	1.085
	n=1,610			

Sample: Participant surveys, mothers with an infant aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: All else equal, mothers with some college education were less likely (OR=0.424) to feed their infants only formula. This finding is statistically significant (p<0.001).

[a] Both time periods were estimated using a single model with an indicator for the post-implementation period. Stars indicate statistical significance of the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001. [b] Both time periods were estimated using a single model with interaction terms for the post-implementation period. Stars indicate statistical significance of the pre/post difference in the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001. A full tabulation of regression coefficients is available in Exhibit D.6 in Appendix D.

Chapter 11: Discussion and Conclusions

The Interim Rule sought to encourage WIC mothers to increase the amount of breastmilk and decrease the amount of formula they choose to feed their infants. This study evaluated the impact of the regulatory changes on WIC package choices, infant formula amounts, and the initiation, duration, and intensity of breastfeeding.

This chapter is organized as follows. The first three sections are review:

- Section 11.1 highlights a key feature of the WIC package changes,
- Section 11.2 reviews the study's research design, and
- Section 11.3 summarizes the main results from the five research domains.

The next two sections serve as a bridge between the main results and the policy discussion, by addressing two questions with implications for how the empirical results should be interpreted.

- Section 11.4 discusses whether the study's observation periods correctly distinguish pre-implementation and post-implementation conditions, and
- Section 11.5 discusses whether changes in WIC package assignments were merely a reclassification, or whether they were accompanied by changes in actual breastfeeding outcomes.

In the final section:

- Section 11.6 presents some policy implications.

11.1 WIC Package Changes

The Interim Rule made multiple changes to the infant and maternal food packages, designed to improve nutrition and promote breastfeeding (Section 1.4). In particular, the Interim Rule limited the amount of infant formula available to dyads receiving the partial breastfeeding package. To encourage the successful initiation of breastfeeding, the WIC formula amount for these partial breastfeeding dyads was limited during the infant's birth month to no more than 104 ounces. To encourage greater duration and intensity of breastfeeding, when the infant was aged 1-5 months, the formula amount for these partial breastfeeding dyads was limited to no more than about 45% of the maximum formula amount. After implementation, if a dyad required more than these amounts of formula, the mother would receive the full formula WIC package, even if she was partially breastfeeding her infant. Receiving the full formula package instead of the partial breastfeeding package may be a significant change. The full formula package provides less food for the mother, and these maternal benefits end when the infant is six months old. The partial breastfeeding package provides more food for the mother, and the benefits last throughout the infant's first year.

11.2 Research Design

The study focused on infants and their mothers for the birth month and the next five months postpartum. It used a pre/post research design, comparing outcomes shortly before and shortly after implementation of

the Interim Rule. The data describing these outcomes came from several sources in each period, including interviews with State and local WIC staff, administrative records for all dyads with an infant aged 0-5 months old in the sampled LWAs, and participant surveys with mothers of infants aged 0-9 weeks old who had initiated breastfeeding.

In this report, Chapter 3 provided background on the setting for the study in 17 sampled LWAs. Chapter 4 described the implementation of the Interim Rule, including program operations. Chapter 4 also discussed the perceptions of State and LWA staff about how the changes influenced participants. Chapter 5 summarized survey respondents' own account of factors that influenced their breastfeeding decisions. Chapters 6 through 10 presented the main results for the study's five research domains.

11.3 Main Results in Five Domains

The study provided information about many changes in outcomes before and after implementation of the interim rule. These outcomes are organized into five domains.

1. ***Program participation patterns*** (Chapter 6). There was little pre/post difference in WIC program participation patterns among mothers and infants. The percentage of mothers receiving WIC during pregnancy whose infants were enrolled after birth was the same before and after implementation. The average age of infant's first enrollment was the same before and after implementation. The average demographic characteristics of WIC mothers and infants were largely the same before and after implementation. Participant income as a percentage of the Federal Poverty Level fell slightly, as the study took place during a time of economic recession. Since there were few differences in the re-enrollment of pregnant WIC participants or in the characteristics of WIC participants, changes in food package assignments and breastfeeding behavior do not simply reflect differences in the participant population itself. For example, when dyads receiving the full breastfeeding package are measured as a percentage of WIC dyads, we have confidence that pre/post differences reflect real changes in the outcome (in the numerator), not merely changes in the number of WIC dyads (in the denominator).
2. ***WIC food package assignments and infant formula amounts*** (Chapter 7). The first principal finding in this domain is that fewer WIC mothers were assigned the partial breastfeeding package, while more mothers were assigned to the full breastfeeding and full formula packages. For dyads or partial dyads during the infant's birth month, the percentage whose mother received the partial breastfeeding package fell from 24.7% (pre) to 13.8% (post). The percentage receiving the full breastfeeding package rose from 9.8% (pre) to 17.1% (post), and the percentage receiving the full formula package rose from 20.5% (pre) to 28.5% (post). The second principal finding in this domain is that infant formula amounts also changed. Among dyads with infants in the birth month, the percentage where the infant received no formula increased from 12.2% (pre) to 19.7% (post), which is a favorable outcome. However, the proportion where the infant received the maximum or nearly the maximum formula amount also increased, from 49.4% (pre) to 56.4% (post), which is a less favorable outcome. Both principal findings suggest a move away from intermediate WIC packages and toward the two extremes (full breastfeeding or full formula).
3. ***Breastfeeding initiation rates*** (Chapter 8). As measured in administrative records, the breastfeeding initiation rate for WIC participants was essentially unchanged: 65.6% (pre) and

65.2% (post). Overall breastfeeding initiation rates appeared quite stable even as WIC package assignments changed.

4. ***Breastfeeding duration*** (Chapter 9). Based on evidence from three analytic approaches, the preponderance of evidence suggests that the Interim Rule had at most small impacts on breastfeeding duration. The duration estimates used data from the survey respondents, all of whom had at least initiated breastfeeding. First, a survival analysis showed a small shift in the profile of breastfeeding duration: at each infant age measured in weeks, the percentage of respondents that was still breastfeeding was slightly higher after implementation than before implementation. Second, simple estimates of respondents with infants who were still breastfeeding after four weeks, measured as a percentage of all respondents with infants observed at age four to nine weeks, increased from 73.1% (pre) to 81.9% (post). This change was barely statistically significant (p=0.048). Third, in a multivariate analysis, holding other factors constant, the change after implementation in the odds of reaching four weeks of duration was negligible in magnitude and statistically insignificant.
5. ***Breastfeeding intensity*** (Chapter 10). Based on the participant survey data, there was no change after implementation in the intensity of breastfeeding among initiators. The main analysis categorized participant feeding practices as breastmilk only, mostly breastmilk with some formula, breastmilk and formula about equally, mostly formula and some breastmilk, and only formula. The percentage of respondents in these categories was not significantly different before and after implementation of the Interim Rule.

The next two sections discuss, respectively, the changes observed in the WIC food packages and the absence of major changes in breastfeeding outcomes.

11.4 The Timing of the Pre- and Post-Implementation Periods

In a pre/post research design, it is generally helpful to have a short interval between the two time periods. Such a short interval limits the extent to which unrelated changes in the larger environment can confound the results.

In this study, the observation window included three months before the implementation date (analysis months 1-3), and nine months after the implementation date (analysis months 4-12). For the participant surveys, the pre-implementation data collection took place in approximately analysis months 1-2 (about one to two months before implementation), and the post-implementation data collection took place in approximately analysis months 7-9 (approximately four to six months after implementation).

However, a short time interval also has disadvantages. Some implementation changes may have happened before the formal implementation date, while other implementation changes may have happened after our survey. Interviews with State and LWA staff indicated that some aspects of policy changes and breastfeeding promotion were discussed with participants even before the formal implementation date (Chapter 4). Moreover, after implementation, the administrative records indicated some assignments of infant formula amounts that appeared higher than we expected based on the new limits for participants receiving the partial breastfeeding package (Section 7.6.3). This pattern may reflect data limitations, such as our inability to determine whether infant formula amounts were changed part way through a month, but it may also indicate either that LWAs were still learning the new rules in the post-implementation months or that LWAs sometimes allow exceptions to the formal limits.

We addressed the implications of the short time interval in two ways. First, the analysis of administrative records used analysis months 1-2 as the pre-implementation period and analysis months 5-12 as the post-implementation period, excluding the two intermediate months (i.e., analysis months 3 and 4) as a transitional period. Second, for selected key results, we analyzed the time trends across all 12 analysis months. In particular, we noted a substantial change in WIC package assignments (Section 7.3) and the proportion of dyads receiving no formula (Section 7.7), whose timing corresponded exactly to the formal implementation date. Although we recognize that some changes may have happened over a longer period, these results provide reassurance about our ability to distinguish the pre-implementation and post-implementation periods within our observation time frame.

11.5 Package Changes and Actual Outcomes

At a broad level, the objective of these policy changes was to encourage adoption of the full breastfeeding package and to promote breastfeeding initiation, duration, and intensity. Yet, the changes in package options could in principle have several other possible effects on breastfeeding outcomes.

- First, if infant feeding choices are predetermined or fixed, the policy change could lead fewer cases to be assigned partial breastfeeding status and more cases to be assigned full formula status, without greatly influencing actual breastfeeding behavior in either direction. In this case, there would be a change in package assignments without large effects on breastfeeding outcomes.
- Second, even if mothers do respond to the changing incentives provided by the food package changes, the observed effects on breastfeeding outcomes are ambiguous. A shift from the partial breastfeeding package to the full formula package would seem like bad news for breastfeeding promotion, while a shift from the partial breastfeeding package to the full breastfeeding package would seem like good news.

The evidence in Chapter 7 suggests that the pre/post differences in WIC package assignments do not merely reflect reclassification alone, for two reasons. First, the reclassification hypothesis could in principle explain a shift from the partial breastfeeding package to the full formula package, but it cannot explain the modest increase we observed in the proportion of dyads whose mother receives the full breastfeeding package (Section 7.1). Second, the pre/post changes in the distribution of package assignments were accompanied by changes in the distribution of infant formula amounts, which cannot be explained by reclassification alone. As more dyads after implementation had mothers who received the full breastfeeding package, the proportion of all dyads receiving no formula increased; and, as more dyads after implementation had mothers who received the full formula package, the proportion of all dyads receiving the maximum or nearly the maximum formula amount also increased (Section 7.6). These results suggest that there was a real change in the distribution of infant formula amounts, not merely a change in WIC package category assignments.

On the other hand, changing WIC package assignments does not automatically lead to all the changes in actual outcomes that one might hope. It appears possible to change the WIC package assignment for a short period, but then to have a reversion. After implementation, more dyads with infants in the birth month received the full breastfeeding package for the mother and no formula for the infant, but this finding should be considered in the context of later package changes. After implementation, among dyads where the mother received the full breastfeeding package in the infant's birth month, the transitions to other packages appeared to happen more rapidly than they did before implementation (Section 7.5).

Likewise, after implementation, among dyads where the infant received no formula in the birth month, the transitions to receiving some formula appeared to happen more rapidly than they did before implementation (Section 7.8).

There is other evidence that the changes in WIC package assignments did not necessarily lead to changes in actual breastfeeding outcomes. The best example is breastfeeding initiation rates, which appeared very stable in this study even as WIC package assignments changed. The initiation decision may be strongly influenced by the mother's information and environment during pregnancy and at the time of birth, but more weakly influenced by anticipated advantages of one WIC package over another in the future when the infant is 1-5 months old. It is possible that WIC can more strongly influence breastfeeding initiation for mothers who participated in WIC while pregnant than for mothers who enrolled after the infant's birth. Chapter 7 found that the overall pre/post changes in package assignments appeared largely due to pre/post changes in the sub-group of mothers that had participated in WIC while pregnant, not the sub-group of mothers that began WIC after the infant's birth (see Section 7.1). Chapter 8 found that breastfeeding initiation rates were higher for the sub-group of mothers that had participated in WIC while pregnant than for the sub-group that began WIC after the infant's birth. These conclusions are corroborated by mothers' own description of their decisions: most survey respondents reported that that they made their breastfeeding initiation decision while still pregnant (Chapter 5).

Interviews with WIC staff provide further information about perceptions of the effect of package changes (Chapter 4). For example, the State-level WIC staff reported that it was common for infants to be issued more than 45% of the maximum formula amount but less than the maximum formula amount. Cases with infant formula amounts in this range would have been classified as partial breastfeeding cases before implementation but full formula cases after implementation. Some local WIC staff mentioned that it was difficult to change the package assignment to full formula status for mothers who were partially breastfeeding before implementation, if they received more than the new limit of about 45% of the maximum infant formula amount. Some local WIC staff were concerned that WIC participants might not be well enough educated about the changes to make truly informed decisions about the benefits, and might give up too easily on breastfeeding, given the more stringent requirements for the partial breastfeeding package. Moreover, both the WIC staff interviews (Chapter 4) and participant surveys (Chapter 5) indicated that many WIC mothers did not fully understand the package options and their dependence on breastfeeding choices. For example, only 56.3% (pre) and 56.8% (post) of survey respondents knew that the full breastfeeding package has more food than the full formula package (Chapter 5).

11.6 Policy Implications

The Interim Rule sought to address the challenging policy dilemma of balancing breastfeeding promotion with provision of safe and appropriate food for infants who are formula fed. From shortly before to shortly after implementation, this study found no change in initiation and intensity, and only a small change in duration. These results are neutral in the sense that no adverse impact was observed, but unfavorable in the sense that larger positive changes in breastfeeding outcomes were not observed. These results raise the question of what further policy changes could be explored as the most sensible next steps toward even more vigorous breastfeeding promotion.

A first policy option is to increase further the economic value of the full breastfeeding and partial breastfeeding packages relative to the full formula package. Although the Interim Rule shifted the package incentives somewhat towards making the full breastfeeding package more valuable, the full formula package continues to have the highest market value (Chapter 1). For this first policy option, it is worthwhile to review the mixed evidence from this study regarding whether breastfeeding and infant feeding choices appeared to respond to WIC package incentives. Compared to before implementation, this study found that more dyads had mothers receiving the full formula package after implementation, and that most of these full formula dyads received the maximum or nearly the maximum formula amount. The study found no evidence that changes in package options affect some outcomes, such as breastfeeding initiation or self-reported breastfeeding intensity, but the formula amounts at least appeared responsive.

Eighty percent of survey respondents reported that the WIC food package was "very important" or "somewhat important" in their breastfeeding decision (Section 5.2), although many respondents may not have fully understood how the WIC food packages varied with breastfeeding status.

A second policy option is to continue to improve staff training and strengthen State-and LWA-level breastfeeding promotion efforts. The implementation of the Interim Rule should be seen as one event in an ongoing process of promoting breastfeeding through WIC. This study found considerable diversity across LWAs in breastfeeding promotion (Chapter 4), package assignments and infant formula amounts (Chapter 7), and breastfeeding outcomes (Chapters 8-10). For example, although the Interim Rule allows the provision of up to 104 ounces of formula for partial breastfeeding dyads with infants in their birth month, LWAs are encouraged routinely to provide no formula to such dyads. FNS anticipates that over time fewer breastfeeding WIC dyads will be provided any formula in the birth month (Section 1.4). Later, as the infant reaches ages 1-5 months, about half of the LWAs responded to mothers' requests for additional formula by addressing their concerns through counseling before issuing a new package (Section 4.8). Such efforts could be extended to more LWAs. FNS encourages States (a) to review existing policies and procedures to ensure they support breastfeeding women and infants through minimum supplementation with infant formula, and (b) to ensure staff are adequately trained to provide the necessary counseling and support.

A third policy option, motivated by the stability of the breastfeeding initiation outcomes after implementation of the Interim Rule, is to focus on pregnant mothers and the very first days postpartum. WIC could invest even more heavily in educating pregnant women and new mothers about the relative merit of the full breastfeeding package. Through outreach efforts, and perhaps even through changes in the pregnancy WIC package, the WIC program could increase its recruitment of eligible pregnant women. WIC also could study the experience of those States and LWAs with the lowest provision of infant formula to breastfeeding mothers during the infant's birth month. The WIC staff interviews (Section 4.6.2) indicated that some LWAs work under the assumption that participants will be breastfeeding unless the participant brings up formula as an issue, while other LWAs treat formula provision as more typical. Finally, many hospitals in the United States continue to distribute free formula to new mothers (Chapter 1), and some WIC agencies already report working with hospitals on breastfeeding promotion (see Chapter 4). In the post-implementation period, 60% of new WIC mothers who were exclusively breastfeeding nevertheless reported having received formula from the hospital at discharge (Section 5.1). The Federal Government's proposed Healthy People 2020 objectives include increasing the percentage of live births that occur in hospitals, birthing centers, or other facilities that provide recommended care for

lactating mothers and their babies. WIC could be used as a vehicle for more vigorously promoting appropriate lactation policies and practices for U.S. hospitals.

These policy options are not mutually exclusive. Although this study found no change in average breastfeeding initiation rates in response to changing package incentives, it is possible that stronger effects would have been found under two conditions: (a) if WIC breastfeeding promotion efforts reached a larger fraction of eligible women while pregnant and in hospitals, and (b) if these promotion efforts could point to larger and more immediately salient advantages of the full breastfeeding package relative to other WIC packages. If such policy options are explored, it would be important to evaluate both the intended outcomes (higher breastfeeding initiation rates) and the potential risk of unintended outcomes (less adequate formula provision to non-breastfeeding infants).

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Appendix A. Sampling Weights

As described in Section 2.2, our analyses of food package choices and breastfeeding outcomes are based on two data sources – the participant survey and administrative records. We selected a sample of LWAs using a complex stratified sampling plan, which yielded (1) a sample of 16 LWAs from which we further selected a sample of WIC mothers to complete the participant survey (see Section 2.2.1), and (2) a sample of 17 LWAs from which we obtained administrative records (see Section 2.1). Because the number of LWAs and the number of WIC participants are different for the two sources of data, different sampling weights are assigned to the participant survey sample and to the administrative records, as explained below. The weights are in accordance with the sampling design used for the selection LWAs and WIC participants.

A.1. Participant Survey Sampling Weights

Sampling weights are assigned to individual participant records in the participant survey sample to reflect the sampling of LWAs and then the subsequent sampling of WIC mothers to be surveyed. The survey sampling weights account for both stages of sampling in the complex sampling design. The first is the sampling of 16 LWAs and the second is sampling of WIC units within each of the 16 sampled LWAs. These weights are the product of two factors: (a) the probability of selecting each of the 16 sampled LWAs from the population of all LWAs in the sampling frame, and (b) an adjustment to make the survey sample within each LWA reflect the infant age distribution of the corresponding WIC units in each of the 16 sampled LWAs.

(1a) LWA Weighting Factor

The first factor in the survey sampling weights is based on the probability of selection of each of the 16 sampled LWAs from the population of all LWAs nationwide. As discussed earlier, a sample of 16 LWAs was selected to represent 36 strata at the margins for the three stratifying variables. The sampling weight assigned to the selected agencies within strata selected by this method assumes that the agencies were selected with equal probability within each stratum. Under this assumption, a sampling weight for each agency was calculated again based on the estimator proposed by Bryant, Hartley, and Jesson (1960). The sampling weight for an agency selected in region i, race/ethnicity group j and BF rate k is (after some simplification) is:

$$w_{ijk} = \frac{n^2 N_{ijk}}{n_{i..} n_{.j.} n_{..k}}$$

where $n_{i..}$ is the number of agencies selected in region i and $n_{.j.}$ is the number of agencies selected in race/ethnicity group j and $n_{.k}$ is the number of agencies selected in BF rate category k. These weights give unbiased estimates of the population parameters assuming equal probability sampling within each stratum. We discuss below how we adjust for the fact that LWAs were in fact selected with probability proportional to size (where the measure of size is the LWA's number of pregnant women).

Under the sampling selection procedure, the sum of the weighted number of agencies gives an estimate of the number of agencies in the population and therefore not exactly equal to the total. In this case, the

weighted estimate was close to the population total. The weights were adjusted such that the sum of the weights of the sampled agencies exactly equals the number of agencies in the population. These are the first set of agency weights.

(1b) Participant Weighting Factor for the Survey

The sample of WIC participants who were surveyed did not have a known probability of selection; they were not randomly selected from a population that was known at the time of selection. However, we assign weights so that the survey sample has the same distribution as the corresponding WIC population in the same 16 LWAs with regard to infant age. Using administrative records from each agency in the study, we determine: (1) the proportion of infants at one month and two months of age and (2) the breastfeeding initiation rate. We determine this information separately for the pre-implementation interview period and for the post-implementation interview period. Because the Interim Rule may influence the length of time between birth and certification, we anticipate that the distribution of infant age among eligible survey participants may differ before and after the Interim Rule.

As noted previously, the number of eligible mothers selected within each LWA was proportional to the breastfeeding initiation rate for that agency, based on WIC PC data from 2008. However, the actual number of interviews completed may be slightly higher or lower than the number targeted based on initiation rate for the agency. Furthermore, we have now collected current administrative records from all agencies in the sample; therefore we use the current breastfeeding initiation rates to ensure that our sample is proportionally representative of current rates, both prior to implementation and after implementation. Participant surveys from each agency are weighted using administrative records to reflect current breastfeeding initiation rates.

The product of (1a) the LWA weighting factor and (1b) the WIC participant weighting factor for the survey are used in analyses of data collected from the survey. The product of these two weights creates a weight for each participant in the survey sample, which when applied yields estimates of the population of WIC units with infants aged 0-9 weeks and who initiated breastfeeding.

A.2. Sampling Weights for Administrative Records

Sampling weights are assigned to administrative records for WIC dyads to reflect the probability of selecting the 17 sampled LWAs. The sampling weight for administrative records is the product of two factors. The first factor is the LWA weighting factor that reflects the probability of selecting each of the 17 sampled LWAs from the population of all LWAs in the sampling frame. The second factor is an adjustment to the LWA weights within each stratum to ensure that the sum of the weighted total pregnant WIC participants is the same as the known total number of pregnant WIC participants in the stratum. This adjustment is necessary to make the estimated totals of various characteristics of WIC participants more efficient than estimates obtained using the unadjusted weights.

(2a) LWA Weighting Factor

Like the LWA weighting factor described above under survey sampling weights, are based on the probability of selecting the 17 sampled LWAs from the population of all LWAs. Even though the administrative records provide information about the entire population within a particular LWA, we still

need the LWA weights because they account for the fact that the 17 LWAs were in turn sampled from the population of all WIC LWAs nationally. As indicated earlier, the sum of the LWA sampling weights equals the total population of LWAs in the sampling frame from which these agencies were sampled.

(2b) Participant Weighting Factor for Administrative Records

As indicated earlier, this factor adjusts the weights to ensure that the weighted number of pregnant WIC participants based on the sample is the same as the known total number of pregnant WIC participants in each stratum.

The LWA weights assume that the agencies were selected with equal probability. Using the LWA weights without adjustment may result in overestimates of counts as larger agencies have a higher probability of selection. In addition, administrative records for larger LWAs have a larger number of observations again resulting in overestimation of counts.

The LWA weight is adjusted as follows. From administrative records we obtain

X = the total number of pregnant WIC participants for the population of LWAs in the stratum (based on WIC PC data for 2006 and

$\hat{X}$ = the weighted estimate of the total number of pregnant WIC participants of in the stratum (the number of pregnant WIC participants in the selected agency multiplied by the agency sampling weight).

Let w_{ij} be the LWA weight agency j in stratum i . Let X_i be the total number of pregnant women in based on all agencies in the population in stratum i Let $\hat{X}_i$ be the estimated number of women based on sampled agencies in stratum i. The adjustment factor is

$$\text{AF}= \frac{X_i}{\hat{X}_i}$$

The product of this ratio and the LWA weighting factor (1a) is applied in analyses of the WIC participant administrative records to yield estimates that represent the population of WIC units with infants aged 0 to 5 months.

The adjusted LWA weight is

$$w_{ij}^{*} = w_{ij} \frac{X_i}{\hat{X}_i}$$

For example, consider the example of a stratum that has 10 agencies and a total population of 1,500 pregnant WIC participants across all agencies in the stratum. Assume our sampled agency has 200 pregnant WIC participants. In this case we would overestimate the population of pregnant WIC participants (200 times 10 = 2000). Instead, we want to weight the administrative records for that agency to a population of 1500 pregnant participants (1500/2000 = 0.75). In this case, each participant would be weighted by 7.5 instead of 10.

The ratio is calculated for each stratum in the sample (there are 12 strata with one agency sampled and two strata with two agencies sampled) and then applied to each agency in the stratum.

The sampling weights for administrative records are used in analyses that employ administrative records for all WIC units of a particular type within the sampled LWAs.

Appendix B: Study Instruments

Local WIC Agency Interview (Post-Implementation)

Local WIC Agency Survey Items: Post-Implementation (P2)

OMB Clearance Number: xxxx-xxxx Expiration Date: xx/xx/xxxx

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is XXXX-XXXX. The time required to complete this information collection is estimated to average 90 minutes per response. If you have any comments concerning the accuracy of time estimates or suggestions for improving this form, please contact: U. S. Department of Agriculture, Food and Nutrition Service, Office of Research & Analysis, Alexandria, VA 22302.

Hello, my name is [INTERVIEWER]. Thank you for taking time today to help us. I spoke with you a few months ago over the phone and want to follow-up now that your State has implemented the WIC food package changes. You may recall I work for Abt Associates Inc., which is conducting a study sponsored by the U.S. Department of Agriculture's Food and Nutrition Service to learn about the recent changes to the WIC food packages for postpartum women and infants.

The information will help us understand how the recent food package changes were implemented in your local agency/clinic. Your input is important to help us understand the different issues surrounding these changes and how your local agency/clinic addressed them. Your participation in this interview is voluntary. There will be no penalties (now or in the future) associated with a decision not to participate in this study.

The interview will take approximately 90 minutes. Your responses will not be attributed to you but will be merged with responses from other interviews we conduct in your local agency/clinic to create an overall summary of the implementation process. Do you have any questions before I begin?

[Answers for questions in italics given during P1 interview will be reviewed to see if any of these things have changed in the interim]

General Site Characteristics

1. How many staff members work in your agency? How many (if any) clinics do you have and what are the types of communities that they serve?

2. What are the racial/ethnic characteristics of the WIC participants you serve? (*Make sure adds up to 100%)* Approximately what proportion are recent immigrants?

3. Are pregnant women routinely given information from WIC staff about breastfeeding prior to delivery? If so, when is this information given? How is it communicated? (*Obtain copies of any written materials.*)

4. During certification appointments for pregnant and postpartum women, are food package options typically discussed with WIC participants? (always, often, occasionally, rarely, never). Is this done with all WIC participants or only with certain ones? Please specify.

5. During follow-up or Nutrition Education Sessions, are food package options typically discussed with the WIC participant? (always, often, occasionally, rarely, never)

6. During voucher pick-up, are food package options typically discussed? (always, often, occasionally, rarely, never)

7. How long does a certification appointment usually take for a postpartum woman? For an infant? How much time, if any, is spent discussing food package options for mother and infant?

8. How often do postpartum women change food packages during the first month? (e.g., from breastfeeding to non-breastfeeding)? (often, occasionally, rarely). How much of an administrative burden does this present?

Breastfeeding Information and Support [Answers from P1 interview will be reviewed to see if any of these things have changed in interim]

9. What proportion of your staff who see WIC participants have received a lactation counselor certificate or lactation management training? Which staff receives training? How often do they receive it?

10. Do you have a lactation consultant on staff? How many FTEs?

11. Please answer the following questions for the local hospital where WIC participants served by your agency most frequently deliver. (*Obtain name of hospital. If two hospitals equally serve WIC participants, obtain information for both).*

    a. Has this hospital been designated a Baby-Friendly Hospital, as outlined by UNICEF and the World Health Organizations?
    b. Is there rooming-in for newborns?
    c. Are mothers encouraged to breastfeed within the first hours after birth?
    d. Are breastfeeding infants routinely given any supplementation, including water?
    e. Are formula discharge packs provided?
    f. Are there lactation consultants on staff?
    g. Has hospital staff received training in lactation management in the last 3 years?
    h. Does the hospital have any discharge lactating support programs?
    i. Does WIC staff provide education to newly delivered women in the hospital?
    j. Are WIC certifications of newly delivered women and their infants done while in the hospital?

12. Does your agency have a *Loving Support* breastfeeding program or other peer counseling program? If yes, please describe.

    a. How many women do peer counselors contact in the average month?
    b. If you have a grant, what is its size?
    c. Did your agency receive other funding for peer counseling, and if so, how much?

13. In addition to any peer counseling your agency may offer, does your agency provide other breastfeeding promotion services or programs (e.g. support groups, classes, educational materials) for WIC participants?

    a. If yes, please indicate the breastfeeding promotion activities available to WIC participants in your local agency:

- Media campaigns and /or posting materials in public places
- Making lactation consultants and other trained specialists available to WIC participants
- Support groups or classes
- Equipment (e.g., pumps)
- Peer counseling or other counseling to WIC participants that is different than *Loving Support* peer counseling
- Special training to nutritionists and other WIC staff, hotline, other.

Implementing Food Package Changes for Postpartum Women and their Infants

14. Please describe how the changes to postpartum food packages were implemented. What were your biggest logistical issues? How did you address them?

15. What systems, if any, were changed or put in place to accommodate the Interim Rule. (computers, printers, software, new forms, etc.)? Were they implemented?

16. How long did it take to fully implement these changes? Did it take shorter or longer than you expected?

17. Please describe any problems, if any, which occurred during implementation. Did any of these problems affect the process of providing women with the correct food packages? How long did the problems last and how were they fixed?

18. Were any staffing changes made as a result of the implementation of the Interim Rule? (new hires, changes in job descriptions, added job responsibilities, other)

Information and Support to WIC Staff on Food Package Changes

19. How did the process of information dissemination to local WIC agency staff work? (i.e., Did the State agency inform WIC directors who in turn informed their staff?)

20. How was WIC staff informed of the food package changes? (through meetings, trainings, written materials, other)

21. Did the staff receive written materials about the new food packages for partially breastfeeding women and their infants?

    a. What kind of written materials did they receive? (posters, pamphlets, manuals, other) [Collect examples]
    b. Who provided the written materials?
    c. How were these materials used?

22. What kind of training did the following Local WIC Agency staff receive?

    a. WIC Director:
    b. WIC Nutrition Staff:
    c. WIC Peer Counselor Staff:
    d. WIC Clerical Staff:
    e. Other WIC Staff:

23. How many times did the staff receive training?

    a. WIC Director:
    b. WIC Nutrition Staff:
    c. WIC Peer Counselor Staff:
    d. WIC Clerical Staff:
    e. Other WIC Staff:

24. Who conducted the training for the following staff?

    a. WIC Director:
    b. WIC Nutrition Staff:
    c. WIC Peer Counselor Staff:
    d. WIC Clerical Staff:
    e. Other WIC Staff:

25. What did staff like about the new food package for breastfeeding women and infants in general? What didn't they like?

26. What types of questions did local WIC staff have about the new food package changes for partially breastfeeding women?

27. What types of concerns did local WIC staff have about the new food package changes for breastfeeding women and infants? (e.g. increased workload; concerns for WIC participants; concern regarding understanding the changes; other).

28. How were these questions and concerns addressed? (additional training or meetings; changes in written materials; additional communication; etc)

29. Overall, how supportive were WIC staff about the food package changes for women who partially breastfeed?

Information on New Postpartum Food Packages

30. Did you inform WIC participants about the food package changes for partially breastfeeding women and infants? If yes, how were they informed? (notified by mail, phone, in person, other).

31. When were WIC participants informed of the changes? (at certification or follow up appointments? By phone or mail prior to appointments?)

32. Were the changes publicized within WIC clinics? If so, how were they publicized (posters, pamphlets, verbally by staff, written on vouchers)

33. Were any written materials explaining the changes provided to WIC participants [collect copies]? Were the materials directly handed to the WIC participants or were they available to pick up? Were the materials written in languages other than English? If so, what languages?

34. Were the written materials prepared by the State office or by a staff member in your local agency?

35. Who was responsible for explaining the changes to the WIC participants? (nutritionists, clinic assistants, clerical staff, other)

36. How were the changes explained (from a nutritional, practical, monetary or other standpoint)?

37. Did communication to WIC participants about the partial breastfeeding changes go according to plan? Explain.

38. Other than local WIC agencies, were the food package changes communicated to other places in the community? If so, where? (local physicians, hospitals, health centers, stores, community or daycare centers, schools, churches, other) How was this information communicated (written materials, posters, word of mouth, information sessions, other)?

39. Did community-focused communication about changes go according to plan? Explain.

Food Package Use of Postpartum Women

40. How well do you think WIC participants understand the differences between the full- and partial- formula packages?

41. What were WIC participants' reactions to the food package changes? Did they have any concerns and if so, what were they? How did you address these concerns? Did these concerns change over time?

42. What are the reasons WIC staff hear from participants as to why they change from exclusively breastfeeding to another package? To what degree does the content of the food packages affect these decisions?

43. If a women switches to packages with more formula, how much time generally passes before they switch? Have you seen this time period change with the implementation of the Interim Rule?

44. Do you think these changes are due to problems with breastfeeding? If they are due to breastfeeding issues, what steps do you generally take, if any? (refer to peer counseling or other breastfeeding supports) How effective are these steps?

Effects of Food Package Changes

45. How do you think the Interim Rule change as related to fully and partially breastfeeding participants has affected breastfeeding initiation? Duration? Intensity?

46. Do you have any supporting data or is this purely anecdotal?

47. Do you track the effects of postpartum food package changes on breastfeeding outcomes? If yes, please explain how.

48. Do you collect data on initiation, duration or exclusivity (intensity) of breastfeeding? If so:

    a. How are these data collected? (paper or electronic reports, entered into state or local database, survey sent by state to all LWAs).
    b. How are these data used? (Needs assessment, reporting to State, local evaluation of *Loving Support* program, other).

49. Were there any program changes based on the results?

State WIC Interview (Post-Implementation)

State Interview Questions: Post-implementation (P2)

OMB Clearance Number: xxxx-xxxx Expiration Date: xx/xx/xxxx

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is XXXX-XXXX. The time required to complete this information collection is estimated to average 60 minutes per response. If you have any comments concerning the accuracy of time estimates or suggestions for improving this form, please contact: U. S. Department of Agriculture, Food and Nutrition Service, Office of Research & Analysis, Alexandria, VA 22302.

Hello, my name is [INTERVIEWER]. Thank you for taking time today to help us. I spoke with you a few months ago over the phone and want to follow-up now that your State has implemented the WIC food package changes. You may recall I work for Abt Associates Inc., which is conducting a study sponsored by the U.S. Department of Agriculture's Food and Nutrition Service to learn about the recent changes to the food packages for postpartum women and infants.

The information will help us understand how the recent food package changes were implemented in your State. Your input is important to help us understand the different issues surrounding these changes and how your State agency addressed them. Your participation in this interview is voluntary. There will be no penalties (now or in the future) associated with a decision not to participate in this study.

The interview will take approximately one hour. Your responses will not be attributed to you but will be merged with responses from other interviews we conduct in your State to create an overall summary of the implementation process. Do you have any questions before I begin?

Changes in State Policies/Practice on the Partial Breastfeeding Package

1. Have you studied the variations in food package issuance across LWAs since the Interim Rule was implemented? To what degree do you see local variation in the proportion of WIC participants in local WIC agencies who receive the different packages? Is this different than before the Interim Rule was implemented? Is there variation among partially breastfeeding mothers in how much formula they receive? What do you think are the reasons for this variation?

Implementing the New Regulations

2. What systems did you change to implement the new food packages for postpartum women and infants?

3. Were food package changes phased in for different participant groups or were they done all at once? If they were phased in, how was this done?

4. What was the timeline for the making the changes? How close were you able to stay to your planned timeline?

5. Was additional staffing necessary at the State level to implement the Interim Rule? If so, was a new position created to deal exclusively with implementation efforts? If no, which staff members had responsibility for implementation?

6. What were the biggest challenges to making these changes?

7. Were there "temporary" changes that you made during the implementation that may affect your administrative data on food packages choices of WIC participants? If yes, please describe.

8. As you phased in the changes, were there any "glitches" that affected the process of women being assigned and obtaining specific food packages? Please describe the issue and how and when it was resolved. Approximately how many WIC participants did it affect?

9. What was the planned role of the LWAs in implementing the food package changes? What, if any, decisions did they make related to implementing the food package changes? When implementation occurred, did they have the role that was planned? If not, why not?

Support to Local WIC Agencies

10. What was the general reaction to the changes in food packages among local WIC staff in your State? What were their main questions and concerns? How did you go about addressing questions and concerns (additional training or meetings, changes in written materials, additional communication, etc.)?

11. What kind of administrative burden did LWAs experience related to implementing the changes for the first month postpartum? Did you take any steps to try to ease the burden? If so, what?

12. Does LWA staff have any specific concerns about the implementation of the new food packages for breastfeeding and partially breastfeeding mothers and their infants? What are their main questions or concerns?

13. Was there any training for local WIC directors and other staff? If so, what type of training?

    For local WIC Directors:
    For local WIC staff:

    a. Did the intended audience want more training?
    Local WIC Directors:
    Local WIC staff:

    b. Was the intended audience satisfied with the training?
    Local WIC Directors:
    Local WIC staff:

c. Who conducted the training for the following staff?
WIC Directors:
Local WIC staff:

14. In addition to training, what, if any, kinds of other assistance and support were given to local agencies (additional funding, training, computer programming, additional equipment, etc)? Did this vary from what was planned? If yes, how and why?

Information for WIC Participants

15. Did the State WIC agency develop written guidelines about how to describe the food package changes to WIC participants? If so, please describe the guidelines.

16. Did the State WIC agency provide written materials (brochures/posters/etc.) to describe the food package changes? (Collect copies)

17. How were these materials used? When did they start being used (before/after the new food package implementation)? Did LWAs develop and use additional materials about the food package changes?

Effects of Food Package Changes for Postpartum Women and their Infants

18. Do you know how WIC participants in your State have reacted to the new food packages? Did these reactions change over time? If so, how?

19. To what extent do you think that the changes in the food packages influence the decisions of WIC participants in your State about breastfeeding initiation? Breastfeeding intensity? Breastfeeding duration? Why do you think this?

20. To what extent do you believe that changes in food packages have influenced mothers in your State who would have received a modified full formula package under the previous rule because they were partially breastfeeding? What proportion of partially breastfeeding women do you think are now taking the full formula package? Why do you think this?

21. Are you tracking the effects of food package changes on women's breastfeeding behavior or food package receipt? What are you finding?

22. How have State policies regarding assessments been modified, if at all, to measure the effects of the food package changes?

Participant Survey (Post-Implementation)

WIC Birth Month Food Package Evaluation

Participant Survey

November 23, 2009

OMB Clearance Number: 200809-0584-002 Expiration Date: 02/29/2012

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0584-0551. The time required to complete this information collection is estimated to average 30 minutes per response. If you have any comments concerning the accuracy of time estimates or suggestions for improving this form, please contact: U. S. Department of Agriculture, Food and Nutrition Service, Office of Research & Analysis, Alexandria, VA 22302.

Hello, my name is [INTERVIEWER].
Thank you for taking time today to help us. I'm from Abt Associates Inc. and we are talking to new mothers to learn about their decisions about feeding their babies. We also are interested in their experiences receiving services from WIC.

IF BY PHONE:
[A short time ago, you should have received a letter from your WIC agency about this study, stating that someone would be contacting you to participate in an interview.]
OR
[A short time ago, I talked to you about the study and you consented to participate in the interview.][1]

The interview will take about 30 minutes. Your answers will help make WIC better for mothers and their babies. Everything you tell me will be kept confidential, to the extent provided by law. We'd like to thank you by giving you a $35 Postal Money Order when we are finished.

Your participation in this interview is voluntary. Your benefits will not be affected if you choose not to participate. If you take part, you may refuse to answer any question. If you take part, your answers won't change any benefits you may receive from any agency. If now is a good time for you and you are willing to participate, I'd like to begin my questions. Do you have any questions before I begin?

[1] Some of the WIC participants will be sent a letter by their local agency indicating that unless they otherwise object, they will be contacted and asked to participate in the study. Others will be recruited in the WIC clinics by field staff, who will be responsible for conducting the interview.

Infant Information and Feeding Practices

[INTERVIEWER: IF IN-PERSON, THE RESPONDENT MUST READ AND SIGN THE CONSENT FORM BEFORE BEGINNING THE INTERVIEW. IF THIS IS A PHONE INTERVIEW YOU MUST READ CONSENT TO THE RESPONDENT AND OBTAIN VERBAL CONSENT BEFORE BEGINNING.]

1. What is your baby's date of birth? 14-15/

Infant date of birth: ____ / ____ / _____ (GO TO Q2) 16-17/

(mm dd yyyy) 18-21/

❑97 REFUSED (GO TO Q1a)

❑98 DON'T KNOW (GO TO Q1a) 22-23/

[REFER TO DATE CHART]

1a. Was your baby born on or after: ____ / ____ / _____ ? 24-25/ 26-27/

❑1 YES

❑2 NO (GO TO TERMINATION SCRIPT ON PAGE 20) 28-31/

❑97 REFUSED (GO TO TERMINATION SCRIPT ON PAGE 20) 32-33/

❑98 DON'T KNOW (GO TO TERMINATION SCRIPT ON PAGE 20)

2. How much did your baby weigh at birth?

Infant birth weight: _____ pounds _____ ounces 34-35/

❑97 REFUSED 36-37/

❑98 DON'T KNOW 38-39/

2a. What is your baby's first name? _____

❑97 REFUSED 40-69/

❑98 DON'T KNOW 70-71/

[ENTER BABY'S NAME ON DROPSHEET]

3. Did you give [BABY's NAME] breastmilk at any point after delivery?

❑1 YES (GO TO Q4) 72-73/

❑2 NO (GO TO Q3a)

❑97 REFUSED (GO TO Q3a)

❑98 DON'T KNOW (GO TO Q3a)

3a. According to our records, you indicated you attempted to initiate breastfeeding (even if only one time). Is this accurate?

❑1 YES (GO TO Q4) 74-75/

❑2 NO (GO TO TERMINATION SCRIPT ON PAGE 20)

❑97 REFUSED (GO TO TERMINATION SCRIPT ON PAGE 20)

❑98 DON'T KNOW (GO TO TERMINATION SCRIPT ON PAGE 20)

4. Are you still giving [BABY'S NAME] breastmilk?

❑1 YES (GO TO Q5) **[MARK RESPONSE TO Q4 ON DROPSHEET]** 76-77/
❑2 NO
❑97 REFUSED
❑98 DON'T KNOW

4a. How many weeks or months did you give your baby breastmilk? (SKIP TO Q6)

_____ Weeks 78-80/
_____ Months 81-83/
❑97 REFUSED 84-85/
❑98 DON'T KNOW

5. Which of the following best describes the kind of milk you fed your baby in the last 24 hours? **[MARK RESPONSE TO Q5 ON DROPSHEET]**

❑1 Breastmilk only (GO TO Q8) 86-87/
❑2 Mostly breastmilk with some formula (GO TO Q5b)
❑3 Breastmilk and formula about equally (GO TO Q5b)
❑4 Mostly formula with some breastmilk (GO TO Q5b)
❑5 Formula only (GO TO Q5a)
❑97 REFUSED
❑98 DON'T KNOW

5a. Earlier you indicated that you were still breastfeeding your baby. Is this correct?

❑1 YES **[MARK RESPONSE TO Q5a ON DROPSHEET]** 88-89/
❑2 NO (GO TO Q6)
❑97 REFUSED
❑98 DON'T KNOW

5b. Thinking back over the last week, how frequently did you feed your baby breastmilk?

❑1 Usually 2 times a day or more often 90-91/
❑2 Usually once a day
❑3 Less than once a day
❑97 REFUSED
❑98 DON'T KNOW

6. Yesterday, how many ounces of formula did your baby drink in total? By yesterday, I mean from the time your baby woke up yesterday morning to the time [he/she] woke this morning.

[ENTER NUMBER OF OUNCES] _____ Ounces (GO TO Q7) 92-94/
❑97 REFUSED 95-96/
❑98 DON'T KNOW

PROMPT: if you can't tell me the number of ounces, can you tell me the number of bottles?

- ❑$_1$ YES 97-98/
- ❑$_2$ NO (GO TO Q7)
- ❑$_{97}$ REFUSED (GO TO Q7)
- ❑$_{98}$ DON'T KNOW (GO TO Q7)

6a. How many bottles?

[ENTER NUMBER OF BOTTLES] _____ Bottles 99-101/

6b. How many ounces *are* in a bottle?

[ENTER NUMBER OF OUNCES] _____ Ounces 102-104/

- ❑$_{97}$ REFUSED 105-106/
- ❑$_{98}$ DON'T KNOW

7. Yesterday, did you feed your baby anything else besides formula or breastmilk? By yesterday, I mean from the time your baby woke up yesterday morning to the time [he/she] woke this morning.

- ❑$_1$ YES 107-108/
- ❑$_2$ NO (GO TO Q8)
- ❑$_{97}$ REFUSED
- ❑$_{98}$ DON'T KNOW

7a. Please tell me what else you fed your baby yesterday and approximately how much.

(NOTE: DO NOT LEAVE ANY LINES BLANK. MARK YES, NO, REF, OR DK FOR EACH LINE. ALSO, IF YES IS MARKED FOR ANY ITEM, THEN BE SURE TO FILL IN HOW MUCH.)

	YES	NO	IF YES: How much?	REF	DK	
Baby cereal	❑$_1$	❑$_2$ 109/	_____ Tbsp/Oz. 110-112/	❑$_{97}$	❑$_{98}$	113-114/
Cow's milk or any other milk	❑$_1$	❑$_2$ 115/	_____ Ounces 116-118/	❑$_{97}$	❑$_{98}$	119-120/
Plain water	❑$_1$	❑$_2$ 121/	_____ Ounces 122-124/	❑$_{97}$	❑$_{98}$	125-126/
Juice/sugar water	❑$_1$	❑$_2$ 127/	_____ Ounces 128-130/	❑$_{97}$	❑$_{98}$	131-132/
Table/solid/adult food	❑$_1$	❑$_2$ 133/	_____ Tbsp/Oz. 134-136/	❑$_{97}$	❑$_{98}$	137-138/
Other (SPECIFY): _____	❑$_1$	❑$_2$ 139/	_____ Tbsp/Oz. 140-142/	❑$_{97}$	❑$_{98}$	143-144/

[IF ANYTHING OTHER THAN PLAIN WATER WAS FED, ASK Q7b, ELSE GO TO Q7c]

7b. How old was your baby the *first time* you fed [him/her] any of these things *except plain water*? [IF NEEDED: I am referring to baby cereal, cow's milk or any other milk, Juice or sugar water, and table/solid/adult food.]

_____ Weeks 145-146/
❑97 REFUSED 147-148/
❑98 DON'T KNOW

[IF PLAIN WATER WAS FED, ASK Q7c, ELSE GO TO Q8]

7c. How old was your baby the *first tim*e you fed [him/her] plain water?

_____ Weeks 149-150/
❑97 REFUSED 151-152/
❑98 DON'T KNOW

WIC Program Participation

8. Did you receive WIC at any time while you were pregnant with [BABY'S NAME]?

❑1 YES (ASK Q8a AND Q9) 153-154/
❑2 NO (SKIP TO Q10)
❑97 REFUSED
❑98 DON'T KNOW

8a. How many months pregnant were you when you started getting WIC?

_____ Months 155/
❑97 REFUSED 156-157/
❑98 DON'T KNOW

9. When you were pregnant with [BABY'S NAME], did you take a class from WIC where they talked about breastfeeding?

❑1 YES 158-159/
❑2 NO (GO TO Q10)
❑97 REFUSED
❑98 DON'T KNOW

9a. Did they talk about… (CHECK ALL THAT APPLY)

- ❑1 Proper positioning for breastfeeding 160/
- ❑2 How to tell if your baby is getting enough breastmilk 161/
- ❑3 Differences in the food you get from WIC depending upon whether or not you chose to breastfeed 162/
- ❑4 Who to call if you had problems with breastfeeding 163/
- ❑95 Other (SPECIFY): _____ 164-165/
- ❑97 REFUSED 166-315/
- ❑98 DON'T KNOW 316-317/

9b. How many months pregnant were you when you took the class?

_____ Months 318/

- ❑97 REFUSED 319-320/
- ❑98 DON'T KNOW

10. Have you or a family member ever received WIC before this time?

- ❑1 YES 321-322/
- ❑2 NO
- ❑97 REFUSED
- ❑98 DON'T KNOW

11. Were you <u>ever</u> encouraged to breastfeed by WIC?

- ❑1 YES 323-324/
- ❑2 NO
- ❑97 REFUSED
- ❑98 DON'T KNOW

12. While you were in the hospital for delivery of [BABY'S NAME], did anyone besides a family member or friend help you with breastfeeding by showing you how or talking to you about breastfeeding?

- ❑1 YES 325-326/
- ❑2 NO
- ❑97 REFUSED
- ❑98 DON'T KNOW

13. Did you have any questions or problems when you first tried to breastfeed this baby?

- ❑1 YES 327-328/
- ❑2 NO (GO TO Q14)
- ❑97 REFUSED
- ❑98 DON'T KNOW

13a. What was the issue? (CHECK ALL THAT APPLY)

- ❑1 My baby had trouble sucking/latching on 329/
- ❑2 Breastmilk alone did not satisfy my baby 330/
- ❑3 My baby was not gaining enough weight 331/
- ❑4 I didn't have enough milk/My baby was not getting enough to eat 332/
- ❑5 Breastfeeding was too painful or uncomfortable 333/
- ❑95 OTHER(SPECIFY): _____ 334-335/
- ❑97 REFUSED 336-485/
- ❑98 DON'T KNOW 486-487/

13b. Who did you talk to for help? (CHECK ALL THAT APPLY)

- ❑1 A friend 488/
- ❑2 A relative 489/
- ❑3 Someone from WIC 490/
- ❑4 Someone at my doctor's office 491/
- ❑5 Someone at the hospital 492/
- ❑6 Someone on a helpline 493/
- ❑95 OTHER(SPECIFY): _____ 494-495/
- ❑97 REFUSED 496-570/
- ❑98 DON'T KNOW 571-572/

14. When you left the hospital after the delivery of [BABY'S NAME], were you given any formula by someone who worked at the hospital?

- ❑1 YES 573-574/
- ❑2 NO
- ❑97 REFUSED
- ❑98 DON'T KNOW

Food Package Choices

15. Are you aware of a difference in either the amount or type of foods a mother gets from WIC if she only breastfeeds her baby compared to if she feeds her baby only formula? I am talking about the **food that a mother gets for herself to eat**.

- ❑1 YES 575-576/
- ❑2 NO (GO TO Q16)
- ❑97 REFUSED
- ❑98 DON'T KNOW

15a. What are the differences in the **types** of foods a mother can get from WIC if she only breastfeeds compared to if she feeds her baby only formula? (DO NOT PROMPT. CHECK IF ANY OF THESE RESPONSES ARE GIVEN.)

Breastfeeding mothers get….

- ❑1 JUICE 577/
- ❑2 MILK 578/
- ❑3 EGGS 579/
- ❑4 MONEY FOR FRUITS AND VEGETABLES 580/
- ❑5 CANNED FISH 581/
- ❑6 PEANUT BUTTER 582/
- ❑7 CARROTS 583/
- ❑95 OTHER(SPECIFY): _____ 584-585/
- ❑97 REFUSED 586-660/
- ❑98 DON'T KNOW 661-662/

15b What are the differences in the **amounts** of food a mother can get from WIC if she only breastfeeds compared to if she feeds her baby only formula?

Do you believe that breastfeeding mothers get…

- ❑1 More food, 663-664/
- ❑2 Less food, or
- ❑3 The same amount of food
- ❑97 REFUSED
- ❑98 DON'T KNOW

15c. How did you learn about these differences we've been discussing in foods that you would get from WIC, depending on how you feed your baby? Did you learn about the differences from… (CHECK ALL THAT APPLY)

(******NOTE: IF WIC IS ONE OF THE ITEMS SELECTED, THEN GO TO Q15d, NO MATTER WHAT OTHER OPTIONS ARE ALSO SELECTED)

- ❑1 WIC 665/
- ❑2 Friends (GO TO Q16, UNLESS WIC IS ALSO SELECTED) 666/
- ❑3 Family (GO TO Q16, UNLESS WIC IS ALSO SELECTED) 667/
- ❑95 OTHER(SPECIFY): _____(GO TO Q16, UNLESS WIC IS ALSO SELECTED) 668-669/
- ❑97 REFUSED 670-694/
- ❑98 DON'T KNOW 695-696/

15d. Did you receive any kind of brochure, pamphlet or fact sheet from WIC about the differences in foods mothers get who only breastfeed compared to foods mothers get who feed their babies only formula?

- ❑1 YES 697-698/
- ❑2 NO (GO TO Q16)
- ❑97 REFUSED
- ❑98 DON'T KNOW

15e. When did you get information about these differences?

- ❑1 During the pregnancy 699-700/
- ❑2 After the baby was born (GO TO Q16)
- ❑97 REFUSED (GO TO Q16)
- ❑98 DON'T KNOW (GO TO Q16)

15f. When during your pregnancy did you get this information?

- ❑1 First Trimester 701-702/
- ❑2 Second Trimester
- ❑3 Third Trimester
- ❑97 REFUSED
- ❑98 DON'T KNOW

16. Are you aware of a difference in the amount of formula WIC will give you for a baby if the baby is fed only baby formula compared to if he/she gets some breastmilk and some formula?

- ❑1 Yes (ASK Q16a) 1385-1386/
- ❑2 No (GO TO Q17a)
- ❑97 REFUSED (GO TO Q17a)
- ❑98 DON'T KNOW (GO TO Q17a)

16a. What is the difference in the amount of formula you get from WIC for a baby in his or her first month after birth if the baby gets only formula compared to if the baby gets some breastmilk and some formula? (DO NOT PROMPT. CHECK IF ANY OF THESE RESPONSES ARE GIVEN ELSE MARK "NONE OF THE ABOVE RESPONSES GIVEN".)

- ❑1 Only a small amount of formula is available for the partial breastfed option 1387
- ❑2 Only powder formula is available for the partial option 1388/
- ❑3 Much more formula is given for the full formula option 1389/
- ❑96 NONE OF THE ABOVE RESPONSES GIVEN 1390/
- ❑97 REFUSED 1390-1391/
- ❑98 DON'T KNOW

16b. Between the time a baby is 2 months old and 6 months old, what is the difference in the amount of formula given for babies who get only formula compared to babies who get some formula and some breastmilk? (DO NOT PROMPT. CHECK IF ANSWER IS GIVEN ELSE MARK "RESPONSE ABOVE NOT GIVEN.)

- ❑1 Half as much formula is given for babies who get some formula and some breastmilk compared to babies who get all formula 1392/
- ❑96 RESPONSE ABOVE NOT GIVEN 1393-1394/
- ❑97 REFUSED
- ❑98 DON'T KNOW

16c. Your infant gets different amounts of formula from WIC depending upon whether you choose to feed (him/her) only formula or some breastmilk and some formula. How did you learn about the differences? From… (CHECK ALL THAT APPLY) (NOTE: IF WIC IS ONE OF THE ITEMS SELECTED, THEN GO TO Q16d, NO MATTER WHAT OTHER OPTIONS ARE ALSO SELECTED)

- ❑1 WIC (ASK Q16d) 1395/
- ❑2 Friend (GO TO Q17a, UNLESS WIC IS ALSO SELECTED) 1396/
- ❑3 Family (GO TO Q17a, UNLESS WIC IS ALSO SELECTED) 1397/
- ❑95 Other (SPECIFY):_____(GO TO Q17a, UNLESS WIC IS ALSO SELECTED) 1398-1399/
- ❑97 REFUSED (ASK Q16d) 1400-1449/
- ❑98 DON'T KNOW (ASK Q16d) 1450-1451/

16d. Did you get any kind of brochure, pamphlet or fact sheet from WIC about differences in the amounts of formula babies receive from WIC depending upon whether you feed the baby only breastmilk or feed (him/her) some breastmilk and some formula?

- ❑1 Yes (ASK Q16e) 1452-1453/
- ❑2 No (GO TO Q17a)
- ❑97 REFUSED (ASK Q16e)
- ❑98 DON'T KNOW (ASK Q16e)

16e. When did you first hear about the differences in amount of formula WIC would give you?

- ❑1 When I was pregnant (IF THIS IS SELECTED: Which trimester? _____) 1454-1455/
- ❑2 After I gave birth 1456-1457/
- ❑97 REFUSED
- ❑98 DON'T KNOW

17a. How important in your decision about breastfeeding was what you and your baby would get from WIC? I am talking about both the types and amounts of foods that you, as a mother, would get and the amount of formula your baby would get. Would you say it was:

- ❑1 Very important 1458-1459/
- ❑2 Somewhat important
- ❑3 Not very important
- ❑4 Not important at all
- ❑97 REFUSED
- ❑98 DON'T KNOW

[SEE DROPSHEET. IF Q4=NO OR Q5 = 2, 3, 4, or 5, ASK Q18, ELSE GO TO Q19]

18. Have you <u>ever</u> received at least two weeks of infant formula for [BABY'S NAME]?

❑$_1$ YES 705-706/
❑$_2$ NO (GO TO INTRO TO Q19)
❑$_{97}$ REFUSED (GO TO INTRO TO Q19)
❑$_{98}$ DON'T KNOW (GO TO INTRO TO Q19)

18a. Did you receive any formula this month?

❑$_1$ YES 707-708/
❑$_2$ NO FORMULA FROM WIC (GO TO INTRO TO Q19)
❑$_{97}$ REFUSED (GO TO INTRO TO Q19)
❑$_{98}$ DON'T KNOW (GO TO INTRO TO Q19)

18b. Do you receive your formula in liquid or powder form?
(MARK ALL THAT APPLY)

❑$_1$ Liquid 709/
❑$_2$ Powder (GO TO Q18e, UNLESS LIQUID ALSO SELECTED—THEN Q18c) 710/
❑$_{97}$ REFUSED (GO TO Q18g) 711-712/
❑$_{98}$ DON'T KNOW (GO TO Q18g)

18c. How many cans of liquid formula did you receive this month?

Number of cans: _____ [ENTER NUMBER OF CANS] 713-715/
❑$_{97}$ REFUSED (GO TO Q18g) 716-717/
❑$_{98}$ DON'T KNOW (GO TO Q18g)

18d. How many ounces of liquid formula are in each of the cans that you receive from WIC?

Number of ounces: _____ [ENTER NUMBER OF OUNCES AND GO TO 18g] 718-720/
❑$_{97}$ REFUSED (GO TO Q18g) 721-722/
❑$_{98}$ DON'T KNOW (GO TO Q18g)

18e. How many cans of powdered formula did you receive this month?

Number of cans: _____ [ENTER NUMBER OF CANS] 723-725/
❑$_{97}$ REFUSED (GO TO Q18g) 726-727/
❑$_{98}$ DON'T KNOW (GO TO Q18g)

18f. How many ounces of powder are in each can?

Number of ounces: _____ [ENTER NUMBER OF OUNCES] 728-730/
❑$_{97}$ REFUSED 731-732/
❑$_{98}$ DON'T KNOW

18g. In the past month, (or however long the baby has been receiving formula if less than a month) have you had the right amount, too little, or too much formula for your baby?

- ❑1 The right amount (GO TO INTRO TO Q19) 733-734/
- ❑2 Too much
- ❑3 Too little (GO TO Q18i)
- ❑97 REFUSED (GO TO INTRO TO Q19)
- ❑98 DON'T KNOW (GO TO INTRO TO Q19)

18h. What did you do with the extra formula? (CHECK ALL THAT APPLY)

- ❑1 Saved it for later 735/
- ❑2 Gave it to someone who needed it 736/
- ❑3 Traded it for something else that I needed 737/
- ❑4 Sold it 738/
- ❑95 OTHER(SPECIFY): _____ 739-740/
- ❑97 REFUSED 741-790/
- ❑98 DON'T KNOW 791-792/

[GO TO INTRO TO Q19]

18i. What did you do to feed your baby this month since you did not get enough formula from WIC? (CHECK ALL THAT APPLY)

- ❑1 Used formula that I had from a previous month 793/
- ❑2 Added water to the formula I had 794/
- ❑3 Fed my baby (more) breastmilk 795/
- ❑4 Fed my baby other things as well as formula, such as cows' milk, juice or cereal 796/
- ❑5 Borrowed or was given formula from someone else 797/
- ❑6 Bought more formula 798/
- ❑95 OTHER(SPECIFY): _____ 799-800/
- ❑97 REFUSED 801-950/
- ❑98 DON'T KNOW 951-952/

Breastfeeding History, Knowledge About, Attitudes Towards, Decisions

INTRO Q19. Now I'm going to ask you questions about your knowledge, experiences and opinions about breastfeeding. I'd like to learn more about the things that might have made a difference in your choices about how to feed your baby.

19. Please indicate if the following information is true, false, or you don't know:

	True	False	REF	DK	
a. You should follow a strict schedule for feeding the baby when breastfeeding	❑1	❑2	❑97	❑98	953-954/
b. You should follow a strict schedule for feeding when you start feeding your baby solid foods.	❑1	❑2	❑97	❑98	955-956/
c. Giving a baby solid food helps him or her sleep through the night	❑1	❑2	❑97	❑98	957-958/
d. A baby should eat as many different types of food as soon as possible	❑1	❑2	❑97	❑98	959-960/
e. Newborns need to be breastfed often (day and night)	❑1	❑2	❑97	❑98	961-962/
f. Breastfeeding babies have fewer illnesses	❑1	❑2	❑97	❑98	963-964/
g. You feed your baby solid food with a spoon only	❑1	❑2	❑97	❑98	965-966/
h. Breastfeeding even one week is better than not at all	❑1	❑2	❑97	❑98	967-968/
i. Breastfeeding provides complete nourishment for a baby	❑1	❑2	❑97	❑98	969-970/

20. When did you decide what to first feed [BABY'S NAME]?

971-972/

- ❑1 Before birth
- ❑2 At hospital
- ❑3 After arriving home from hospital
- ❑97 REFUSED
- ❑98 DON'T KNOW

21. Have you breastfed any babies before this one?

❑$_1$ YES 973-974/
❑$_2$ NO **(MARK DROPSHEET AND GO TO INTRO TO Q22)**
❑$_{97}$ REFUSED
❑$_{98}$ DON'T KNOW

21a. How many other babies did you breastfeed? _____ 975-976/
❑$_{97}$ REFUSED
❑$_{98}$ DON'T KNOW

21b. What is the longest period of time you've breastfed any of your babies?

Period: _____
[ENTER PERIOD ABOVE AND CHOOSE ONE OF THE FOLLOWING:

❑$_1$ Days 977-979/
❑$_2$ Weeks 980-981/
❑$_3$ Months
❑$_4$ Years
❑$_{97}$ REFUSED
❑$_{98}$ DON'T KNOW

<u>INTRO Q22</u>. Now I'm going to ask you some questions about your initial choice about whether or not to breastfeed [BABY'S NAME]

[SEE DROPSHEET. IF Q21 = NO, START WITH Q22b, BELOW]

22. In your responses, tell me if each of these is: not at all important, somewhat important, important, very important, or not applicable in your decision about how to feed your baby.

	Not at all important	Somewhat important	Important	Very important	N/A	REF	DK	
a. How important were your own past experiences with breastfeeding in your decision about breastfeeding?	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$	❑$_{97}$	❑$_{98}$	982-983/
b. How important was information and advice from family members in your decision?	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$	❑$_{97}$	❑$_{98}$	984-985/
c. How important was information and advice from friends in your decision?	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$	❑$_{97}$	❑$_{98}$	986-987/
d. How important was information and advice from your doctor or a nurse at your doctor's office in your decision?	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$	❑$_{97}$	❑$_{98}$	988-989/
e. How important was information and advice from someone at WIC in your decision?	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$	❑$_{97}$	❑$_{98}$	990-991/

23. For each of the following items, please tell me how important this was when you made your first decision about how you feed [BABY'S NAME]. Again tell me whether each of these was not at all important, somewhat important, important, very important, or not applicable.

	Not at all important	Somewhat important	Important	Very important	N/A	REF	DK	
a How important to your decision was convenience? [IF NEEDED: By convenience I am referring to either because formula would be more convenient or breastmilk would be more convenient.]	❑1	❑2	❑3	❑4	❑5	❑97	❑98	992-993/
b. How important to your decision was how trouble free it was? [IF NEEDED: By trouble-free I am referring to any potential problems/issues with breastfeeding or how trouble-free not having to prepare formula in advance would be.]	❑1	❑2	❑3	❑4	❑5	❑97	❑98	994-995/
c. How important to your decision was how close it made you feel to your baby?	❑1	❑2	❑3	❑4	❑5	❑97	❑98	996-997/
d. How important to your decision was if it helped you lose weight?	❑1	❑2	❑3	❑4	❑5	❑97	❑98	998-999/
e. How important to your decision was the baby's health?	❑1	❑2	❑3	❑4	❑5	❑97	❑98	1000-1001/
f. How important to your decision was how much it allowed the baby's father or other family member to be involved in feeding the baby?	❑1	❑2	❑3	❑4	❑5	❑97	❑98	1002-1003/
g. How important to your decision was how much it made you feel embarrassed when in public?	❑1	❑2	❑3	❑4	❑5	❑97	❑98	1004-1005/
h. How important to your decision was how easy it was to go out socially <u>without</u> your baby?	❑1	❑2	❑3	❑4	❑5	❑97	❑98	1006-1007/
i. How important to your decision was how easy it was to go to work or school?	❑1	❑2	❑3	❑4	❑5	❑97	❑98	1008-1009/
j. How important to your decision was how it allowed you to see exactly how much the baby has eaten?	❑1	❑2	❑3	❑4	❑5	❑97	❑98	1010-1011/
k. How important to your decision was how much you have to watch what you eat or drink?	❑1	❑2	❑3	❑4	❑5	❑97	❑98	1012-1013/

[SEE DROPSHEET. IF Q5 DOES NOT = 1, ASK Q24, ELSE GO TO Q25]

24. Why did you start feeding your baby formula?
[DO NOT PROMPT BUT CHECK ALL THAT APPLY]

- ❑1 MY BABY (HAS) HAD TROUBLE SUCKING/LATCHING ON 1014/
- ❑2 THE DIFFERENCE BETWEEN BREASTMILK AND FORMULA NO LONGER MATTERS BECAUSE MY BABY IS OLDER NOW 1015/
- ❑3 BREASTMILK ALONE DID NOT SATISFY MY BABY 1016/
- ❑4 MY BABY WAS NOT GAINING ENOUGH WEIGHT 1017/
- ❑5 I DIDN'T HAVE ENOUGH MILK/MY BABY WAS NOT GETTING ENOUGH TO EAT 1018/
- ❑6 BREASTFEEDING WAS TOO PAINFUL OR UNCOMFORTABLE 1019/
- ❑7 BREASTFEEDING WAS TOO INCONVENIENT 1020/
- ❑8 I STARTED A JOB OR RETURNED TO WORK 1021/
- ❑9 ALTHOUGH I DIDN'T RETURN TO WORK I NEEDED TO LEAVE MY BABY FOR SEVERAL HOURS AT A TIME 1022/
- ❑10 I WANTED SOMEONE ELSE TO FEED MY BABY TOO 1023-1024/
- ❑95 OTHER(SPECIFY): _____ 1025-1026/
- ❑97 REFUSED 1027-1176/
- ❑98 DON'T KNOW 1177-1178/

25. In general, how comfortable do you feel about the following situations?
Rate your feelings (very uncomfortable, uncomfortable, comfortable, very comfortable).

	Very uncomfortable	Uncomfortable	Comfortable	Very comfortable	N/A	REF	DK	
a. A woman breastfeeding her baby in the presence of close women friends	❑1	❑2	❑3	❑4	❑5	❑97	❑98	1179-1180/
b. A woman breastfeeding her baby in the presence of men and women	❑1	❑2	❑3	❑4	❑5	❑97	❑98	1181-1182/
c. A woman breastfeeding her baby in the presence of strangers (such as at a shopping mall or restaurant)	❑1	❑2	❑3	❑4	❑5	❑97	❑98	1183-1184/
d. A woman breastfeeding her baby in the presence of family members	❑1	❑2	❑3	❑4	❑5	❑97	❑98	1185-1186/

26. How do or did most of your friends and family feed their babies before they were 3 months old?

- ❑1 Give babies breastmilk 1187-1188/
- ❑2 Give babies both breastmilk and formula
- ❑3 Only give babies formula
- ❑97 REFUSED
- ❑98 DON'T KNOW

Now I'm going to ask you some general questions about work, child care, and about people in your household. This is the last part of the interview.

Employment

27. Are you currently employed?

- ❑1 YES 1189-1190/
- ❑2 NO (GO TO Q32)
- ❑97 REFUSED
- ❑98 DON'T KNOW

28. Do you leave your baby in someone else's care when you go to work?

- ❑1 YES 1191-1192/
- ❑2 NO
- ❑97 REFUSED
- ❑98 DON'T KNOW

29. What is the average number of hours you work per week?

- _____ Hours per week 1193-1195/
- ❑97 REFUSED 1196-1197/
- ❑98 DON'T KNOW

30. In your opinion, how supportive of breastfeeding is where you work?

- ❑1 Not at all supportive 1198-1199/
- ❑2 Not too supportive
- ❑3 Somewhat supportive
- ❑4 Very supportive
- ❑97 REFUSED
- ❑98 DON'T KNOW

[SEE DROPSHEET. IF Q4=Yes OR Q5a=YES THEN ASK Q31, ELSE GO TO Q32]

31. Which of the following circumstances describe your situation during the past (4) weeks? Tell me all that apply: (CHECK ALL THAT APPLY)

- ❑1 I breastfeed my baby during my work day 1200/
- ❑2 I pump milk during my work day and dump it 1201/
- ❑3 I pump milk during my work day and save it for my baby to drink later 1202/
- ❑4 I neither pump nor breastfeed during my work day 1203/
- ❑97 REFUSED 1204-1205/
- ❑98 DON'T KNOW

Child Care

32. Did someone other than you care for your baby for more than 3 hours at one time in the last week?

❑$_1$ YES 1206-1207/
❑$_2$ NO (GO TO Q35)
❑$_{97}$ REFUSED
❑$_{98}$ DON'T KNOW

32a. Does the person who took care of your baby do so on a regular basis? This could be for work or non-work related reasons (for example, you had classes or other activities).

❑$_1$ YES 1208-1209/
❑$_2$ NO (GO TO Q35)
❑$_{97}$ REFUSED
❑$_{98}$ DON'T KNOW

33. How many days in the last week was your baby cared for by someone else?

_____ Days per week (IF ZERO, GO TO Q35) 1210/
❑$_{97}$ REFUSED 1211-1212/
❑$_{98}$ DON'T KNOW

34. On an average day in the last week, how many hours was [he/she] cared for by someone else?

_____ Hours per day 1213-1214/
❑$_{97}$ REFUSED 1215-1216/
❑$_{98}$ DON'T KNOW

Demographic Characteristics

35. How many people currently live in your household? We are talking here about adults and children who stay with you all or most of the time and who you think of as part of your household. Please include yourself in the total.

TOTAL HOUSEHOLD MEMBERS _____ 1217-1218/
❑$_{97}$ REFUSED 1219-1220/
❑$_{98}$ DON'T KNOW

36. How many of the persons who live in your household are under the age of 18? Please include all of the persons under age 18, including [BABY'S NAME] who stay with you all or most of the time.

TOTAL HOUSEHOLD MEMBERS UNDER AGE 18 _____ 1221-1222/
❑97 REFUSED 1223-1224/
❑98 DON'T KNOW

37. What is your current marital status?

❑1 Never married 1225-1226/
❑2 Married/living with partner
❑3 Divorced
❑4 Legally separated
❑5 Widowed
❑97 REFUSED
❑98 DON'T KNOW

38. What was the highest grade/level of school you completed?

❑1 Did not graduate high school 1227-1228/
❑2 High school graduate or GED
❑3 Some college or 2-year degree
❑4 4-year college graduate
❑5 More than 4-year college degree
❑97 REFUSED
❑98 DON'T KNOW

39. Please choose one or more categories to describe your race.

❑1 American Indian or Alaskan Native 1229/
❑2 Asian 1230/
❑3 Black or African American 1231/
❑4 Native Hawaiian or Other Pacific Islander 1232/
❑5 White 1233/
❑95 OTHER (SPECIFY) _____ 1234-1235/
❑97 REFUSED 1236-1285/
❑98 DON'T KNOW 1286-1287

40. What is your ethnic background? Are you…

❑1 Hispanic or Latino 1288-1289/
❑2 Not Hispanic or Latino
❑97 REFUSED
❑98 DON'T KNOW

41. Where were you born?

- ❑1 One of the 50 US states or the District of Columbia 1290-1291
- ❑2 One of the US Territories (PROBE: Puerto Rico, Guam, American Samoa, US Virgin Islands, Mariana Islands, or Solomon Islands)
- ❑95 Some other country (SPECIFY): _____ 1292-1316/
- ❑97 REFUSED 1317-1366/
- ❑98 DON'T KNOW

42. When were you born?

____ / ____ / _____ 1367-1368/
(mm dd yyyy) 1369-1370/

- ❑97 REFUSED 1371-1374/
- ❑98 DON'T KNOW 1375-1376/

43. Please indicate your total household income.

- ❑1 Less than $10,000 1377-1378/
- ❑2 Between $10,001 – $15,000
- ❑3 Between $15,001 – $20,000
- ❑4 Between $20,001 – $25,000
- ❑5 Between $25,001 – $30,000
- ❑6 Between $30,001 – $35,000
- ❑7 Between $35,001 – $40,000
- ❑8 More than $40,000
- ❑97 REFUSED
- ❑98 DON'T KNOW

44. Do you receive any of the following? (CHECK ALL THAT APPLY)

- ❑1 Food stamps 1379/
- ❑2 TANF or cash assistance 1380/
- ❑3 Medicaid 1381/
- ❑4 Welfare 1382/
- ❑97 REFUSED 1383-1384/
- ❑98 DON'T KNOW

CLOSING

PHONE INTERVIEW:

Thank you. Your answers will help make WIC better for mothers and their babies.
As I mentioned earlier, we'd like to thank you by giving you a $35 Postal Money Order in appreciation of your participation. So that we can mail it to you, please give me the correct spelling of your name and your address.

Respondent name_____

Street Address _____

Apartment or building number, etc. _____

City _____

State _____ Zip _____

As part of a routine check on the quality of the work that I am doing, my supervisor also may contact you by phone. I'd like to verify that the number I've reached you at now is the correct number for us to call. The number I have is

- ❑ Number dialed:_____

- ❑ Is this correct?
- ❑ YES
- ❑ NO (IF 'NO' ENTER IN CORRECT NUMBER BELOW)

- ❑ Correct number_____

Thank you. We will mail your gift card to the address you provided.
Thanks again for your time and your participation.

IN-PERSON INTERVIEW:

Thank you for participating in this study. Your answers will help make WIC better for mothers and their babies. As we mentioned earlier, we'd like to thank you by giving you a $35 Postal Money Order in appreciation of your participation.

As part of a routine check on the quality of the work that I'm doing, my supervisor may contact you by phone. May I have the correct spelling of your name and the best number to call you?

Respondent's name_____

Phone number _____

Is this number for

- ❑ Home _____
- ❑ Work _____
- ❑ Cell _____

Is there another number that we could call?

- ❑ YES, RECORD NUMBER_____

Is this number for

- ❑ Home_____
- ❑ Work_____
- ❑ Cell_____
- ❑ No

Once again, thank you for your time and your participation.

TERMINATION SCRIPT FOR 1A AND 3A:

Thank you for agreeing to participate in this study. However, we would like to interview WIC participants who have breastfed their baby at least once and whose baby is less than 60 days of age. Because this is not your situation, we do not need to complete the interview with you.

Appendix C: Interpretation of Odds Ratios in Logistic Regression Models

It is worthwhile to review how odds ratios are interpreted.

- For any event, the probability *p* is a number between 0 and 1, inclusive, where 0 means the event is certain not to happen and 1 means the event is certain to happen.
- "Odds" are simply an alternative scale for describing a probability. The odds equals the probability that the event happens divided by the probability that the event does not happen: $p/(1-p)$. For example, if $p=0.25$ then $odds=1/3$. If $p=0.5$ then $odds=1$. If $p=0.75$ then $odds=3$.
- A higher odds implies a higher probability, and vice versa, but the numerical scale is different. Probabilities range from 0 to 1, and $p = 0.5$ means the event is equally likely to happen or not happen. Odds range from nearly 0 to positive infinity, and $odds = 1$ means the event is equally likely to happen or not happen.
- An "odds ratio" (*OR*) shows how a change in an explanatory variable influences the odds that the outcome happens. It is the ratio of the odds given a new value of the explanatory variable to the odds given an initial value of the explanatory variable: *OR = new odds / initial odds*.

An odds ratio greater than 1 means an outcome has become more likely to happen, while an odds ratio less than 1 means an outcome has become less likely to happen, due to the change in the explanatory variable. For example, consider the odds ratio showing how the outcome of being assigned the full breastfeeding package is related to an explanatory variable "participated in SNAP." This odds ratio is an estimate of the effect of going from being a SNAP nonparticipant (initial value) to being a SNAP participant (new value), all else equal. If *OR* = 0.427, then SNAP participants were 0.427 times as likely as (i.e., less likely than) nonparticipants to have the full breastfeeding package, all else equal. The shorthand phrase "times as likely" refers to the relative change in the odds, not the probability. In our example, the odds ratio is much less than 1, so a SNAP participant is much less likely than a nonparticipant to be assigned the full breastfeeding package.

As with ordinary linear regression models, some explanatory variables may describe more than two mutually exclusive categories, like Hispanic, non-Hispanic white, non-Hispanic black, and other. In these models, one of the categories is considered the reference category and omitted. In this case, the interpretation must keep in mind which category is the omitted reference category. Continuing our example, where the outcome is being assigned the full breastfeeding package, suppose Hispanic is the omitted reference category. If a table entry for non-Hispanic black states *OR* = 0.327, the interpretation is that non-Hispanic black respondents were 0.327 times as likely as Hispanic participants to have the full breastfeeding package, all else equal.

Why do tables for logistic regression analyses commonly report odds ratios? Why do they not simply report probabilities, which are more familiar? The reason is that the constant odds ratios can be computed directly from the estimated coefficients in logistic regression models, while the corresponding probabilities may vary widely depending on the average values of all the explanatory variables in the model. For example, an odds ratio of 2 is equivalent to a change in probability from 50% to 66.7% (as

odds change from 1 to 2) and also equivalent to a change in probability from 80% to 88.9% (as odds change from 4 to 8). The relative change in odds is a constant, but the change in probability varies depending on the example one chooses. Once one understands the meaning of "odds," a table of odds ratios is a commonly used way to interpret estimated coefficients from a logistic regression model without having to make additional assumptions about the average values of the explanatory variables.

Appendix D: Supplementary Tables

Exhibit D.1. Predictors of Receiving the Full Breastfeeding Package in the Birth Month

	Model 1		Model 2		Model 3		interaction	
	coeff (std.error)		coeff (std.error)		coeff (std.error)		coeff (std.error)	
Intercept	-2.281	***	-3.063	***	-3.457	***		
	(0.050)		(0.0589)		(0.116)			
Race/Ethnicity (Ref=Hispanic)								
White	0.476	***	0.470	***	1.237	***	-0.908	***
	(0.040)		(0.040)		(0.086)		(0.088)	
Black	-0.367	***	-0.377	***	0.230	**	-0.705	***
	(0.037)		(0.037)		(0.089)		(0.093)	
Other	-0.197	**	-0.220	**	0.395	**	-0.719	***
	(0.063)		(0.064)		(0.141)		(0.155)	
Income (% Federal Poverty Level)	0.002	***	0.002	***	0.001		0.001	
	(0.000)		(0.000)		(0.001)		(0.001)	
Program Participation								
SNAP	-0.250	***	-0.270	***	-0.106		-0.188	
	(0.035)		(0.035)		(0.091)		(0.099)	
TANF	-0.118	*	-0.119	*	-0.569	***	0.513	**
	(0.051)		(0.051)		(0.133)		(0.145)	
Household Size	0.014		0.013		0.074	**	-0.072	**
	(0.008)		(0.008)		(0.019)		(0.021)	
Post [a]			0.942	***	1.399	***		
			(0.032)		(0.119)			
	n=77,198		*n*=77,198		*n*=77,198			

Sample: Administrative records, all dyads with infants in the birth month in analysis months 1-2 (pre) and analysis months 5-12 (post).

[a] Both time periods were estimated using a single model with an indicator for the post-implementation period. The explanatory variables include fixed effects for LWAs. Stars indicate statistical significance of the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001.

Exhibit D.2. Predictors of Receiving the Full Formula Package in the Birth Month

	Model 1		Model 2		Model 3		Model 3 interaction	
	coeff (std.error)		coeff (std.error)		coeff (std.error)		coeff (std.error)	
Intercept	-1.403	***	-1.692	***	-1.638	***		
	(0.036)		(0.0402)		(0.073)			
Race/Ethnicity (Ref=Hispanic)								
White	0.288	***	0.282	***	0.378	***	-0.118	
	(0.029)		(0.0280)		(0.059)		(0.064)	
Black	0.259	***	0.258	***	0.082		0.213	**
	(0.023)		(0.0225)		(0.048)		(0.052)	
Other	0.409	***	0.404	***	0.445	***	-0.051	
	(0.041)		(0.0410)		(0.096)		(0.105)	
Income (% of Federal Poverty Level)	-0.002	***	-0.002	***	-0.003	***	0.001	
	(0.000)		(0.000)		(0.001)		(0.001)	
Program Participation								
SNAP	0.282	***	0.279	***	0.342	***	-0.078	
	(0.024)		(0.024)		(0.051)		(0.056)	
TANF	0.242	***	0.244	***	0.494	***	-0.311	**
	(0.040)		(0.040)		(0.087)		(0.096)	
Household Size	0.036	***	0.036	***	0.030	*	0.007	
	(0.005)		(0.005)		(0.012)		(0.014)	
Post [a]			0.366	***	0.300	**		
			(0.021)		(0.078)			
	n=77,198		*n*=77,198		*n*=77,198			

Sample: Administrative records, all dyads with infants in the birth month in analysis months 1-2 (pre) and analysis months 5-12 (post).

[a] Both time periods were estimated using a single model with an indicator for the post-implementation period. The explanatory variables include fixed effects for LWAs. Stars indicate statistical significance of the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001. [b] Both time periods were estimated using a single model with interaction terms for the post-implementation period.

Exhibit D.3. Predictors of Breastfeeding Initiation

	Model 1		Model 2		Model 3		Model 3 interaction	
	coeff (std.error)		coeff (std.error)		coeff (std.error)		coeff (std.error)	
Intercept	1.112	***	1.119	***	1.214	***		
	(0.080)		(0.090)		(0.117)			
Race/Ethnicity (Ref=Hispanic)								
White	-0.425	**	-0.425	**	-0.449	**	0.045	
	(0.122)		(0.122)		(0.130)		(0.063)	
Black	-0.700	***	-0.700	***	-0.738	***	0.074	
	(0.121)		(0.120)		(0.125)		(0.055)	
Other	-0.500	*	-0.500	*	-0.578	*	0.146	
	(0.224)		(0.224)		(0.253)		(0.088)	
Income (% Federal Poverty Level)	0.003	***	0.003	***	0.003	***	0.001	*
	(0.000)		(0.000)		(0.000)		(0.001)	
Program Participation								
SNAP	-0.385	***	-0.384	***	-0.410	***	0.048	
	(0.030)		(0.0230)		(0.033)		(0.038)	
TANF	-0.009		-0.009		-0.047		0.076	
	(0.024)		(0.023)		(0.044)		(0.084)	
Household Size	-0.011		-0.011		-0.022	*	0.001	*
	(0.008)		(0.008)		(0.010)		(0.001)	
Post [a]			-0.013		-0.198			
			(0.048)		(0.109)			
	n=126,518		*n*=126,518		*n*=126,518			

Sample: Administrative records, all dyads with infants aged 0-5 months in analysis month 2 (pre) and analysis month 10 (post). The explanatory variables include fixed effects for LWAs.

[a] Both time periods were estimated using a single model with an indicator for the post-implementation period. Stars indicate statistical significance of the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001. [b] Both time periods were estimated using a single model with interaction terms for the post-implementation period. Stars indicate statistical significance of the pre/post difference in the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001.

Exhibit D.4. Predictors of Breastfeeding for at Least Four Weeks

	Model 1		Model 2		Model 3		Model 3 interaction
	coeff (std.error)		coeff (std.error)		coeff (std.error)		coeff (std.error)
Intercept	1.320		1.284	*	1.502	**	
	(0.488)		(0.501)		(0.506)		
Race/Ethnicity (Ref=Hispanic)							
White	-0.757		-0.769		-1.091	*	0.477
	(0.447)		(0.447)		(0.534)		(0.798)
Black	-0.912		-0.931		-1.261		0.415
	(0.515)		(0.527)		(0.769)		(0.961)
Other/Not reported	0.317		0.306		0.121		0.329
	(0.640)		(0.642)		(1.051)		(1.294)
Some College or More	1.015	*	1.018	*	1.159		-0.335
	(0.437)		(0.436)		(0.681)		(0.885)
Employed	-0.238		0.259		0.295		-0.396
	(0.641)		(0.644)		(0.722)		(0.979)
Income (% Federal Poverty Level)	0.001		0.001		0.004		-0.007
	(0.004)		(0.004)		(0.006)		(0.008)
Missing Income	0.688		0.674		1.533	*	-1.622
	(0.512)		(0.508)		(0.674)		(0.908)
Program Participation							
SNAP	0.613		0.567		1.445	*	-1.597
	(0.452)		(0.438)		(0.715)		(0.937)
TANF	-2.056	**	-2.026	**	-1.663		0.411
	(0.576)		(0.557)		(0.968)		(1.063)
Not reported	0.182		0.075		0.157		-0.189
	(0.664)		(0.742)		(0.717)		(1.059)
Single Adult in Household	-0.862		-0.837		-1.678	*	1.952
	(0.502)		(0.502)		(0.702)		(1.032)
Post [a]			0.145		-0.674		
			(0.373)		(0.533)		
	n=961		*n*=961		*n*=961		

Sample: Participant surveys, mothers who initiated breastfeeding and were surveyed with infants were aged 4 weeks or older. The explanatory variables include fixed effects for LWAs.

Note: The sample for this exhibit was restricted to mothers with an infant aged 4 weeks or older.

[a] Both time periods were estimated using a single model with an indicator for the post-implementation period. The explanatory variables include fixed effects for LWAs. Stars indicate statistical significance of the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001.

Exhibit D.5. Predictors of "Mostly or Only Breastmilk" Intensity Level

	Model 1		Model 2		Model 3 interaction	
	coeff (std.error)		coeff (std.error)		coeff (std.error)	coeff (std.error)
Intercept	-0.476		-0.484		-0.788	
	(0.276)		(0.345)		(0.407)	
Race/Ethnicity (Ref=Hispanic)						
White	-04.54		-0.283		-0.272	-0.336
	(0.280)		(0.319)		(0.337)	(0.478)
Black	-0.515		-0.585		-0.472	-0.100
	(0.281)		(0.334)		(0.414)	(0.513)
Other	0.143		0.380		0.024	0.151
	(0.387)		(0.444)		(0.535)	(0.812)
Some College or More	0.932	***	1.135	***	-1.026	-1.026
	(0.225)		(0.271)		(0.452)	(0.452)
Employed	-0.443	*	-0.799	*	-0.371	-0.024
	(0.263)		(0.316)		(0.361)	(0.486)
Income (% Federal Poverty Level)	0.005		0.004		0.004	0.001
	(0.003)		(0.003)		(0.004)	(0.005)
Missing Income	0.218		0.185		0.779	-0.997
	(0.309)		(0.379)		(0.432)	(0.590)
Program Participation						
SNAP	0.401		0.481		0.065	0.065
	(0.245)		(0.256)		(0.463)	(0.463)
TANF	-0.886	*	-1.011	*	-0.262	-0.262
	(0.380)		(0.395)		(0.666)	(0.664)
Not reported	0.103		0.112		0.045	0.190
	(0.259)		(0.256)		(0.354)	(0.496)
Single Adult in Household	-0.403		-0.412		-0.423	-0.055
	(0.316)		(0.317)		(0.428)	(0.603)
Post [a]			-0.080		0.557	
			(0.195)		(0.564)	
	n=1,610		*n*=1,610		*n*=1,610	

Sample: Participant surveys, mothers with an infant aged 0-9 weeks who initiated breastfeeding.

[a] Both time periods were estimated using a single model with an indicator for the post-implementation period. The explanatory variables include fixed effects for LWAs. Stars indicate statistical significance of the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001. [b] Both time periods were estimated using a single model with interaction terms for the post-implementation period

Exhibit D.6. Predictors of "Formula Only" Intensity Level

	Model 1		Model 2		Model 3		interaction
	coeff (std.error)		coeff (std.error)		coeff (std.error)		coeff (std.error)
Intercept	-5.696		-5.760		-0.437		
	(3.303)		(3.331)		(0.370)		
Race/Ethnicity (Ref=Hispanic)							
White	0.520	*	0.516	*	0.785	*	0.108
	(0.238)		(0.240)		(0.355)		(0.496)
Black	0.830	**	0.817	**	1.040	*	-0.470
	(0.287)		(0.279)		(0.417)		(0.492)
Other	-0.065		-0.049		0.266		-0.895
	(0.414)		(0.428)		(0.473)		(0.745)
Some College or More	-0.625	*	-0.621	**	-1.068	**	0.883
	(0.244)		(0.240)		(0.337)		(0.476)
Employed	0.309		0.332	*	0.241		-0.104
	(0.165)		(0.153)		(0.356)		(0.502)
Income (% Federal Poverty Level)	-0.008	**	-0.008	*	-0.004		-0.006
	(0.003)		(0.003)		(0.004)		(0.005)
Missing Income	-0.609		-0.638		-0.691		0.097
	(0.400)		(0.421)		(0.394)		(0.533)
Program Participation							
SNAP	-0.190		-0.214		-0.287		-0.032
	(0.337)		(0.361)		(0.388)		(0.470)
TANF	0.730	*	0.745	*	1.152	*	-0.381
	(0.285)		(0.291)		(0.541)		(0.641)
Not reported	0.030		0.018		0.201		-0.489
	(0.257)		(0.246)		(0.384)		(0.530)
Single Adult in Household	0.360		0.337		0.377		-0.296
	(0.269)		(0.278)		(0.434)		(0.606)
Post [a]			0.142		0.489		
			(0.165)		(0.531)		
	n=1,610		*n*=1,610		*n*=1,610		

Sample: Participant surveys, mothers with an infant aged 0-9 weeks who initiated breastfeeding.

Interpretation Guide: All else equal, mothers with some college education were less likely (OR=0.424) to feed their infants only formula. This finding is statistically significant (p<0.001).

[a] Both time periods were estimated using a single model with an indicator for the post-implementation period. Stars indicate statistical significance of the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001. [b] Both time periods were estimated using a single model with interaction terms for the post-implementation period. Stars indicate statistical significance of the pre/post difference in the relationship between each explanatory variable and the outcome: * p<0.05, ** p<0.01, *** p<0.001.