

Appendices B1 – B3

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Appendix B1

Details of Sampling and Weighting Procedures

Appendix B1

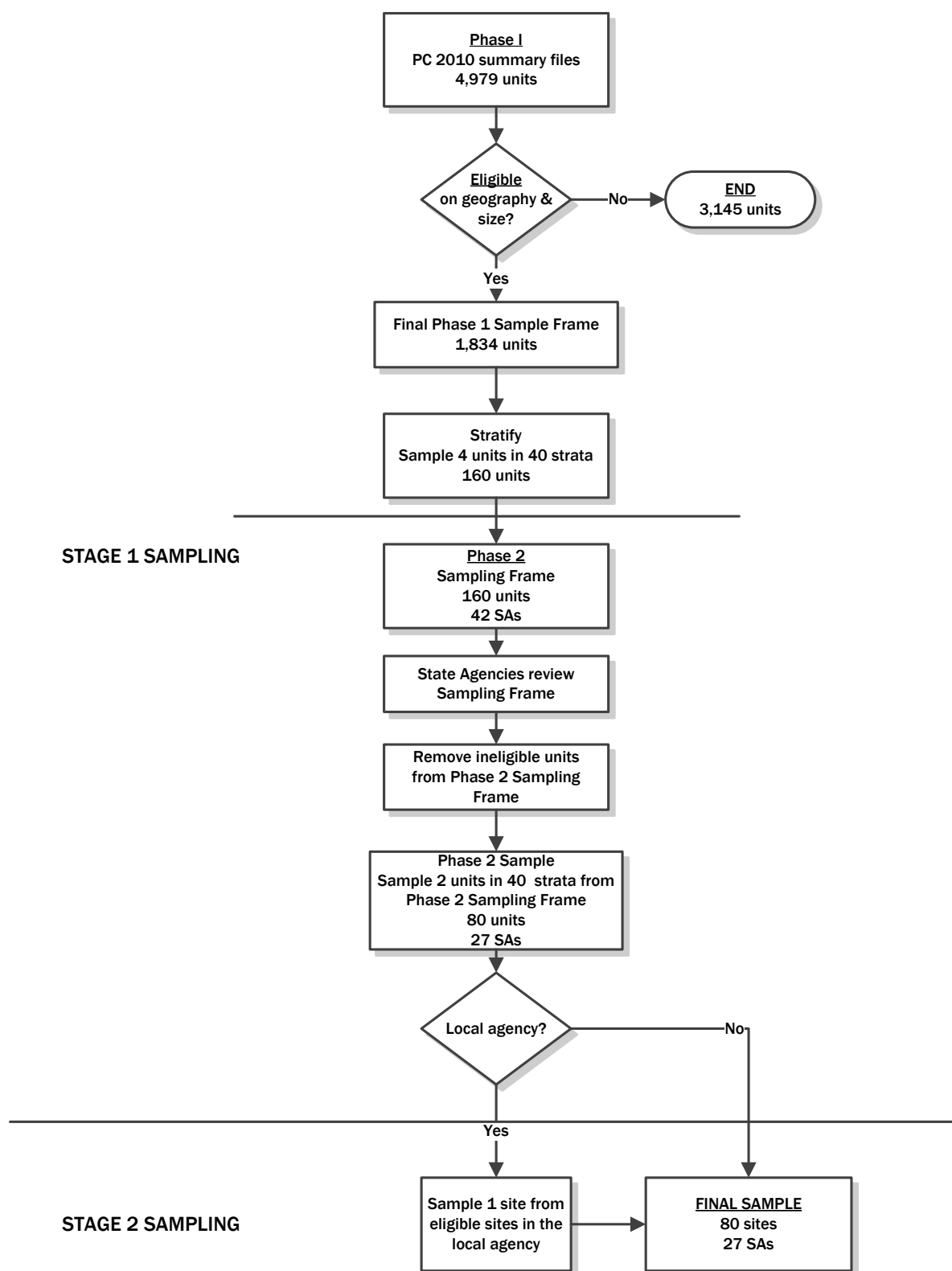
Details of Sampling and Weighting Procedures

B1.1 Selection of WIC Sites

The WIC service sites were selected using a stratified two-stage sampling approach. Because no national list of service sites exists, we used, as a sampling frame, a summary file at the level of the unit reported by each State Agency (SA) in the census of April 2010 (the WIC Program and Participant Characteristics 2010, or PC2010). This census resulted in a file with one record for each participant being served by WIC in that month. Because State agencies had flexibility for PC2010 for reporting service location identifiers, the IDs provided in the records by the State agencies varied; some State agencies provided the site ID in addition to a local agency code, whereas other State agencies included only a local agency code. As a result, two stages of selection were used to sample sites. The first stage involved the sampling of “PC2010 tabulation units”—the units for which IDs were provided in the PC2010 data. The second stage involved the sampling of sites for situations in which the sampled tabulation unit was a local agency. (For the remainder of this report, these tabulation units will be referred to, using standard statistical terminology, as “first-stage” sampling units.) Additionally, because the information needed to determine final eligibility of sites (namely, current enrollment information and whether the site was expected to be operational during the study recruitment period) was not available in the PC2010 data, the first-stage sample was selected in two phases in order to contact State agencies to obtain additional eligibility information about the sites. The ultimate goal was the selection of 80 WIC sites. Figure B1-1 is a flowchart that gives a general overview of the WIC site sampling process.

As shown in Figure B1-1, Phase 1 of Stage 1 involved the selection of four first-stage sampling units in each of 40 strata to create a Phase 2 sampling frame of 160 units. Stratification involved partitioning the sampling frame into four homogeneous groups and was used to improve the precision of estimates and to ensure representation in the sample of different types of sites. In Phase 2 of Stage 1, we contacted State agencies to determine the eligibility of each of the units sampled in the first phase and then sampled two units from among the eligible first-stage sampling units in each stratum for a total of 80 units. In Stage 2 we sampled the services sites within the sampled units that were local agencies (rather than service sites) and selected one site from each local agency.

Figure B1-1. Overview of WIC site sampling process



Site eligibility was defined in terms of enrollment flow. A minimum average flow of 1.5 new enrollees per day was required for a site to be eligible and ensure a sufficient volume of participants.

Additionally, to ensure that recruitment could be completed within the study recruitment period, we imposed a restriction requiring that eligible sites yield the target number of eligible enrollees within a 4-month period.

Following the completion of the sampling of sites for the study, we began site recruitment efforts in earnest to eliminate the adverse effects of site-level nonresponse on sample yield, sampled service sites that were unable to participate in the study were replaced by members of a matched sample.

B1.2 Construction of the Sampling Frame

The sampling frame was constructed from the WIC Program and Participant Characteristics 2010 (PC2010) dataset. PC2010 data were provided through a total of 90 individual SAS data files—one for each State WIC Agency. The PC2010 was obtained from FNS in October 2011. Once received, Westat’s subcontractor, Altarum, merged all 90 files into a single analytic file. Altarum thoroughly reviewed the PC2010 Guidance document to better understand each field that is included in the PC2010 database and to identify fields that would be required to develop the first-stage sampling frame file, including the following variables that Altarum derived from information provided in the PC2010 database:

- Unit (i.e., a unique identifier for the PC2010 tabulation unit described in Section B1.1, which was either the WIC site or the local agency);
- Unit Source;
- Number of Exclusively Breastfeeding Women;
- Number of Postpartum Women, Not Breastfeeding;
- Number of Prenatal Women Enrolled in April 2010 (PC2010 reference month);
- Number of Infants Under Age 3 Months Enrolled in April 2010;
- Total Number of Infants Enrolled in April 2010;
- Percent of Infants Enrolled in April 2010 Who Were Under Age 3 Months;
- Total Number of Participants (all Categories);

- Number of Women Participants Under Age 18 Years in April 2010;
- Number of Women Participants Under Age 16 Years in April 2010;
- Percent of Women With High Weight for Height Risk Code; and
- Percent of Children With High Weight for Height Risk Code.

B1.3 Stage 1 Sampling: Selection of the Phase 1 Sample

The Stage 1 sampling was conducted in two phases. The process used to select the Phase 1 sample involved three steps: computation of the measure of size (MOS) used for Phase 1 selection, exclusion of ineligible units, and stratification and selection of the units.

B1.3.1 Measure of Size Computation

The sample design involved sampling sites with probabilities proportional to a measure of size (MOS) (i.e., PPS sampling). For the Phase 1 sample, the MOS was the expected number of eligible enrollees for the first-stage sampling unit, based on the April 2010 enrollment counts from the PC2010. That is, the MOS was calculated for each first-stage sampling unit by summing the total prenatal enrollment and 20 percent of the total enrollment of infants less than 3 months.¹ Based on the aforementioned eligibility considerations, units with a value less than 30 for this MOS (i.e., less than 1.5 enrollees per day, assuming 20 enrollment days per month) were considered ineligible.

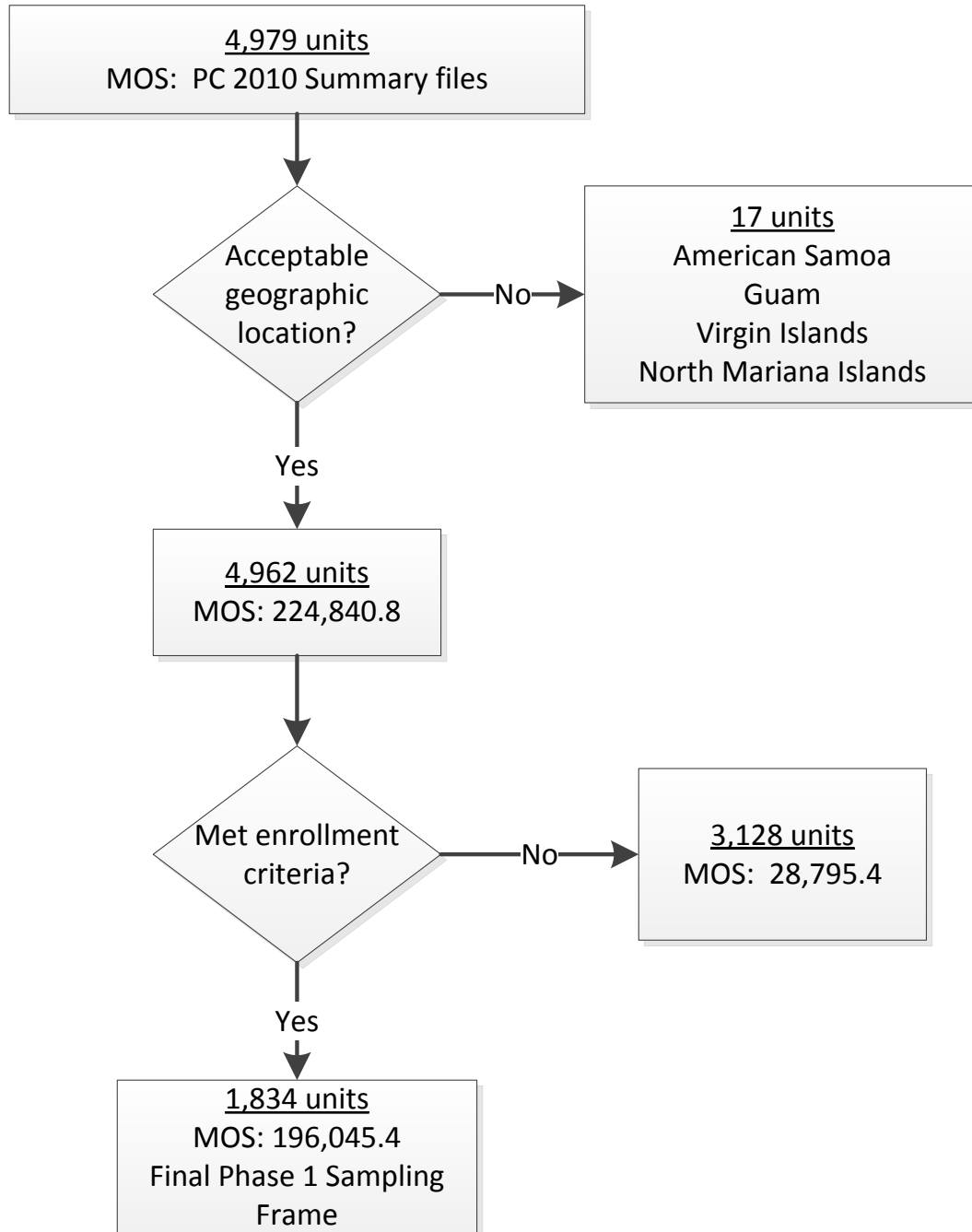
B1.3.2 Exclusion of Ineligible Units

As shown in Figure B1-2, a total of 4,979 units appeared on the PC2010 summary file that served as the basis for creating the sampling frame. Of these, a very small proportion (17 units) was dropped because of geographic location (American Samoa, Guam, Northern Mariana Islands, U.S. Virgin Islands). Since the units in these territories represented only 0.3 percent of the total sampling frame, this did not impact the representativeness of the frame. The remaining 4,962 units had a total MOS of 224,840.8. Of these, 3,128 units (with a total MOS of 28,795.4, about 12.8 percent of the total among

¹ The 20 percent figure is based on an estimate from the Early Childhood Longitudinal Study-Birth Cohort that 20 percent of infants enrolled in WIC were not enrolled prenatally.

geographically eligible units) were dropped because their MOS value was less than 30. As a result, the final Phase 1 sampling frame contained a total of 1,834 units, with a total MOS of 196,045.4.

Figure B1-2. Exclusion of ineligibles from unit selection process



B1.3.3 Stratification and Selection of the Phase 1 Sample

As noted above, the sample was designed to yield 80 sampled service sites. To achieve this, a total of 40 strata were formed, and ultimately (after two phases of selection) two sites were sampled from each of these strata. Five characteristics of the first-stage sampling unit or its SA were used to form the strata (note that the first three of these five characteristics are features of the State WIC Agency Plan that were used to group the WIC SA programs into categories):

- **Peer Counseling Program.** Whether the SA has a breastfeeding peer counseling program in place.²
- **Trained Paraprofessionals.** Whether SA policy allows for trained paraprofessionals to provide nutrition education (vs. requiring that staff that provide nutrition education have professional training or credentials).
- **Policy to Provide Formula.** Whether SA policy is to provide one can of formula for breastfeeding infants during the first 30 days of life.
- **Percent of Women Who Used Fully Breastfeeding Package.** This variable was an estimate of the percentage of women in the first-stage sampling unit who utilized the fully breastfeeding food package during the postpartum period. The PC2010 data were used to measure food-package selection by first-stage sampling unit, and this rate was computed by taking the ratio of the number of postpartum women who received the fully breastfeeding package during April of 2010 to the total number of postpartum women receiving any food package that same month.
- **Average of Children's and Mothers' High Weight for Height Rates.** The PC2010 data were used to estimate the percent's of children and of mothers who are "high weight for height"³ at the first-stage sampling unit level, and these percentages were averaged together to get a measure of risk of being overweight for all participants at the first-stage sampling unit level.

Using these characteristics (i.e., combinations of different levels of these variables), the first-stage sampling units were grouped to form 40 fairly homogenous strata of roughly equal size (in terms of total MOS). Specifically, the first-stage sampling units in a given stratum all came from State Agencies in the same State WIC Agency Plan classification (based on the three SA plan characteristics discussed above) and, to the extent possible, had similar fully breastfeeding and "high weight for height" rates.

² It turned out that there was no variation in this characteristic; all states reported offering a breastfeeding-peer counseling program.

³ For children (12 months or older), "high weight for height" is determined based on nutrition risk code 110. For children 24 months and older, it is defined as higher than the 95th percentile of BMI for age. For children 12 to 24 months, it is defined as at risk of being overweight by virtue of having a mother or father who is obese (BMI of 30 or greater). For mothers, the criterion is a pregravid BMI of 25 or higher.

One first-stage sampling unit (PHFE-WIC, in California) was, by itself, large enough (in terms of the total MOS) to constitute a stratum. That is, this unit (a local agency) was a certainty stratum, meaning that the unit was included in the first-stage sample with certainty. The service sites associated with the local agency were enumerated and sampled as described below.

Table B1-1 presents a tabulation of how the strata were defined. Specifically, each particular combination shown in the (1) cross-tabulation of the features of the WIC State Agency plan, (2) exclusively breastfeeding range, and (3) high weight for height range, constitutes a stratum. This tabulation shows, for each stratum, the total MOS, the number of units on the sampling frame, the number of units selected in the first phase, the number of sampled Phase 1 units that were eligible for Phase 2 selection, and the number of units sampled in the second phase. Each of the counts of units was broken down by local agencies and individual sites.

Besides the certainty stratum, there were a few cases in which a particular first-stage sampling unit was sufficiently large to be sampled with certainty in the first phase of selection; that is, the unit's measure of size (MOS) was greater than one-fourth of the total MOS for its stratum, so that its probability of selection in a probability proportional to size (PPS) design was 1.

Table B1-1. Definitions of the strata used for site sampling and key sampling statistics by stratum

Stratum ID	Features of the state WIC program	% of Women who used fully breastfeeding package	Children and mothers' high weight for height rates (%)	Total stratum measure of size	Number of											
					Units on frame			Phase 1 units sampled			Phase units sampled eligible for phase 2			Phase 2 units sampled		
					Total	Agencies	Sites	Total	Agencies	Sites	Total	Agencies	Sites	Total	Agencies	Sites
101	Does the state operate a breastfeeding peer counseling program? YES	0 - 10.5691	0 - 36.7147	4,997.2	65	1	64	4	0	4	4	0	4	2	0	2
102		0 - 10.5691	36.7147 - 45.9689	4,952.0	62	0	62	4	0	4	3	0	3	2	0	2
103		10.5691 - 14.4928	0 - 35.5971	4,994.0	61	4	57	4	0	4	4	0	4	2	0	2
104	Does the State require that general nutrition education be provided by a professional staff member, e.g., dietitian, nurse? NO	10.5691 - 14.4928	35.5971 - 44.0943	5,000.0	49	3	46	4	0	4	3	0	3	2	0	2
105		14.4928 - 20.3863	0 - 33.5319	4,973.4	66	4	62	4	0	4	4	0	4	2	0	2
106		14.4928 - 20.3863	33.5319 - 44.3548	4,980.8	63	9	54	4	1	3	2	0	2	2	0	2
107	Is infant formula issued in the 1st month to partially breastfed infants? NO	20.3863 - 63.5838	0 - 30.7242	5,019.4	59	28	31	4	3	1	4	3	1	2	1	1
108		20.3863 - 63.5838	30.7242 - 33.0749	4,988.0	43	16	27	4	2	2	4	2	2	2	1	1
109		20.3863 - 63.5838	33.0749 - 35.2011	4,999.6	52	14	38	4	2	2	4	2	2	2	1	1
110		20.3863 - 63.5838	35.2011 - 52.7565	4,968.4	67	22	45	4	2	2	2	0	2	2	0	2

Table B1-1. Definitions of the strata used for site sampling and key sampling statistics by stratum (continued)

Stratum ID	Features of the state WIC program	% of Women who used fully breastfeeding package	Children and mothers' high weight for height rates (%)	Total stratum measure of size	Number of											
					Units on frame			Phase 1 units sampled			Phase units sampled eligible for phase 2			Phase 2 units sampled		
					Total	Agencies	Sites	Total	Agencies	Sites	Total	Agencies	Sites	Total	Agencies	Sites
200	Does the state operate a breastfeeding peer counseling program? YES	0 – 100	0 – 100	6,340.4	1	1	0	1	1	0	1	1	0	1	1	0
201		0 – 14.2857	0 – 28.7699	4,874.6	64	14	50	4	1	3	4	1	3	2	0	2
202		0 – 14.2857	28.7699 – 30.9995	4,905.0	47	11	36	4	2	2	3	1	2	2	1	1
203		0 – 14.2857	30.9995 – 33.0338	4,839.8	47	10	37	4	1	3	3	1	2	2	0	2
204	Does the State require that general nutrition education be provided by a professional staff member, e.g., dietitian, nurse? NO	0 – 14.2857	33.0338 – 34.1299	4,913.8	45	14	31	4	3	1	4	3	1	2	1	1
205		0 – 14.2857	34.1299 – 35.0733	4,893.4	48	12	36	4	1	3	4	1	3	2	1	1
206		0 – 14.2857	35.0733 – 35.8987	4,853.8	45	17	28	4	2	2	3	2	1	2	1	1
207		0 – 14.2857	35.8987 – 36.6585	4,881.4	45	18	27	4	3	1	4	3	1	2	2	0
208		0 – 14.2857	36.6585 – 37.5487	4,868.6	40	18	22	4	4	0	4	4	0	2	2	0
209		0 – 14.2857	37.5487 – 39.0369	4,961.8	39	18	21	4	1	3	4	1	3	2	0	2
210		0 – 14.2857	39.0369 – 40.9907	4,768.6	38	17	21	4	3	1	4	3	1	2	2	0
211	Is infant formula issued in the 1st month to partially breastfed infants? YES	0 – 14.2857	40.9907 – 44.6064	4,982.6	53	21	32	4	3	1	4	3	1	2	1	1
212		0 – 14.2857	44.6064 – 61.7659	4,874.4	55	24	31	4	3	1	3	2	1	2	1	1
213		14.2857 – 20.9273	0 – 31.9917	4,934.6	36	9	27	4	2	2	4	2	2	2	2	0
214		14.2857 – 20.9273	31.9917 – 34.1434	4,837.4	45	7	38	4	1	3	4	1	3	2	1	1
215		14.2857 – 20.9273	34.1434 – 35.2664	5,028.0	29	10	19	4	1	3	3	1	2	2	1	1
216		14.2857 – 20.9273	35.2664 – 37.6706	4,989.8	47	19	28	4	2	2	3	2	1	2	1	1
217		14.2857 – 20.9273	37.6706 – 41.8135	4,935.6	49	17	32	4	2	2	4	2	2	2	2	0
218		14.2857 – 20.9273	41.8135 – 55.0665	4,860.4	49	19	30	4	2	2	3	2	1	2	2	0
219		20.9273 – 29.3196	0 – 32.3818	4,892.6	39	8	31	4	2	2	4	2	2	2	1	1
220		20.9273 – 29.3196	32.3818 – 36.7067	4,924.8	56	20	36	4	3	1	4	3	1	2	1	1
221		20.9273 – 29.3196	36.7067 – 38.5783	4,897.2	23	13	10	4	4	0	4	4	0	2	2	0
222		20.9273 – 29.3196	38.5783 – 52.1351	4,912.4	44	22	22	4	3	1	4	3	1	2	2	0
223		29.3196 – 35.9756	0 – 32.5106	4,823.4	30	18	12	4	4	0	3	3	0	2	2	0
224		29.3196 – 35.9756	32.5106 – 49.5159	4,706.6	36	20	16	4	2	2	4	2	2	2	1	1
225		35.9756 – 69.1358	0 – 32.6778	4,878.4	28	24	4	4	3	1	3	3	0	2	2	0
226		35.9756 – 69.1358	32.6778 – 47.0875	4,954.0	38	32	6	4	4	0	3	3	0	2	2	0

Table B1-1. Definitions of the strata used for site sampling and key sampling statistics by stratum (continued)

Stratum ID	Features of the state WIC program	% of Women who used fully breastfeeding package	Children and mothers' high weight for height rates (%)	Total stratum measure of size	Number of											
					Units on frame			Phase 1 units sampled			Phase units sampled eligible for phase 2			Phase 2 units sampled		
					Total	Agencies	Sites	Total	Agencies	Sites	Total	Agencies	Sites	Total	Agencies	Sites
301	Does the state operate a breastfeeding peer counseling program? YES	0 - 7.6336	0 - 100	4,222.0	47	4	43	4	1	3	3	1	2	2	1	1
302		7.6336 - 33.3992	0 - 34.2542	4,262.8	37	10	27	4	3	1	3	2	1	2	2	0
303																
	Does the State require that general nutrition education be provided by a professional staff member, e.g., dietitian, nurse? YES															
	Is infant formula issued in the 1st month to partially breastfed infants? N/A	7.6336 - 33.3992	34.2542 - 50.2087	4,154.4	47	6	41	4	1	3	4	1	3	2	1	1
Total				196,045.4	1,834	554	1,280	157	78	79	139	70	69	79	42	37

B1.3.4 Stage 1 Sampling: Selection of the Phase 2 Sample

Following the selection of the Phase 1 sample of 160 first-stage units, further work was undertaken to enumerate individual service sites (when the first-stage unit was a local agency), ascertain each unit's eligibility, and select the final sample of sites. During April 2012, 42 State Agencies were sent an introductory letter and asked to review a list of local agencies in their State in the Phase 1 sampling frame of 160 units and provide information needed for Phase 2 of sampling. The 42 State Agencies were divided into two groups based on the information they reported for the PC2010 census. The 21 State Agencies in Group A reported their local agencies on the census, but not the service sites under the local agencies. The 21 State Agencies in Group B reported their local agencies but also reported IDs for the sites under the local agencies. Group A was sent a list of all their local agencies on the sampling frame, along with the names of the sites within each local agency, based on information we obtained from their State and local web sites. They were asked to review the list of local agencies and service sites, remove sites that were not operational, and add sites that were missing from the list. State Agencies in Group B were sent a list of local agencies and the ID numbers of service sites under the local agencies, and were asked to provide the name of the site corresponding to the site number(s), and indicate whether or not the site(s) was expected to continue as an operational site for the next 12 months.

The State Agencies were also asked to provide five items of information about their sites on the frame that would be operational for the next 12 months: (1) number of days the site was open to conduct prenatal and infant enrollments during January 2012, (2) total number of participants served that month, (3) number of prenatal women enrolled during that month, (4) number of infants enrolled during that month, and (5) whether any of the prenatal and infant participants were enrolled at outreach locations affiliated with the site.

The information provided by the State Agencies was used to determine eligibility for the Phase 2 sample. Sites that were not expected to continue in operations for the next 12 months and sites that did not meet the eligibility criteria (in terms of enrollment flow) were designated as ineligible. If the first-stage sampling unit was a local agency, that unit was designated as ineligible if all sites associated with the local agency were ineligible; otherwise, that unit was eligible.

Subsampling (second-phase selection) of eligible first-stage sampling units was done to arrive at the final sample of first-stage sampling units. In each of the 40 strata (the same strata used for the Phase 1 sample) two first-stage units were sampled with equal probability from among the eligible units.

B1.4 Stage 2 Sampling

As shown in Figure B1-1, Stage 1 sampling units selected in the Phase 2 sample that were local agencies (i.e., consisted of more than one service site), went through a second stage of sampling to select one service site. For each first-stage sampling unit that was a local agency, the eligible service sites were listed. An MOS that reflected the expected average daily enrollment was obtained for each service site by summing the January 2012 prenatal enrollment and 20 percent of the January 2012 infant enrollment, and dividing this total by the number of enrollment days in January 2012. Within each local agency in the Phase 2 sample, exactly one service site was sampled from the eligible sites with probabilities proportional to this MOS. The final sample of service sites contained a total of 80 sites in 27 State agencies.

B1.5 Site Replacements

During site sampling, candidate replacement sites were designated for each sampled site. These replacements were available for use in the event that the sampled site was unable or unwilling to participate in the study. All replacements were selected at the same time as the original sample from the same stratum as the sampled sites and had a similar measure of size. This replacement of sites by matched substitutes is similar to imputation and thus does not affect the weights of any member of the sample. A total of six sites were replaced.

B1.6 Sampling New WIC Enrollees

B1.6.1 Recruitment Windows

The sample included all prenatal mothers or their babies less than 2.5 months old who were newly enrolled into WIC at the sampled site during a pre-specified recruitment window. Mothers were eligible to participate even if they had enrolled in WIC for a previous pregnancy or previous child. The recruitment window was a consecutive string of days in which all new WIC enrollees in that site were designated to be screened for eligibility and recruited into ITFPS-2. The length of the recruitment window for each site was predetermined based on the estimated amount of time that would have been

needed in July 2012⁴ to yield 98 new WIC enrollees per site (the target sample size for each site). Since the flow of new WIC enrollees into the 80 sampled sites was decidedly different, the window length was much shorter in clinics with a “high flow” of new enrollees compared with clinics with a “low flow.” The study screening and enrollment processes did not necessarily occur during the recruitment window, but the study participants must have enrolled in WIC at the service site during the recruitment period.

After notifying the sites of their selection into the study, we provided them enrollment data obtained from the WIC PC2010 dataset on their participation, prenatal and infant enrollment rates, and the site days of operation for January 2012. The sites were asked to identify any significant changes to the information (such as increases or decreases in participation or prenatal/infant enrollments between January and August), and to update the site schedule for enrolling new participants.

The length of the recruitment window for each site was calculated based on the updated enrollment figures and the total recruitment period was set at 20 weeks. The recruitment windows ranged from 4 to 77 days per site. The recruitment protocol called for staggering the launch of recruitment in the 80 sites over a nine week period and each site was randomly assigned to a “release group” which corresponded to one of the nine weeks that recruitment was launched. A site’s eligibility for a given release group depended on the length of that site’s recruitment window. For example, a site that required a 3-month recruitment window could not be assigned to the last release group. Thus, the randomization of recruitment windows took into account each site’s window length but was also done in such a manner that the planned number of sites was assigned to each release group. The first and last release groups each included five sites while the remaining release groups each included 10 sites. In general, recruitment in the sites was launched on the Monday of the recruitment week.

The 20-week recruitment period began July 1, 2013 and ended November 18, 2013. Before starting recruitment we increased the recruitment window for each site by 3 percent to serve as a buffer based on new enrollment data that suggested the WIC enrollment was declining. However, even with the 3 percent buffer, after 4 weeks into recruitment with 40 sites in the field (August 1, 2013), we projected we would only reach about 84 percent of the estimated number of eligible WIC women relative to the expected numbers that were estimated in July 2012. As a result, all recruitment windows were extended by an additional 10 percent (with the exception of 5 sites where the full 10 percent extension could not be achieved while still ending recruitment on November 18).

⁴ July 2012 was the month the sites provided updated enrollment counts and schedule information prior to calculating recruitment windows.

B1.6.2 Core and Supplemental Samples

Two samples were selected at each service site: a core longitudinal and supplemental cross-sectional sample. The core sample was originally designed to be an equal probability sample of all new enrollees. The supplemental sample was designed to focus on subpopulations with specific characteristics such as African American mothers and infants enrolled postnatally with no prenatal WIC exposure. The supplemental sample was not designed to be analyzed by itself but only in conjunction with the core sample. Under the original design, the two samples were to start out as equal in size with an average of 49 (one half of the total of 98) new enrollees each per service site. The supplemental sample was designed to be considerably smaller after screening and subsampling.

During recruitment, each pregnant client was asked if this was the first time she had enrolled for WIC during this pregnancy, and each mother of a newly enrolling infant was asked if she was enrolled in WIC during her pregnancy for the infant at hand. For both prenatal and postnatal enrollees, only first-time enrollees were eligible for the sample. With this approach, ineligible postpartum mothers and infants were immediately screened out of the sample. During recruitment, the sample was screened to determine race, ethnicity, trimester at enrollment, pre-pregnancy BMI, household composition, and income, and new enrollees not required to achieve the subgroup targets were subsampled from the supplemental sample. This approach was designed to drop approximately: 68 percent of white mothers; 81 percent of Hispanic mothers; 71 percent of mothers in their first trimester; 68 percent of mothers in their second or third trimester; 18 percent of mothers enrolling postnatally; 58 percent of obese mothers; 29 percent of overweight mothers; 71 percent of mother with low or normal pre-pregnancy BMI; 54 percent of mothers with income at or below 75 percent of poverty; 64 percent of mothers with income between 76-130 percent of poverty; and 69 percent of mothers with income above 130 percent of poverty. These rates were based on the sample sizes needed to support the precision requirements (power projections) and were determined by taking into account estimated population distributions.

Following the decision to extend the recruitment windows by 13 percent, the sample was closely monitored to determine whether recruitment targets could be met. Several weeks of tracking the enrollment of prenatal mothers and their infants into WIC in each of the 80 sites confirmed that we could not meet the projected study recruitment targets. To compensate we altered the study participant sampling process to eliminate the subsampling of participants in the supplemental sample. Additionally, the proportion of sampled cases designated for the core (versus supplemental) sample was revised to 87.5 percent (a change from the original 50 percent).

These changes were designed to meet the core target sample size (based on the lower than expected WIC enrollment flows that had been observed to date) and meet or exceed the overall target sample size. The core sample remains nationally representative. Following these changes, no eligible participant was subsampled out; thus, the demographic characteristics of the supplemental sample after the change differed considerably from the demographic profile before the change. These changes went into effect as of August 27, 2013. Cases completing the screener prior to August 27, 2013 were sampled using the original rates, and cases completing the screener on or after August 27, 2013 were sampled using the revised rates.

B1.6.3 Multiple Births

For those study mothers who had twins, triplets, and so on, a single infant was sampled at the first postnatal interview.

B1.7 Details of the Weighting Procedures

B1.7.1 Computation of Survey Weights

For the analyses in this report, survey weights were computed for:

- The prenatal respondents;
- The 1-month interview, 3-month interview, 5-month interview, 7-month interview, 9-month interview, 11-month interview, and 13-month interview respondents (separately);
- A set of participants who responded to either the 1- or 3-month interview;
- A set of participants who responded to the prenatal interview, the 1-month interview, the 3-month interview, the 5-month interview, the 7-month interview, the 9-month interview, the 11-month interview, and the 13-month interview; and
- A set of participants who responded to either the 1-month or the 3-month interview, and also responded to the 5-month interview, the 7-month interview, the 9-month interview, the 11-month interview, and the 13-month interview.

These weights account for differential probabilities of selection and nonresponse. For some analyses, weights were computed for the “combined” set of respondents (including both core and supplemental

sample cases); for other analyses, weights were computed for the core sample only. (See below for further discussion of this.)

For each sampled site, the site-level base weight was computed as the reciprocal of the probability of selection of the site. For example, if a site was sampled with probability equal to 1/100, its base weight was 100. Because sites were sampled within strata with probabilities proportionate to their estimated size, there was variation in these probabilities. The site-level base weights varied from 4.9 to 64.9.

The site-level base weights were adjusted to account for the probability of sampling the participant within the site. This adjustment accounts for the length of the recruitment window at the site (relative to the total number of days the site was enrolling participants during the study recruitment period). The resulting weight was the participant-level base weight, and these weights varied from 23.2 to 245.0.

As discussed in Section B1.3, two samples were selected at each site: a core longitudinal and supplemental sample. For some interviews, both the core and supplemental sample (combined) are interviewed, while for other interviews, only the core sample is interviewed. The participant weights for these interviews include factors to account for the subsampling of participants for the core sample and for the subsampling of participants in the supplemental sample, to produce core-only sample weights and combined sample weights. The weights for a particular interview are based on the sample to which the interview was administered.

For those study mothers who have multiple births, a single infant was sampled at the first postnatal interview, and the weights account for the sampling of the particular infant.

B1.7.2 Adjusting for Nonresponse

Nonresponse occurs as a result of respondents refusing or being unable to participate in some interviews. Because the set of participants who respond differs from interview to interview, the weights used to analyze data from a particular interview were developed to adjust for nonresponse to that particular interview. Some analyses involve participants who respond to a given combination of interviews, or those who respond to either one interview or another. In such cases, custom weights that adjust for nonresponse to the particular combination of interview were developed.

Specifically, to reduce the potential nonresponse bias, the base weights were adjusted to compensate for differential nonresponse. A weighting class adjustment (Brick and Kalton, 1996) was used to adjust for nonresponse. With this approach, weighting classes are formed (using variables known for respondents and non-respondents), and non-respondents' weights are redistributed to respondents within the same weighting class. Characteristics used to form the weighting classes should be associated with the probability of response as well as key survey outcome variables (Little and Vartivarian, 2003). In the early stages of recruitment for WIC ITFPS-2, however, very limited information was available for both respondents and non-respondents. The characteristics used to form weighting classes to adjust for nonresponse at each stage were as follows:

- **Adjusting for log nonresponse and nonresponse to the screener:** Service site.
- **Adjusting for nonresponse to the enrollment instrument or failure to consent to the study:** Mother's age, timing of WIC enrollment (1st trimester, 2nd trimester, 3rd trimester, postnatal), mother's weight category (overweight, obese, other), mother's Hispanic origin, mother's race, poverty status, and language.
- **Adjusting for prenatal interview nonresponse:** Timing of WIC enrollment, mother's age, language, and race.
- **Adjusting for 1-month interview nonresponse:**
 - **Core-only sample:** Timing of WIC enrollment, food security, mother's Hispanic origin, mother's weight category, mother's race, age, language, and poverty status.
 - **Combined sample (core and supplemental):** Timing of WIC enrollment, mother's race, mother's weight category, mother's Hispanic origin, age, food security, language, and poverty status.
- **Adjusting for 3-month interview nonresponse (Core-only sample):** Mother's weight category, food security, language, poverty status, race, timing of WIC enrollment, and mother's age.
- **Adjusting for nonresponse to both the 1- and 3-month interviews:**
 - **Core-only sample:** Food security, mother's weight category, mother's age, timing of WIC enrollment, mother's Hispanic origin, poverty status, language, and mother's race.
 - **Combined sample (core and supplemental):** Food security, mother's weight category, mother's age, language, mother's race, timing of WIC enrollment, and poverty status.

- **Adjusting for 5-month interview nonresponse (Core-only sample):** Food security, mother's weight category, mother's age, timing of WIC enrollment, mother's Hispanic origin, poverty status, language, and mother's race.
- **Adjusting for 7-month interview nonresponse (Combined sample):** Food security, mother's weight category, mother's age, timing of WIC enrollment, mother's Hispanic origin, poverty status, and mother's race.
- **Adjusting for 9-month interview nonresponse (Core-only sample):** Food security, mother's weight category, mother's age, timing of WIC enrollment, mother's Hispanic origin, poverty status, language, and mother's race.
- **Adjusting for 11-month interview nonresponse (Core-only sample):** Food security, mother's weight category, mother's age, timing of WIC enrollment, mother's Hispanic origin, poverty status, language, and mother's race.
- **Adjusting for 13-month interview nonresponse (Combined sample):** Food security, mother's weight category, mother's age, timing of WIC enrollment, mother's Hispanic origin, poverty status, language, mother's race, and WIC enrollment status at 7 months.
- **Adjusting for nonresponse to any interview from the prenatal interview through the 13-month interview (Core-only sample):** Food security, mother's weight category, mother's age, timing of WIC enrollment, mother's Hispanic origin, poverty status, language, and mother's race.
- **Adjusting for nonresponse to the 1-month interview and the 3-month interview, or to any interview from the 5-month interview through the 13-month interview (Core-only sample):** Food security, mother's weight category, mother's age, timing of WIC enrollment, mother's Hispanic origin, poverty status, and mother's race.

These adjustments were performed sequentially; that is, the base weights were adjusted for log nonresponse and nonresponse to the screener, these adjusted weights were adjusted for nonresponse to the enrollment instrument or failure to consent, and these adjusted weights were adjusted for nonresponse to the particular interview(s). Within these weighting classes, a weighted response rate was computed (using the weights produced in the previous adjustment) and applied to the weights from the previous adjustment (i.e., the weights from the previous adjustment were divided by the weighted response rate in the weighting class) to obtain the corresponding nonresponse-adjusted weights.

B1.7.3 Replicate Weights

In addition to the full sample weights described above, a series of replicate weights were created and attached to each data record for variance estimation. Replication methods provide a relatively simple and robust approach to estimating sampling variances for complex survey data (Rust and Rao, 1996). The basic replication approach is to repeatedly select portions of the sample (“replicates”) and then to apply the weighting process developed for the full sample to each replicate separately. The estimate of interest is calculated for each replicate. The variability among these estimates is then used to estimate the variance of the full sample statistics. The replicate weights were used to calculate standard errors of the survey-based estimates and to conduct significance tests and other analyses.

Different approaches can be used to create these replicates. For WIC ITFPS-2, 40 replicates were created, and the replication approach that was used is a modified balanced repeated replication (BRR) method suggested by Fay (Judkins, 1990). When estimating the variance of ratios of rare subsets, one problem that occasionally arises from standard BRR is that one or more replicate estimates will be undefined due to zero denominators. Instead of increasing the weights of one half-sample by 100 percent and decreasing the weights of the other half-sample to zero as in standard BRR, Fay’s method perturbs the weights by $\pm 100(1-K)$ percent where K is referred to as “Fay’s factor.” The perturbation factor for standard BRR is 100 percent, or $K=0$. For WIC ITFPS-2, $K=0.3$ was used.

B1.8 Imputation

Imputation was used to adjust for item nonresponse (i.e., missing data for particular items among those who respond to a given wave). All the key socio-demographic variables (see Section 1.7) are imputed for the total sample. As with weighting, a carefully designed imputation procedure aims to reduce bias due to nonresponse (in this case, item nonresponse). The hot deck imputation method was used to generate the imputations (Kalton and Kasprzyk, 1982). With this approach, imputation cells are formed by cross-classifying variables that are associated with the variable being imputed and, where possible, also associated with the probability of response to the variable being imputed.

B1.9 References

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Appendix B2

Development of WIC Program Composite Variables

Appendix B2

Development of WIC Program Composite Variables

B2.1 WIC Program Composite Variables

We use composite measures to capture the variation among WIC sites. Four strategies were used to collect information about site characteristics and practices:

- Key informant interviews conducted with state agency officials (State Interview);
- Key informant interviews conducted with local agency and/or site staff (Local Interview);
- WIC site profile developed from onsite observation and discussion of staffing, facilities and resources (Site Profile); and
- Survey of WIC site staff (Staff Survey).

Each of the data sources provided multiple variables for consideration in developing composite variables for the following five programmatic topic areas: Breastfeeding Education and Support, Breastfeeding Peer Counseling, Breast Pumps, Education, and Food Packages. The composites contain site-level variations in WIC program characteristics and features of service delivery.

Methodology

The variables identified for each topic area were included in principal component analyses (PCA) to identify latent themes, or main factors, present at the WIC site level. PCA is a variable reduction technique that is useful to employ when data on a large number of variables has been obtained and the variables are believed to be correlated. Under these conditions, PCA can help to reduce the variables into a smaller number of principal components that will account for most of the variance. These may then be used as predictor or criterion variables in subsequent analyses.

Within each composite, there were often multiple themes present as identified through PCA and expert review. Determination of relevant themes and potential applicability led to more than one factor being retained for some topic areas. Once the number of factors, and correspondingly the number of variables generated to represent a composite topic area, were identified for retention and

use for each domain, PCA post-estimation techniques were used to create one or more composite variables.

To address the issue of missing data, a second set of variables was created using only the specific variables identified as substantially contributing to the composite theme. Within a given factor loading, only those with a 40 percent or greater variable contribution were retained for the second set of alternative composite measures¹. These variables were calculated as the average of the retained variables standardized values. This step resulted in variables that included more WIC sites.

Description of the Composite Variables

Breastfeeding Education and Support

Principal component analysis was conducted with 8 variables identified as potentially contributing to a composite for the Breastfeeding Education and Support topic area. Results of the PCA showed two primary factors that closely corresponded to the subtopics identified for this composite: Factor 1: Pre- and post-natal breastfeeding support contacts and Factor 2: Staff available to support breastfeeding. The two factors account for 40.7 percent of the variance in sites that had complete information on all of the variables included in the analysis (n=76). Data sources for the two factors are listed below.

Source	Questions
Factor 1: Pre- and Post-natal Breastfeeding Support Contacts	
Local Interview	How many contacts do the staff below have with pregnant women and when do these occur: Q40.e. breastfeeding peer counselors (BFPC)? Q41.c. lactation consultants/professionals (LC)? Please describe the types of breastfeeding support: Q40.d. peer counselors provide to WIC mothers? Q41.b. your lactation consultants/professionals provide to WIC mothers?
Staff Survey	Asked of breastfeeding peer counselors: Q43.a. How many times, on average, do you speak with a mother who is breastfeeding for the first time (in person or on the phone) during the first 10 days after birth?
Factor 2: Staff Available to Support Breastfeeding	
Local Interview	Q41. Do you have certified lactation consultants/professionals at your site?
Site Profile	Section E: Staffing. Identify the duties of each job classification/role of WIC staff (e.g., eligibility, certification assessment, nutrition education, breastfeeding education and support, food issuance/administrative)

¹ Two variables did not meet the common 0.4 threshold but were retained based on expert opinion. Their values were 0.37 and 0.33.

Breastfeeding Peer Counseling

Principal component analysis was conducted with 13 variables identified for the Breastfeeding Peer Counseling (BFPC) composite, and only the 64 sites reported they have BFPC programs and 58 had complete data and were included in the analysis. PCA identified a common underlying theme related to Staff Confidence and Professional Support. This final single factor accounted for 14 percent of the variance between the 58 sites for which data were available. The data sources for the Breastfeeding Peer Counseling composite are listed below.

Source	Staff Confidence and Professional Support Questions
Local Interview	Q40.g. Describe the supervision and training for breastfeeding peer counselors?
Staff Survey	Q5. What is your highest level of education?
Staff Survey	Asked of breastfeeding peer counselors: How confident are you when talking with: Q23a. WIC participants who do not want to breastfeed? Q23b. WIC participants about problems establishing a sufficient milk supply? Q23c. WIC participants who lack support from family or friends to breastfeed? Q23d. WIC participants about strategies for returning to work? Q23e. WIC participants whose doctor's suggested adding formula?

Breast Pumps

For the Breast Pumps composite, principal component analysis was conducted with 17 variables identified as potentially impacting breast pump allocation to WIC mothers. The results of the PCA identified three factors with the following underlying themes: Factor 1: Open allocation of breast pumps, Factor 2: Targeted allocation of breast pumps, and Factor 3: Breast pump accessibility. In all, the three factors account for 35.8 percent of the variance across sites. The three factors drew from variables across the subtopic areas that were previously identified and the items represented are shown below by factor.

Source	Questions
Factor 1: Open Allocation of Breast Pumps	
Staff Survey	Q32 Which type of participants do you think should receive a breast pump from WIC?
Local Interview	Q44. Tell me about the education provided to the WIC mothers on the use of the breast pumps. What information is provided and who does it?
Factor 2: Targeted Allocation of Breast Pumps	
Staff Survey	Q32. Which type of participants do you think should receive a breast pump from WIC? Q31. Having breast pumps available for WIC participants improves the likelihood that they will breastfeed longer.
State Interview	Q17.a What is the State's policy or criteria for providing breast pumps to participants?
Factor 3: Breast Pump Accessibility	
Site Profile	Section F, Q2.a. Breastfeeding supplies onsite: PUMPS
State Interview	Q17.a. What is the State's policy/ criteria for providing breast pumps to participants?
Local Interview	Q43. How do WIC mothers who need breast pumps get access to them?

Education

For the Education composite, principal component analysis was conducted using 18 variables. After careful consideration of 7 variables related to staff knowledge of WIC recommendations for early infant and toddler feeding practices, the study team excluded these from the principal component analysis because there was little variation across sites for these variables. The analyses identified common, underlying themes for two factors: Factor 1: Staff confidence and education methods and Factor 2: Staff training and number of education contacts. These two factors account for 26.8 percent of the variance across sites for which data were available (n=79).

Source	Questions
Factor 1: Staff Confidence and Education Methods	
Staff Survey	Q24. How comfortable are you talking about weight issues with parents/caregivers of overweight WIC toddlers? Q25. How confident are you that you can help WIC infants/toddlers maintain a healthy bodyweight? How confident are you when talking with WIC participants: Q23.a. who do not want to breastfeed? Q23.b. about problems establishing a sufficient milk supply? Q23.c. who lack support from family or friends to breastfeed? Q23.d. about strategies for returning to work? Q23.e. whose doctor's suggested adding formula? Q19.a. about inappropriate formula dilution? Q19.b. about early introduction of solids? Q19.c. about propping the bottle? Q19.d. about food or infant cereal in the bottle? Q19 e. about beverages other than formula or breastmilk in the bottle?
Local Interview	What methods does your staff use to cover these topics: Q16. late prenatal through 6 weeks? Q24. 4 to 8 months? Q32. 11 through 24 months?
Factor 2: Staff Training and Number of Education Contacts	
Local Interview	Q4. Do new employees have to complete a competency-based training program before they can work independently? Q8. Are there any training sessions related to nutrition or breastfeeding that your agency or site provides to your staff beyond those provided by the state?
Staff Survey	Q9 I receive adequate training from the WIC program to help participants with infant and toddler feeding issues.
Local Interview	How many nutrition and breastfeeding education contacts do you plan for the mother and baby, and when do these occur: Q14. for the late prenatal period – the last trimester through 6 weeks postpartum? Q22. for the period between 4 and 8 months? Q30. for the period between 11 through 24 months?

Food Package

Twenty variables were included in the analysis for the Food Package topic area. Sixteen of these were incorporated into three intensity scale variables. After review, one scale variable was omitted from the factor analysis because it did not load on any factor with other variable. The remaining two intensity scale variables plus four other variables not incorporated into the intensity scale variables (total of 6 variables) were used for the analysis. The analyses identified a single factor that accounts for 28 percent of the variance across sites with complete data (n=79) and which is comprised of the six variables examined. The single Food Package Policies and Practices composite variable appears to encompass policy and practices related to both infant and other food packages.

Source	Questions
Food Package Policies and Practices	
State Interview	Q19. Please describe your State's policy for providing formula in the first month (30 days of life) for breastfed infants? Q20. What accommodation has your State made in food selections for cultural or religious dietary practices?
Local Interview	Q42.a. What are your policies and practices when a fully breastfeeding woman says she wants to start some formula for her infant?
Staff Survey	Q13. How do you determine the amount of formula to provide for a partially breastfeeding infant? Q14. I am able to make changes or substitutions to WIC participants' food packages to meet their individual nutritional needs and preferences. Q11. Please tell us how much of an influence you think the WIC foods have on the following participant behaviors: (List of behaviors follows.)

Appendix B3a

Additional Analysis Details from Chapter 2

Appendix B3a

Additional Analysis Details from Chapter 2

B3a.1 Changes in Benefits and Barriers by Race and Ethnicity

Tables B3a-1 and B3a-2 compare how the percentages of women responding positively to benefit and barrier statements have changed by race and ethnicity between WIC IFPS-1 and WIC ITFPS-2. To facilitate comparison over time, we have color coded the relative ranking of responses within each study with rose representing the positive group, followed by teal, followed by green, and with blue representing the least positive group regarding breastfeeding.

As Table B3a-1 shows, in the case of benefits almost all groups are more positive about the benefits of breastfeeding than they were in WIC IFPS-1. Additionally, the relative rankings between racial/ethnic groups have remained generally the same, with Hispanics being the most positive about breastfeeding, followed by those in the “All other races” category, followed by Whites, and with African Americans being the least positive.

Table B3a-1. Percentages of women from WIC IFPS-1 and WIC ITFPS-2 agreeing with benefit

Maternal attitudes and beliefs	Race						Ethnicity	
	African American		White		All Other		Hispanic	
	IFPS-1	ITFPS-2	IFPS-1	ITFPS-2	IFPS-1	ITFPS-2	IFPS-1	ITFPS-2
Breastfeeding helps protect the baby from diseases	64 ^a	74.0 ^a	76 ^b	82.4 ^b	80 ^c	85.0 ^c	93 ^d	87.9 ^d
Breastfed babies are healthier than formula-fed babies	62 ^b	75.4 ^a	51 ^a	78.8 ^b	63 ^c	86.3 ^c	86 ^d	88.5 ^d
Breastfeeding is easier than formula feeding	40 ^a	47.2 ^a	43 ^b	53.4 ^b	63 ^c	68.6 ^d	76 ^d	68.5 ^d
Breastfeeding brings a mother closer to her baby	81 ^b	84.0 ^a	75 ^a	88.4 ^b	96 ^d	90.3 ^c	93 ^c	92.8 ^d
Breastmilk alone gives a new baby all he/she needs to eat	59 ^a	66.9 ^a	69 ^b	71.5 ^b	73 ^c	74.9 ^c	86 ^d	78.0 ^d
Breastfeeding reduces the risk of a child becoming overweight	Not asked ^e	45.0 ^e	Not asked ^e	51.3 ^e	Not asked ^e	51.3 ^e	Not asked ^e	58.0 ^e
Breastfeeding helps women lose weight	42 ^a	73.8 ^a	52 ^b	74.4 ^b	52 ^b	75.3 ^c	70 ^d	78.6 ^d

Color coding provides the relative ranking of responses for each study by racial/ethnic group.

Each study is coded separately:

^aBlue = lowest agreement with statements.

^bGreen = third highest agreement with statements.

^cTeal = second highest agreement with statements.

^dRose = highest agreement with statement.

^eNon-colored cells indicate a lack of comparison group.

Data source: Prenatal interview questions KA18a-f and KA18n.

In contrast, the views about barriers to breastfeeding do not follow a tight pattern by race or ethnicity, as shown in Table B3a-2. Instead, even 17 years ago in WIC IFPS-1, the only dominant pattern by race/ethnicity across the different barriers was that African Americans generally had the highest agreement rate with these statements. Over time, barriers to breastfeeding have lessened for all the racial/ethnic groups and African American no longer have a distinctly different pattern. In general, the changes in relative ranking over time by racial/ethnic group do not follow a systematic pattern.

Table B3a-2. Percentages of women from WIC IFPS-1 and WIC ITFPS-2 agreeing with barrier statements by race and ethnicity

Maternal attitudes and beliefs	Race						Ethnicity	
	African American		White		All Other		Hispanic	
	IFPS-1	ITFPS-2	IFPS-1	ITFPS-2	IFPS-1	ITFPS-2	IFPS-1	ITFPS-2
Breastfeeding ties you down	50 ^a	18.2 ^a	41 ^b	17.5 ^b	37 ^c	16.1 ^c	34 ^d	15.3 ^d
Breastfeeding takes too much time	40 ^a	15.6 ^c	30 ^d	13.8 ^d	32 ^c	16.4 ^b	39 ^b	17.3 ^a
Breastfeeding in public is not something I want to do	68 ^a	39.2 ^a	60 ^b	35.7 ^c	54 ^d	38.2 ^b	55 ^c	35.1 ^d
Breastmilk leaking onto your clothes is something I worry about	61 ^a	34.4 ^a	45 ^b	25.2 ^c	36 ^d	26.6 ^b	36 ^d	23.4 ^d
Breastfeeding is painful	50 ^a	44.4 ^c	32 ^d	41.1 ^d	33 ^c	49.6 ^a	47 ^b	45.6 ^b
<i>Breastfeeding means no one else can feed your baby</i>	64 ^a	55.4 ^c	35 ^d	45.6 ^d	57 ^c	60.7 ^a	58 ^b	60.3 ^b
<i>With bottle feeding, the mother knows that the baby is getting enough to eat</i>	75 ^b	65.0 ^c	75 ^b	68.1 ^a	72 ^d	66.1 ^b	78 ^a	63.6 ^d

Color coding provides the relative ranking of responses for each study by racial/ethnic group.

Each study is coded separately:

^aBlue = highest agreement with statements.

^bGreen = third lowest agreement with statements.

^cTeal = second lowest agreement with statements.

^dRose = lowest agreement with statement.

Data source: Prenatal interview questions KA18g-m.

B3a.2 People Women Seek to Talk to About Breastfeeding

Table B3a-3 displays the percentage of prenatal participants who spoke with various individuals about their infant feeding intentions. Most of them spoke with a husband or boyfriend, more than two-thirds spoke with people at their WIC clinic, and many discussed the issue with their mothers. In contrast, other relatives and friends were least often involved in feeding conversations. Only about half discussed the issue their doctor.

Table B3a-3. Influences on decision to breastfeed or formula feed

Talked to people about breastfeed or formula feed	All prenatal mothers % (SE)
Husband or boyfriend	
Yes	78.2 (1.2)
No/Not Applicable	21.8 (1.2)
Mother	
Yes	61.6 (1.4)
No/Not Applicable	38.4 (1.4)
Other relatives	
Yes	39.0 (1.1)
No/Not Applicable	61.0 (1.1)
Friends	
Yes	40.1 (1.0)
No/Not Applicable	59.9 (1.0)
People at WIC	
Yes	68.0 (1.6)
No/Not Applicable	32.0 (1.6)
Doctor	
Yes	50.7 (1.6)
No/Not Applicable	49.3 (1.6)
Unweighted n^a	2,646
Weighted n	394,894

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

Data source: Prenatal interview questions KA22a-f.

B3a.3 IFI Scale Regression

Table B3a-4 provides IFI regression results. All are significant at the 0.05 level of significance, and all have the expected sign. For parsimony, we collapsed the parity and breastfeeding history variables from three categories to two.

Table B3a-4. Coefficients from regression analysis

Explanatory variable	Coefficient	t-Value
Intercept	2.6723561	3.76
Benefits scale	0.1173651	18.14
Barriers scale	-0.0470397	-6.81
Parity: Second or subsequent born compared to first born	-2.0056575	-8.96
Breastfeeding History: Some history compared to no history	1.6489865	7.24
Education: More than high school compared to high school or less	0.7286793	4.71
Mother living with father of baby	0.7328211	4.54
Spoke with more than one person about infant feeding plans compared to one or less	0.4180955	2.23
R ²	0.3395	
Denominator degrees of freedom for t-test	40	

Appendix B3b

Additional Analysis Details from Chapter 3

Appendix B3b

Additional Analysis Details from Chapter 3

The following tables provide detailed information on estimates used in both the figures in the text and regression results including the standard errors (SE) and the weighted and unweighted sample sizes associated with each calculation. When data from the WIC IFPS-1 were not available cells are shaded gray.

Table B3b-1 shows breastfeeding initiation rates from four sources, including the National Immunization Survey (NIS), the National Health and Nutrition Examination Survey (NHANES), and the Ross Products Division Abbott Laboratories Survey (Ross Mothers Survey). The table also shows the breastfeeding initiation rates for WIC participants using the NIS and the Ross Mothers Survey and low-income women from the PedNSS. PedNSS was a monitoring system focused on the nutritional status of low-income infants and children in federally funded public health programs. While not limited to WIC participants, 87 percent of PedNSS records are from WIC participants. The table displays the WIC IFPS-1 1994 estimate along with the current estimate because this study uses the same methodology to calculate the breastfeeding initiation rates as the WIC IFPS-1.

Because each data series spans a different time period, the table displays the average annual rate of percentage point change for each data source. We use each annual rate of change, in combination with straight line extrapolation, to estimate the change over the full 20-year period between 1994 and 2013 for each source. The extrapolated estimates are shown in cells shaded yellow. Using either the original data or considering the extrapolations, all the sources indicate that both nationally and among WIC women in specific, there has been a notable increase since 1994 in the percentage of women initiating breastfeeding. The extrapolated data suggest that as of 2013 the national breastfeeding initiation rate is between 75 and 86 percent while the rate for WIC women ranges from 64 to 83 percent.

Table B3b-1. Summary of breastfeeding initiation rates from 1994 to 2013 (associated with Figure 3-1)

Instrument	Question	Annual change	Year																			
			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
National population																						
NIS-national ^a	Ever breast-fed	.69	66.8 ^f	67.4 ^f	68.1 ^f	68.8 ^f	69.5 ^f	70.2 ^f	70.9	71.6	71.4	72.6	73.1	74.1	74	75.6	74.6	76.1	76.7	79.2	79.9 ^f	80.6 ^f
NHANES-national ^b	Ever breast-fed	1.31	60	60	60	64	64	67	67	67	67	70	70	77	77	78.3 ^f	79.6 ^f	80.9 ^f	82.2 ^f	83.5 ^f	84.8 ^f	86.1 ^f
Ross Mothers-national ^c	Breast-fed at hospital	.86	57.4	59.7	59.2	62.4	64.3	67.2	68.4	69.5	70.1	66	66.9 ^f	67.7 ^f	68.6 ^f	69.4 ^f	70.3 ^f	71.2 ^f	72.0 ^f	72.9 ^f	73.7 ^f	74.6 ^f
WIC or low-income population																						
NIS-currently receiving WIC ^d	Ever breast-fed	.83	57.0 ^f	57.8 ^f	58.6 ^f	59.4 ^f	60.3 ^f	61.1 ^f	61.9	65.4	65.2	65.1	65.7	67.4	67.1	67.5	No data	68.8	69.2	71.8	72.6 ^f	73.5 ^f
Ross Mothers-WIC ^e	Breast-fed in hospital	1.00	44.3	46.6	46.6	50.4	56.8	56.1	56.8	58.2	58.8	54.3	55.3 ^f	56.3 ^f	57.3 ^f	58.3 ^f	59.3 ^f	60.3 ^f	61.3 ^f	62.3 ^f	63.3 ^f	64.3 ^f
PedNSS Low income	Ever breast-fed	1.51	39.2	41.6	43.7	45.1	47.8	47.8	48.0	50.1	52.5	55.1	56.1	58.5	60.1	59.8	61.7	61.7	63.2	66.3	67.8 ^f	69.3 ^f
WIC IFPS-1- and current study	Initiated breast-feeding	1.37	56	58.7 ^f	60.1 ^f	61.5 ^f	62.8 ^f	64.2 ^f	65.6 ^f	67.0 ^f	68.3 ^f	69.7 ^f	71.1 ^f	72.4 ^f	73.8 ^f	75.2 ^f	76.6 ^f	77.9 ^f	79.3 ^f	80.7 ^f	82.0 ^f	83.4

^a NIS – national indicates national level data from the National Immunization Survey.

^b NHANES – national indicates national level data from the National Health and Nutrition Examination Survey.

^c Ross Mothers – national indicates national level data from the Ross Mothers Survey.

^d NIS – currently receiving WIC indicates data for those receiving WIC benefits from the National Immunization Survey.

^e Ross Mothers – WIC indicates data for those receiving WIC benefits from the Ross Mothers Survey.

^f Numbers in shaded boxes are extrapolated figures based on straight line extrapolation given the average annual percentage point change.

Although the data sources are consistently measured over time, each uses a different definition of breastfeeding initiation as well as different data collection methods. Therefore, caution should be taken when comparing the rates between the different series. The NIS is a telephone survey that targets households with infants 19 to 36 months old and asks women retrospectively about whether they ever breastfed this child.¹ The long recall period likely reduces the number of affirmative responses, which in turn would lower the breastfeeding rate measure. NHANES is an in-person interview that uses the same “ever breastfed” question as the NIS. Ross Mothers is a mail survey administered when the infant is 6 months old and asks mothers to recall the type of milk fed to their infant immediately after birth. The PedNSS used the ever breastfed definition of initiation and calculated rates using existing data from federally funded health programs.

Both the WIC ITFPS-2 estimate of the breastfeeding initiation rate and the WIC IFPS-1 estimate are higher than other sources. There are two likely reasons that the WIC studies, which use the same measurement methodology, produce higher estimates of breastfeeding initiation. First, both studies collected the initiation information shortly after birth.² The short time span between birth and the first postnatal interview increases the likelihood that any breastfeeding attempts were more readily recalled. Moreover, both the WIC IFPS -1 and the WIC ITFPS-2 use multiple questions to determine whether breastfeeding was initiated. In the WIC ITFPS-2, if breastfeeding is indicated by responses to any of the following questions, we categorize the respondent as initiating breastfeeding:

- What was the first thing that the [child] was fed after birth? (1-month interview);
- If the first thing was other than breastmilk, did you start to breastfeed your baby while still in the hospital/birthing center? (1-month interview);
- When you left the hospital/birthing center, were you feeding your baby only breastmilk, only formula, or both breastmilk and formula? (1-month interview);
- Is anyone currently feeding [child] breastmilk either from the breast or from the bottle, formula, or both? (1- and 3-month interviews); and
- Did you ever feed your baby breastmilk, either from the breast or from the bottle? (1- and 3-month interviews).³

¹ A single question about initiation is asked: Was [child] ever breastfed or fed breast milk?

² The WIC ITFPS-2 questions were administered within 2 weeks of the child’s 1-month birthday which was, on average, 23 days after birth, and WIC IFPS-1 questions were administered on average 49 days after the birth of the child.

³ If the baby was in the Neonatal Intensive Care Unit (NICU) the mother is asked an additional sixth question: whether she fed the baby breastmilk while in the NICU.

The questions employed in the WIC IFPS-1 were similar, eliciting information on first feeding, breastfeeding during the week following birth, and breastfeeding status at the time of the first postnatal interview.⁴ Detailed prompting may increase the likelihood of capturing even brief attempts to breastfeed.

Table B3b-2. Percentage of study mothers/infants by select birth experiences (associated with Figure 3-2)

Birth characteristic	Percentage of all infants % (SE)	Unweighted n	Weighted n
Multiples ^a	1.8% (0.4)	3,384	450,229
Premature ^b (birth ≥ 3 weeks before due date)	10.8 (0.8)	3,377	449,306
Infant stayed in NICU ^b	12.0 (0.8)	3,377	449,306
Mother stayed 3 or more nights in hospital	32.1 (1.4)	3,398	452,108
Caesarean delivery	34.1 (1.1)	3,384	442,905
Birth weight^b			
Low (≤ 5 lbs. 9 oz.)	7.4 (0.6)	3,384	442,905
High (≥ 9 lbs. 14 oz.)	1.3 (0.3)	3,384	442,905
Low at-risk (≤ 5 lbs. 8 oz.)	6.6 (0.6)	3,377	449,306
High at-risk (≥ 8 lbs. 13 oz.)	7.2 (0.6)	3,387	449,306

^a n differs from 3,777 due to item nonresponse.

^b For this question, n is limited to mothers who answered the 1-month survey, which is 3,398. n is less than 3,398 due to item nonresponse.

⁴ Baydar et al., 1997, p 52.

Table B3b-3. Percentage of study mothers and infants by number of nights/days^a spent in the hospital^b (associated with Figure 3-3)

Number of days/nights	Percentage of mothers % (SE)		Percentage of infants % (SE)	
	WIC ITFPS-2	WIC IFPS-1	WIC ITFPS-2	WIC IFPS-1
0	0.4% (0.2)	2.7	0.6 (0.2)	3.2
1	16.9 (1.5)	36.1	16.4 (1.5)	33.9
2	50.5 (1.3)	36.5	47.2 (1.4)	34.3
3	22.3 (1.2)	16.1	21.0 (1.1)	14.5
4	6.4 (0.6)	4.8	5.7 (0.6)	4.8
5	1.9 (0.3)	1.9	2.0 (0.3)	3.1
6	0.5 (0.1)	0.9	1.0 (0.2)	1.2
7	0.4 (0.1)	0.3	1.1 (0.2)	1.3
8	0.0 (0.0)	0.2	0.6 (0.2)	0.7
9	0.1 (0.1)	0	0.3 (0.1)	0.4
10	0.1 (0.1)	0.2	0.5 (0.2)	0.5
11	0.0 (0.0)	0.1	0.8 (0.1)	0.5
12 or more	0.4 (0.2)	0.2	3.5 (0.4)	1.5
Unweighted n	3,381	3,376	3,376	873
Weighted n	449,776		449,297	

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

^b Includes birthing centers.

NOTE: Weighted n not available for WIC IFPS-1 data.

Table B3b-4. Among mothers delivering in hospitals^a, the percentage of study infants by type of first feeding and the percentage of study mothers by timing of breastfeeding initiation (associated with Figure 3-4)

Measure	WIC ITFPS-2 % (SE)			WIC IFPS-1 % (SE)	
	% of Infants	Unweighted n	Weighted n	% of Infants	n
First feeding					
Formula	34.2% (1.8)	3,382 ^b	450,056	59.6% (3.0)	815
Breastmilk	61.8 (1.8)	3,382 ^b	450,056	28.8 (2.7)	815
Sugar water	1.4 (0.2)	3,382 ^b	450,056	5.5 (1.0)	815
Plain water	0.2 (0.0)	3,382 ^b	450,056	4.2 (0.8)	815
Something else	1.0 (0.2)	3,382 ^b	450,056	2.0 (0.6)	815
Don't know	1.4 (0.2)	3,382 ^b	450,056	NA	
Timing of breastfeeding initiation	% of Mothers	Unweighted n	Weighted n	% of Mothers	n
While in hospital	79.8 (1.8)	3,384	450,229		
≤ 1 hour after birth	56.8 (1.8)	2,602 ^c	352,747		
> 1 hour after birth	43.2 (1.9)	2,602 ^c	352,747		

^a Includes birthing centers.

^b n is less than 3,384, the number of women giving birth in hospitals or birthing centers, due to item nonresponse.

^c n is limited to those who initiated in the hospital, 2,618. This excludes 21 women who indicated that they tried to pump breastmilk while in the hospital so they were not asked the timing question. n is less than 2,618 due to item nonresponse

NOTE: WIC IFPS-1 did not report timing of breastfeeding initiation.

Table B3b-5. Among study mothers initiating breastfeeding in hospitals^a, the percentage experiencing common breastfeeding problems (associated with Figure 3-5)

Breastfeeding problem	Percentage of study mothers initiating breastfeeding	
	WIC ITFPS-2 % (SE)	WIC IFPS-1 % (SE)
Nipple pain	17.4 (1.0)	46% (3.3)
Unweighted n	2,624	458
Weighted n	355,936	
Breasts too full	24.6 (1.0)	25 (1.6)
Unweighted n	2,624	458
Weighted n	355,936	
Not enough milk	22.0 (1.0)	39 (2.2)
Unweighted n	2,624	458
Weighted n	355,936	
Milk came in late	16.8 (1.0)	24 (2.4)
Unweighted n	2,624	458
Weighted n	355,936	

^a Includes birthing centers.

NOTE: Weighted n not available for WIC IFPS-1 data.

Table B3b-6. Among study mothers experiencing a common breastfeeding problem while in hospitals^a, the percentage that did not receive help from hospital staff by type of problem (associated with Figure 3-6)

Breastfeeding problem	Percentage of study mothers initiating breastfeeding	
	WIC ITFPS-2 % (SE)	WIC IFPS-1 % (SE)
Nipple pain	12.2% (1.8)	29.7% (3.8)
Unweighted n	412	203
Weighted n	61,748	
Breasts too full	9.8 (1.4)	16.9 (4.3)
Unweighted n	654	119
Weighted n	87,615	
Not enough milk	11.0 (1.4)	25.3 (3.5)
Unweighted n	550	172
Weighted n	78,080	
Milk came in late	15.6 (2.0)	23.0 (3.5)
Unweighted n	411	105
Weighted n	59,540	

^a Includes birthing centers.

NOTE: Weighted n not available for WIC IFPS-1 data.

Table B3b-7 reports logistic regression results for breastfeeding initiation. The table reports the value of the coefficients in the regression, their standard errors, and their associated Wald Chi-Square statistics. For parsimony, the education variable was collapsed to two categories: more than high school vs. high school or less.

Table B3b-7. Coefficients from breastfeeding initiation logistic regression analysis (associated with Table 3-7)

Explanatory variable	Coefficient	Standard error	Wald chi-square
Intercept	-2.1804	0.4630	22.1798
Race: Black or African American vs. White	-0.0472	0.2756	0.0294
Race: All Other vs. White	0.4352	0.3088	1.9864
Ethnicity: Hispanic vs. non-Hispanic	0.5460	0.2695	4.1055
Father's residence: Father lives with mother vs. not	0.1713	0.1718	0.9935
Nativity status: Mother born in the U.S. vs. not	0.7965	0.3379	5.5567
Education level: More than high school vs. less	0.0549	0.2224	0.0608
Breastfeeding history: 3 or less months vs. no history	1.6825	0.4324	15.1432
Breastfeeding history: More than 3 months vs. no history	3.1137	0.4312	52.1513
Parity: Second born vs. first born	-0.9131	0.3066	8.8713
Parity: Third or subsequent born vs. firstborn	-1.7322	0.3473	24.8731
Participation in non-WIC Benefit Programs: Participates in SNAP or SNAP and other programs vs. participates in no other programs	-0.4820	0.2587	3.4732
Participation in non-WIC Benefit Programs: Participates in other programs excluding SNAP vs. participates in no other programs	-0.0723	0.2485	0.0846
Father encouraged to breastfeed vs. other	1.2448	0.2562	23.6108
Respondent's mother encouraged breastfeeding vs. other	0.9394	0.2389	15.4613
Other relatives encouraged breastfeeding vs. other	0.8555	0.2813	9.2505
WIC staff called vs. not	0.5169	0.2242	5.3177
Infant's doctor encouraged breastfeeding vs. other	1.1397	0.2218	26.4060
Hospital support for breastfeeding: moderate support vs. weak support	1.3467	0.3097	18.9075
Hospital support for breastfeeding: strong support vs. weak support	2.8081	0.2743	104.7666
Mother smoked during pregnancy: smoked vs. did not smoke	-0.4243	0.3215	1.7410
Mother worked during pregnancy	0.2587	0.1963	1.7366

Table B3b-8 reports logistic regression results for breastfeeding at hospital discharge. The table reports the value of the coefficients, their standard errors, and their Wald Chi-Square statistics.

Table B3b-8. Coefficients from breastfeeding at discharge logistic regression analysis (associated with Table 3-12)

Explanatory variable	Coefficient	Standard error	Wald chi-square
Intercept	1.9755	0.5502	12.8906
Income poverty: > 75% but ≤130% of poverty guideline	0.2780	0.2923	0.9049
Income poverty: above 130% of poverty guideline	1.0002	0.4363	5.2549
Parity: Second born vs. firstborn	-1.2609	0.4957	6.4718
Parity: Third or subsequent born vs. firstborn	-1.7462	0.4385	15.8610
Breastfeeding history: 3months or less vs. none	1.2883	0.4099	9.8789
Breastfeeding history: More than 3 months vs. none	2.3779	0.4670	25.9329
First feeding: Formula vs. breastmilk	-1.1211	0.2886	15.0863
First feeding: something else/don't know vs. breastmilk	-0.2893	0.5141	0.3168
Encouraged by father vs. other	0.5375	0.2512	4.5791
Encouraged by baby's doctor vs. other	0.6372	0.2631	5.8674
WIC staff called vs. not	0.5392	0.2519	4.5828
Infant stayed in room vs. nursery only	0.6584	0.4309	0.1265
Infant stayed both placed vs. nursery only	1.2583	0.6348	0.0475
Experienced breastfeeding problems in hospital	-1.4997	0.2117	<.0001

Table B3b2-9 reports multinomial logistic regression results for breastfeeding at discharge.

Table B3b-9. Coefficients from breastfeeding at discharge multinomial logistic regression analysis

Explanatory variable	Reference group	Coefficient	Standard error	Wald chi-square
Intercept	Feeding breastmilk only at discharge	0.1021	0.5209	0.0384
Intercept	Feeding formula only at discharge	-1.2211	0.5327	5.2543
Income poverty: > 75% but ≤130% of poverty guideline	Feeding breastmilk only at discharge	0.1337	0.1381	0.9374
Income poverty: > 75% but ≤130% of poverty guideline	Feeding formula only at discharge	-0.2294	0.2807	0.6681
Income poverty: above 130% of poverty guideline	Feeding breastmilk only at discharge	0.4887	0.1950	6.2823
Income poverty: above 130% of poverty guideline	Feeding formula only at discharge	-0.7859	0.4254	3.4123
Parity: second born vs. firstborn	Feeding breastmilk only at discharge	-0.5517	0.3488	2.5021
Parity: second born vs. firstborn	Feeding formula only at discharge	1.0626	0.5119	4.3086
Parity: third or subsequent born vs. firstborn	Feeding breastmilk only at discharge	-0.7947	0.2968	7.1708
Parity: third or subsequent born vs. firstborn	Feeding formula only at discharge	1.4719	0.4474	10.8235
Breastfeeding history: three months or less vs. none	Feeding breastmilk only at discharge	0.00272	0.3962	0.0000
Breastfeeding history: three months or less vs. none	Feeding formula only at discharge	-1.2812	0.4175	9.4173
Breastfeeding history: more than three months vs. none	Feeding breastmilk only at discharge	0.6881	0.3192	4.6478
Breastfeeding history: more than three months vs. none	Feeding formula only at discharge	-2.1109	0.4646	20.6399
First feeding: formula vs. breastmilk	Feeding breastmilk only at discharge	-1.9428	0.3330	34.0322
First feeding: formula vs. breastmilk	Feeding formula only at discharge	0.5672	0.2845	3.9743
First feeding: something else/don't know vs. breastmilk	Feeding breastmilk only at discharge	-1.5144	0.6165	6.0336
First feeding: something else/don't know vs. breastmilk	Feeding formula only at discharge	-0.1889	0.5940	0.1011
Encouraged by father vs. other	Feeding breastmilk only at discharge	0.3134	0.1755	3.1897
Encouraged by father vs. other	Feeding formula only at discharge	-0.4305	0.2753	2.4452
Encouraged by baby's doctor vs. other	Feeding breastmilk only at discharge	0.6127	0.1896	10.4422

Table B3b-9. Coefficients from breastfeeding at discharge multinomial logistic regression analysis (continued)

Explanatory variable	Reference group	Coefficient	Standard error	Wald chi-square
Encouraged by baby's doctor vs. other	Feeding formula only at discharge	-0.3772	0.3005	1.5754
WIC staff called vs. not	Feeding breastmilk only at discharge	-0.0474	0.1528	0.0965
WIC staff called vs. not	Feeding formula only at discharge	-0.5662	0.2365	5.7309
Infant stayed in room vs. nursery only	Feeding breastmilk only at discharge	0.3102	0.4757	0.4252
Infant stayed in room vs. nursery only	Feeding formula only at discharge	-0.5207	0.4253	1.4989
Infant stayed both placed vs. nursery only	Feeding breastmilk only at discharge	0.3601	0.4734	0.5788
Infant stayed both placed vs. nursery only	Feeding formula only at discharge	-1.1200	0.6254	3.2077
Experienced breastfeeding problems in hospital	Feeding breastmilk only at discharge	-0.8640	0.1266	46.5953
Experienced breastfeeding problems in hospital	Feeding formula only at discharge	1.1655	0.2123	30.1449

Appendix B3c

Additional Analysis Details from Chapter 4

Appendix B3c

Additional Analysis Details from Chapter 4

The tables in this appendix provide detailed information on estimates used in both the figures in the text and regression results including the standard errors (SE) and the weighted and unweighted sample sizes associated with each calculation. Except for Table B3c-1, all subsequent tables are ordered according to when the information appears in the chapter.

Table B3c-1 presents breastfeeding rates at six month post-partum from WIC ITFPS-2 and the previous study as compared to multiple external data sources on national and WIC specific breastfeeding rates. The table shows the breastfeeding rates for WIC participants using the National Immunization Survey (NIS; which we use as the primary benchmark in the main text), the Ross Products Division Abbott Laboratories Survey (Ross Mothers Survey), and low-income women from the Pediatric Nutrition Surveillance System (PedNSS).¹ These sources provide broad context for current findings. Although the estimated rates differ among these data sources, they all show a large trend increase in the breastfeeding rate at 6-month. The WIC IFPS-1 and WIC ITFPS-2 are shown together as these studies use the same methodology to calculate the breastfeeding initiation rates permitting trend calculations.

Because each data series spans a different time period, the table displays the average annual rate of percentage point change for each data source. We use each annual rate of change, in combination with straight line extrapolation, to estimate the change over the full 20-year period between 1994 and 2013 for each source. The extrapolated estimates are shown in shaded cells on Table B3c-1. As the table shows, the current national breastfeeding rates at 6 months are notably higher than the rates for lower-income mothers. Nonetheless, using either the original data or considering the extrapolations, all sources indicate that both nationally and among WIC mothers, there has been a notable increase since 1994 in the breastfeeding rate at 6 months. The extrapolated data suggest that our finding that 31 percent of study mothers are breastfeeding at 6 months post-partum falls between the range of estimates from the other data sources for low income women.

¹ PedNSS was a monitoring system focused on the nutritional status of low-income infants and children in federally funded public health programs.

Table B3c-1. Breastfeeding rates at six months post-partum over time from multiple data sources (associated with Figure 4-2)

Instrument	Question	Annual change	Year																			
			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
National Population																						
NIS-national ^a	At 6 m	1.38	26.6°	27.9°	29.1°	30.4°	31.7°	32.9°	34.2	36.9	37.6	39.1	42.1	42.9	43.5	43.0	44.4	46.6	47.5	49.4	50.7°	51.9°
Ross Mothers-national ^b	At 6 m	1.46	19.7	21.6	21.7	26.0	28.6	30.7	31.4	32.5	33.2	32.8	34.1°	35.4°	36.7°	38.0°	39.4°	40.6°	42.0°	43.3°	44.6°	45.9°
WIC or Low-Income Population																						
NIS-currently receiving WIC ^c	At 6 m	1.24	17.3°	18.4°	19.5°	20.7°	21.8°	22.7°	24.1	29.7	29.9	29.6	33.5	33.9	33.7	33.7	NA	36.4	36.5	37.8	38.9°	40.1°
Ross Mothers-WIC ^d	At 6 m	1.31	11.6	12.7	12.9	16.5	18.9	19.9	20.1	20.8	22.1	NA	24.4°	25.6°	26.8°	28.0°	29.1°	30.3°	31.5°	32.6°	33.8°	35.0°
PedNSS Low income	At 6 m	0.66	14.7	16.0	15.6	16.8	18.1	18.6	19.7	21.5	20.7	23.4	23.4	24.3	25.2	25.4	26.6	27.0	25.1	26.0	26.6	27.3
WIC IFPS-1 – and WIC ITFPS-2	At 6 m	0.91	14.2	15.1°	16.0°	16.9°	17.8°	18.7°	19.6°	20.5°	21.4°	22.3°	23.2°	24.2°	25.1°	26.0°	26.9°	27.8°	28.7°	29.6°	30.5°	31.4

^a NIS – national indicates national level data from the National Immunization Survey.^b Ross Mothers – national indicates national level data from the Ross Products Division Abbott Laboratories Survey (Ross Mothers Survey).^c NIS – currently receiving WIC indicates data for those receiving WIC benefits from the National Immunization Survey.^d Ross Mothers – WIC indicates data for those receiving WIC benefits from the Ross Mothers Survey.^e Numbers in shaded boxes are extrapolated figures based on straight line extrapolation given the average annual percentage point change.

Tables B3c-2 to B3c-9 provide additional information (e.g., standard errors and sample sizes) associated with figures and tables in the body of the report. For each table, we list the table or figure in the body of the report to which it corresponds.

Table B3c-2. Breastfeeding rates of study mothers, months 1-7 (associated with Figure 4-1)

Feeding practice by interview month	WIC ITFPS-2 % (SE)	WIC IFPS-1 % (SE)
Month 1 Interview		
Exclusive breastfeeding	30.3% (1.4)	13.0% (1.9)
Exclusive formula feeding	39.0 (1.7)	65.3 (2.5)
Combination feeding	30.7 (1.5)	20.2 (2.4)
Unweighted n	3,395	577
Weighted n	451,699	
Month 3 Interview		
Exclusive breastfeeding	19.8 (1.3)	8.9 (1.5)
Exclusive formula feeding	58.3 (1.5)	78.9 (1.9)
Combination feeding	21.9 (1.6)	11.5 (1.7)
Unweighted n	2,788	755
Weighted n	442,248	
Month 5 Interview		
Exclusive breastfeeding	15.9 (1.2)	7.1 (1.4)
Exclusive formula feeding	68.4 (1.4)	83.3 (1.7)
Combination feeding	15.7 (1.2)	8.8 (1.3)
Unweighted n	2,615	819
Weighted n	442,754	
Month 7 Interview		
Exclusive breastfeeding	14.5 (1.0)	5.7 (1.0)
Exclusive formula feeding	72.7 (1.2)	85.8 (1.8)
Combination feeding	11.6 (1.0)	5.4 (1.1)
Neither breastmilk nor formula	1.2 (0.2)	1.7 (0.6)
Unweighted n	3,134	827
Weighted n	442,719	

Data source 1-month through 7-month interviews, CF1.

NOTE: Weighted n not available for WIC IFPS-1 data, months 1-7.

Table B3c-3. Breastfeeding rates by selected socio-demographic variables for interview months 1 through 7, WIC ITFPS-2 and WIC IFPS-1 (associated with Figures 4-4 through 4-7)

Interview month and socio-demographic characteristic	WIC ITFPS-2						WIC IFPS-1 ^c				
	Percentage of study mothers by infant diet				Un–weighted n	Weighted n	Percentage of study mothers by infant diet				Un–weighted n
	Only breast-milk	Only formula	Both breast-milk and formula	Neither breast-milk nor formula			Only breast-milk	Only formula	Both breast-milk and formula	Neither breast-milk nor formula	
Month 1											
Race											
African American or black	26.0%	45.0%	29.0%	NA	872	94,576	3.2%	82.0%	14.3%	0.5%	125
White	32.1	39.8	28.1	NA	1991	69,259	14.5	66.7	16.8	2.0	295
Other	29.5	30.3	40.2	NA	532	87,864	34.4	53.0	12.6	0.0	32
Ethnicity											
Hispanic ^a	29.1	31.8	39.1	NA	1,311	213,429	14.7	50.7	33.2	1.4	125
Non-Hispanic	31.4	45.5	23.1	NA	2,084	238,271	NA	NA	NA	NA	NA
Age											
16-19 ^b	23.5	44.7	31.8	NA	396	55,684	8.5	81.7	9.3	0.5	135
20-25	33.2	41.1	25.7	NA	1,412	179,584	14.4	60.6	23.0	2.0	247
26 or older	29.7	35.8	34.5	NA	1,587	216,468	14.8	58.9	24.9	1.4	195
Month 3											
Race											
African American or black	13.7	65.4	20.8	NA	631	94,079	3.5	91.8	4.3	0.4	167
White	22.1	58.0	19.8	NA	1,991	269,259	8.3	82.1	8.7	0.9	392
Other	19.4	51.2	29.4	NA	532	87,864	10.9	69.1	20.0	0.0	42
Ethnicity											
Hispanic ^a	19.2	52.4	28.4	NA	1,117	206,982	15.2	61.0	23.1	0.7	154
Non-Hispanic	20.3	63.5	16.2	NA	1,671	235,266	NA	NA	NA	NA	NA
Age											
16-19 ^b	11.5	72.7	15.8	NA	316	50,549	5.5	89.4	4.4	0.7	175
20-25	19.2	60.7	20.1	NA	1,149	175,396	8.8	78.2	12.4	0.6	332
26 or older	22.2	52.9	24.9	NA	1,323	216,303	11.7	71.8	15.6	0.9	248

Table B3c-3. Breastfeeding rates by selected socio-demographic variables for interview months 1 through 7, WIC ITFPS-2nd WIC IFPS-1 (associated with Figures 4-4 through 4-7) (continued)

Interview month and socio-demographic characteristic	WIC ITFPS-2						WIC IFPS-1 ^c				
	Percentage of study mothers by infant diet				Un-weighted n	Weighted n	Percentage of study mothers by infant diet				Un-weighted n
	Only breast-milk	Only formula	Both breast-milk and formula	Neither breast-milk nor formula			Only breast-milk	Only formula	Both breast-milk and formula	Neither breast-milk nor formula	
Month 5											
Race											
African American or black	9.0	76.3	14.6	NA	597	95,509					
White	17.9	67.1	15.0	NA	1,600	263,508					
Other	17.3	63.5	19.3	NA	418	83,737					
Ethnicity											
Hispanic ^a	16.2	64.3	19.5	NA	1,053	205,701					
Non-Hispanic	15.6	72	12.5	NA	1,562	237,053					
Age											
16-19 ^b	10.2	80.6	9.2	NA	297	49,784					
20-25	15	73	11.9	NA	1,063	175,005					
26 or older	17.8	61.9	20.3	NA	1,255	217,965					
Month 7											
Race											
African American or black	7.2	80.3	10.6	1.9	814	94,318					
White	15.8	72.2	11.0	1.0	1,848	261,978					
Other	18.7	65.6	14.5	1.1	472	86,422					
Ethnicity											
Hispanic ^a	13.8	70.7	14.6	1.0	1,208	206,135					
Non-Hispanic	15.2	74.4	8.9	1.4	1,926	236,583					
Age											
16-19 ^b	7.8	84.2	6.9	1.1	363	53,823					
20-25	14.8	75.4	8.2	1.6	1,279	175,211					
26 or older	16.1	67.5	15.5	0.9	1,492	213,685					

^a In WIC IFPS-1, ethnicity is asked in the same question as race. In WIC ITFPS-2, ethnicity is asked in a separate question.^b In WIC IFPS-1, age range is from 14-19.^c Data on infant diet by socio-demographic characteristics were not published in the final WIC IFPS-1 Report.

Data Source: 1-month through 7-month interviews, CF1.

The range of estimates for lower-income women is sizable, but, in large part, it likely reflects differences in survey methodologies. As discussed in the chapter, the NIS is a telephone survey that relies on a lengthy recall period. It asks, “How old was [child’s name] when [child’s name] completely stopped breastfeeding or being fed breastmilk?” Given a recall period of up to 35 months, a respondent may not recall the exact date that an infant in her home completely stopped breastfeeding. Some likely estimate using common milestone, e.g., 3 months, 6 months, or 12 months, which would inflate estimates at these milestones. The Ross Mothers survey is a monthly mail survey that asks mothers what type of milk their babies receive and provides options including breastmilk. Response rates for mail surveys can be low, making estimates less precise.

Table B3c-4. Percentage of WIC staff with certain education (associated with Figure 4-12)

Education level	Percentage of WIC staff	
	All respondents	Excluding administrative staff ^a
Some high school or less	0.38%	0.36%
High school graduate/GED	16.48	11.57
Some college	25.03	18.99
Associated degree (AA)	12.70	11.57
Bachelor's degree (BA/BS)	36.60	45.75
Master's degree (MA/MS/MPH)	8.18	10.85
Doctorate degree (PhD/MD/JD)	0.63	0.90
Unweighted n	795	553

^a Identified their role as support staff/clerk/receptionist/screener.

Table B3c-5. Percentage of study mothers adding other foods or liquids to formula or breastmilk beverages (associated with Figure 4-13)

Interview month	Percentage of study mothers adding other foods or liquids to breastmilk or formula % (SE)	Percentage of study mothers adding other foods or liquids to breastmilk % (SE)	Percentage of study mothers adding other foods or liquids to formula % (SE)
Month 1	2.7% (0.4)	0.5% (0.1)	2.3% (0.4)
Unweighted n	3,395	3,395	3,395
Weighted n	451,699	451,699	451,699
Month 3	9.7 (1.1)	0.3 (0.1)	9.5 (1.0)
Unweighted n	2,788	2,788	2,788
Weighted n	442,248	442,248	442,248
Month 5	22.1 (1.7)	0.8 (0.2)	21.4 (1.7)
Unweighted n	2,615	2,615	2,615
Weighted n	442,754	442,754	442,754
Month 7	26.2 (1.7)	0.6 (0.2)	25.8 (1.7)
Unweighted n ^a	3,087	3,087	3,087
Weighted n	437,320	437,320	437,320

^a n is the number of study infants consuming breastmilk or formula.

Data source: AMPM data.

Table B3c-6. Percentage of breastfeeding study mothers and all study mothers by employment status (associated with Figure 4-16)

Work status	Month 3	Month 7
Percentage of breastfeeding study mothers		
Full-time	13.0 (1.3)	15.0 (1.9)
Part-time	14.2 (1.7)	19.3 (2.1)
Not employed	72.8 (2.5)	65.7 (2.8)
Unweighted n	1,121	803
Weighted n	184,525	115,541
Percentage of all study mothers		
Full-time	15.9 (0.8)	20.0 (1.0)
Part-time	14.4 (0.9)	19.5 (1.0)
Not employed	69.8 (1.4)	60.5 (1.6)
Unweighted n	2,785	3,122
Weighted n	441,648	441,766

Data source: 3-month and 7-month interviews, Question SD29.

Table B3c-7. Among breastfeeding study mothers, the percentage encountering barriers by type each interview month (associated with Table 4-10)

Breastfeeding barrier	Percentage of breastfeeding study mothers % (se)		
	Month 1	Month 3	Month 5
Had to return to work or school	2.2% (0.4)	12.5% (1.4)	11.5% (1.4)
Breastfeeding took too much out of me	8.3 (0.9)	8.6 (1.0)	4.2 (0.7)
Not enough time to breastfeed	5.1 (0.6)	10.3 (1.0)	0.0
Felt tied down by breastfeeding	10.8 (0.7)	12.0 (0.9)	8.0 (1.0)
Husband/Boyfriend did not support breastfeeding	0.6 (0.2)	0.0 (0.1)	1.0 (0.2)
Unweighted n	2,027	1,119	801
Weighted n	275,390	184,223	139,564

Data source: 1-, 3-, and 5-month interviews, Question CF4a-e.

Table B3c-8. Percentage of study mothers by feeding practice and WIC participation status each interview month (associated with Table 4-12)

WIC participation status	Feeding practice	WIC mothers % (SE)
Month 1		
Currently on WIC	Exclusive breastfeeding	29.9% (1.5)
	Exclusive formula feeding	39.3 (1.7)
	Combination feeding	30.8 (1.5)
	Unweighted n	3,257
	Weighted n	435,883
Currently not on WIC	Exclusive breastfeeding	44.5 (6.1)
	Exclusive formula feeding	30.6 (5.4)
	Combination feeding	24.9 (5.5)
	Unweighted n	134
	Weighted n	15,341
Month 3		
Currently on WIC	Exclusive breastfeeding	19.0 (1.3)
	Exclusive formula feeding	59.0 (1.6)
	Combination feeding	22.0 (1.6)
	Unweighted n	2,690
	Weighted n	427,019
Currently not on WIC	Exclusive breastfeeding	40.7 (5.2)
	Exclusive formula feeding	39.7 (4.2)
	Combination feeding	19.6 (4.2)
	Unweighted n	96
	Weighted n	15,036
Month 5		
Currently on WIC	Exclusive breastfeeding	15.3 (1.1)
	Exclusive formula feeding	69.2 (1.5)
	Combination feeding	15.5 (1.3)
	Unweighted n	2,504
	Weighted n	424,362
Currently not on WIC	Exclusive breastfeeding	28.2 (4.7)
	Exclusive formula feeding	49.4 (6.2)
	Combination feeding	22.4 (4.5)
	Unweighted n	111
	Weighted n	18,391
Month 7		
Currently on WIC	Exclusive breastfeeding	14.1 (1.1)
	Exclusive formula feeding	73.4 (1.2)
	Combination feeding	11.3 (1.0)
	Neither breastmilk nor formula	1.2 (0.2)
	Unweighted n	2,979
	Weighted n	420,537
Currently not on WIC	Exclusive breastfeeding	24.0 (4.3)
	Exclusive formula feeding	57.8 (6.2)
	Combination feeding	17.5 (3.8)
	Neither breastmilk nor formula	0.7 (0.7)
	Unweighted n	153
	Weighted n	21,913

Data source: 1-month through 7-month interviews, CF1.

Table B3c-9 contains more details on survival analysis results reported in the text including the p-value, and the hazard ratio. The p-value is a measure of statistical significance and with values less than .05 we can be 95- percent confident that the variable affects the time until formula supplementation. The hazard ratio reflects the direction and magnitude of the impact of the variables. The hazard rate measures the expected probability of formula supplementation of one subgroup relative to another subgroup. A hazard ratio of 1 means there is no difference in the relative probability of formula supplementation between subgroups while a hazard ratio greater than 1 means the probability of supplementation for the first group (e.g., African Americans) is more than (41% more) for the other subgroup (e.g., whites). Similarly, a hazard ratio below 1 means the probability of formula supplementation for the first group is lower than it is for the second group.

Table B3c-9. Results from survival analysis of time until formula supplementation

Parameter	p-Value	Hazard ratio
Race: African American vs. white	0.0003	1.405
Race: other vs. white	0.5834	1.071
Ethnicity: Hispanic vs. non-Hispanic	0.0029	1.331
Age of mother at birth: 16-19 years vs. 26+	0.0474	1.229
Age of mother at birth: 20-25 years vs. 26+	0.4629	0.951
Nativity status: non-native vs. native	0.0052	1.310
Parity: second or subsequent born vs. first born	0.8764	1.027
Early breastfeeding problem: reported problem vs did not report a problem	0.0772	1.250
Early breastfeeding problem: not applicable vs. did not have a problem	<.0001	4.381
Encouraged to breastfeed by father	0.2343	0.905
Encouraged to breastfeed by respondent's mother	0.3741	0.937
Breastfeeding history: some history vs. no history	0.7228	1.058
Hospital stay: 3 or more nights vs. 2 or less nights	0.0097	1.166
Aware of food package vs. not aware	0.0947	1.106
Aware of food package: not applicable vs. not aware	0.6487	0.915
Education level: more than high school vs. less than high school	0.0436	0.846
Employment status at 7 month: employed vs. not employed	0.0034	1.287

Appendix B3d

Additional Analysis Details from Chapter 5

Appendix B3d

Additional Analysis Details from Chapter 5

Table B3d-1 contains details on survival analysis results reported in the text including the p-value, and the hazard ratio. The p-value is a measure of statistical significance. Values of $p < .05$ exceed the 95 percent confidence level threshold that the variable affects the likelihood of ceasing to breastfeed prior to 13 months. The hazard ratio reflects the direction and magnitude of the impact of the variables. The hazard rate measures the expected probability of breastfeeding cessation of one subgroup relative to another subgroup. A hazard ratio of 1 means there is no difference in the relative probability of breastfeeding cessation between subgroups while a hazard ratio greater than 1 means the probability of cessation is greater for the listed group than the comparison group. Similarly, a hazard ratio below 1 means the probability of cessation for the listed group is lower than it is for the comparison group.

Table B3d-1. Results from survival analysis of likelihood of breastfeeding cessation prior to 13 months (associated with Table 5-7)

Parameter	P-Value	Hazard ratio
Race: Black or African American vs. white	0.1451	1.105
Race: All other vs. white	0.3345	0.908
Ethnicity: Hispanic vs. non-Hispanic	0.4647	1.062
Parity: second born vs. first born	0.4773	1.226
Parity: third or subsequent born vs. first born	0.6092	1.186
Nativity status: Mother not born in the US	0.0035	0.790
Maternal age at birth	0.0111	0.981
Marital status: Married vs. not married	<.0001	0.678
Income poverty: Above 75 % of guideline but no more than 130% of guideline vs. at or below 75% of guideline	0.2739	0.930
Income poverty: above 130% of guideline vs. at or below 75% of guideline	0.0280	0.750
Prior breastfeeding experience: has prior experience	0.6076	0.849
Encouraged to breastfeed by relative	0.1085	0.829
Encouraged to breastfeed by infant's doctor	<.0001	0.692
Ever used regular, non-parental childcare in 13 months	0.2613	1.093
Ever combination fed	0.0212	0.805
Received a breast pump from WIC	<.0001	0.531
Ever off WIC within 13 months	0.0185	0.808

Tables B3d-2 to B3d-4 contain details on survival analysis results for the likelihood of introducing infant cereal, fruits, and vegetables within the first 13 months of life. Again, the p-value is a measure of statistical significance. Values of $p < .05$ exceed the 95 percent confidence level threshold that the variable affects the likelihood of introducing the food within the first 13 months of life. The hazard ratio reflects the direction and magnitude of the impact of the variables: values greater than 1 indicate increased likelihood of introducing the food for the subgroup relative to the comparison group, and values less than 1 indicate decreased likelihood for the subgroup relative to the comparison group.

Table B3d-2. Results from survival analysis of likelihood of cereal introduction within the first 13 months (associated with Table 5-10)

Parameter	P-Value	Hazard ratio
Race: Black or African American vs. White	0.6019	1.038
Race: All other vs. White	0.4393	0.927
Ethnicity: Hispanic vs. non-Hispanic	0.0006	0.733
Parity: second born relative to first	0.0882	0.872
Parity: third or subsequent born relative to first	0.0191	0.856
Nativity status: not born in the US	<.0001	0.655
Maternal age at birth	0.8921	0.999
Income poverty: Above 75 % of guideline but no more than 130% of guideline vs. at or below 75% of guideline	0.6083	1.040
Income poverty: above 130% of guideline vs. at or below 75% of guideline	0.6569	0.954
Ever combination fed	0.0005	1.232
Received from WIC information on when to begin cereal or other foods	0.5534	0.974
Ever used regular, non-parental childcare in 13 months	0.1216	1.113
Father lives with in household with infant	0.2781	1.071

Table B3d-3. Results from survival analysis of likelihood of fruit introduction within the first 13 months (associated with Table 5-11)

Parameter	P-Value	Hazard ratio
Race: Black or African American vs. White	0.0960	0.866
Race: All other vs. White	0.2757	0.929
Ethnicity: Hispanic vs. non-Hispanic	0.0031	0.809
Parity: second born relative to first	0.0109	0.817
Parity: third or subsequent born relative to first	0.0631	0.888
Nativity status: not born in the US	0.0008	0.775
Maternal age at birth	0.7148	0.998
Income poverty: Above 75 % of guideline but no more than 130% of guideline vs. at or below 75% of guideline	0.2139	1.101
Income poverty: above 130% of guideline vs. at or below 75% of guideline	0.9486	0.994
Ever combination fed	0.2285	1.058
Received from WIC information on when to begin cereal or other foods	0.4154	0.960
Ever used regular, non-parental childcare in 13 months	0.0058	1.188
Father lives with in household with infant	0.0317	1.148

Table B3d-4. Results from survival analysis of likelihood of vegetable introduction within the first 13 months (associated with Table 5-12)

Parameter	P-Value	Hazard ratio
Race: Black or African American vs. White	0.0299	0.854
Race: All other vs. White	0.2906	0.925
Ethnicity: Hispanic vs. non-Hispanic	0.0194	0.837
Parity: second born relative to first	0.0723	0.869
Parity: third or subsequent born relative to first	0.0371	0.878
Nativity status: not born in the US	0.0002	0.733
Maternal age at birth	0.3616	0.996
Income poverty: Above 75 % of guideline but no more than 130% of guideline vs. at or below 75% of guideline	0.1346	1.124
Income poverty: above 130% of guideline vs. at or below 75% of guideline	0.3835	1.068
Ever combination fed	0.0460	1.118
Received from WIC information on when to begin cereal or other foods	0.2694	0.951
Ever used regular, non-parental childcare in 13 months	0.0142	1.152
Father lives with in household with infant	0.0021	1.180