

WIC Infant and Toddler Feeding Practices Study-2: Second Year Report

Executive Summary

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Human subjects' protections for the study are overseen by 17 Institutional Review Boards (IRBs), including: Westat; state Department of Health IRBs in CA, CT, FL, GA, LA, MD, MI, NY, OH, OK, PA, SC, TN, and TX; and local IRBs at Arrowhead Regional Medical Center in San Bernadino, CA, and Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center, CA. We appreciate the effort these IRBs have made in overseeing human subjects' protections. We also appreciate the cooperation of all participating State Departments of Health in providing WIC administrative data for the study. Use of these data does not imply that the IRBs, State Departments of Health, or WIC State Agencies and sites agree or disagree with any presentations, analyses, interpretations or conclusions in this report.

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WIC ITFPS-2 Second Year Report Executive Summary

Key Findings:

- **WIC mothers are returning to school and work, and many are continuing to breastfeed while working.** By 7 months postpartum 48 percent of mothers are in school, working for pay, or both, and by 24 months it rises to 56 percent. By 7 months, significantly fewer full-time employed mothers are breastfeeding (20 percent) than are those who are not employed (28 percent). Mothers who work full-time and breastfeed also have a shorter median duration of breastfeeding (60 days) than those employed part-time (79 days), and then those not employed (91 days).
- **WIC children are making expected developmental progressions in self-feeding.** At 13 months, 97 percent of WIC children are picking up food with their fingers to self-feed, and 47 percent are no longer drinking anything from a bottle. At 18 months, 66 percent of WIC children are feeding themselves with a spoon.
- **WIC children are consuming a varied diet as they move through the second year of life,** including fruits, vegetables, dairy, and meats and other proteins. They are also, however, increasing their consumption of desserts, candy, sugar-sweetened beverages, and salty snacks.
- **WIC children have median nutrient intake levels that mostly meet or exceed recommended levels through the first 2 years of life.** Vitamin D is a notable exception, falling below recommended levels at all ages. Iron and zinc intake, which are nutrients of particular concern for infants and young children, each have estimated prevalence of inadequate intake below 20 percent during the first year of life, and below 5 percent during the second year of life.
- **There is an increasing trend in the prevalence of high weight-for-length status** in WIC children over the first 2 years of life. In early infancy, about 16 percent of WIC infants are high weight-for-length by World Health Organization standards, and this statistic rises to about 23 percent around the time of the second birthday. Although this trend is consistent with other research on WIC and low-income children, it is nonetheless concerning and warrants future tracking.

Overview of Study Goals and Methods

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

¹ U.S. Department of Agriculture, Food and Nutrition Service. (n.d.). *About WIC's Mission*. Retrieved from <http://www.fns.usda.gov/wic/about-wic-wics-mission> on September 27, 2017.

This report describes feeding practices, nutrition, and weight status of WIC children through age 2 years as a part of the longitudinal WIC Infant and Toddler Feeding Practices Study (WIC ITFPS-2). By capturing data on WIC caregivers² and their children over the first 5 years of the child's life, the study will inform a series of research questions regarding feeding practices, the associations between WIC services and those practices, and the health and nutrition outcomes of children on WIC. The study will update past analyses to assess changes in behaviors and trends that may have occurred in the WIC population over the past 20+ years—that is since WIC Infant Feeding Practices Study-1 (WIC IFPS-1), the last major study of the diets of infants and toddlers who were WIC participants. Additionally, the study will draw comparisons to other national infant and toddler feeding studies that include both WIC and non-WIC participants.

WIC ITFPS-2 incorporates a core longitudinal sample (with up to 17 caregiver interviews occurring over the course of 60 months) and a supplemental sample with less frequent interviews to ensure cross-sectional precision in estimates at key points in time. Study mothers are recruited in person as they enrolled in WIC during the summer or fall of 2013 (either prenatally or before their infant was 2.5 months old). They are recruited from 80 WIC sites across 27 states and territories nationwide. Interviews are conducted by telephone in English or Spanish. In addition, the study team periodically obtains data on food package prescriptions from WIC administrative records, and data on child weight and length from WIC administrative records or from child health care providers. The study also collects data from WIC site staff using a web survey, and from State and local agencies staff using a mix of in-person and telephone interviews. This report on the second year of life uses data from the 1-, 3-, 5-, 7-, 9-, 11-, 13-, 15-, 18-, and 24-month interviews, as well as from WIC administrative data and child health care providers.

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

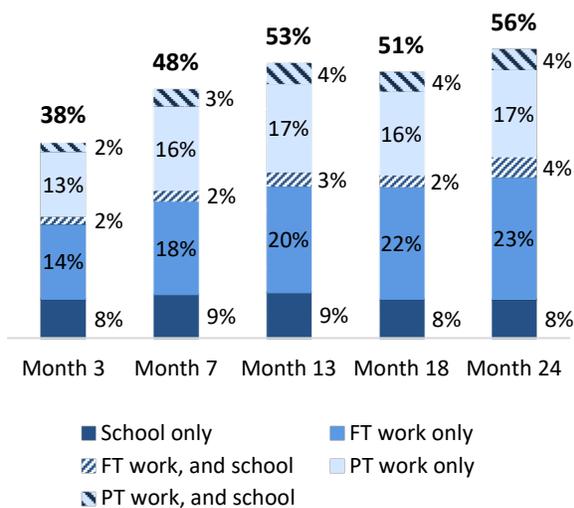
² Over 98 percent of respondents are biological mothers. Throughout the report the terms “mother” and “caregiver” are used interchangeably.

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

Work, School, Child Care, and Breastfeeding

At the time of the 3-month interview, 38 percent of WIC ITFPS-2 mothers are working for pay, going to school, or both. By 24 months, that number rises to 56 percent. At 3 months about 30 percent of WIC ITFPS-2 mothers report working for pay, and at 24 months, nearly half (48%) of the mothers are employed. Figure 1 presents the total percentage of caregivers in school, working full-time (FT) and part-time (PT), or in school while working. There is a subtle shift toward FT employment during later infancy and the second year of life: 52 percent of those who report working for pay work FT at 3 months, and 57 percent of those who report working for pay work FT at 24 months.

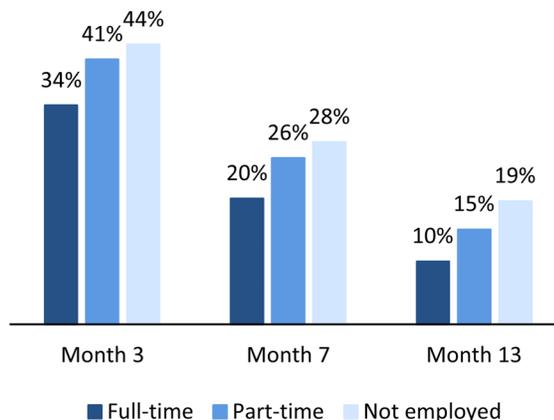
Figure 1 The percentage of WIC ITFPS-2



Work and Breastfeeding

Many WIC women who return to work continue to breastfeed their infants, despite the challenges that working may present for breastfeeding. Figure 2 shows breastfeeding rates by employment status for interview months 3, 7, and 13. Among FT employed caregivers, 34 percent are breastfeeding (either partially or fully⁴) at 3 months; 20 percent are breastfeeding at 7 months; and, 10 percent are breastfeeding at 13 months. A similar pattern of decline in breastfeeding

Figure 2. Breastfeeding rates by employment status groups (Months 3, 7, and 13)

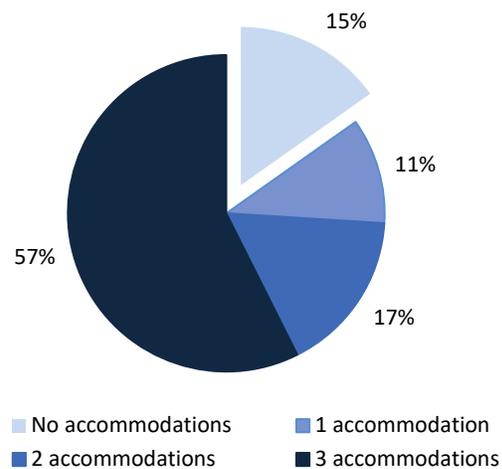


⁴ Fully breastfeeding is defined in the current study as feeding breastmilk, but not infant formula. Fully breastfeeding mothers may be feeding other complementary foods or beverages, including water.

rates is evident among those working PT, and among those not employed. Level of workplace support for breastfeeding women may facilitate or hinder breastfeeding. The Affordable Care Act specifies three types of accommodations that most⁵ workplaces should provide to breastfeeding women: reasonable break time to pump, a private space other than a bathroom for pumping, and a reasonable place to store pumped milk.⁶ Among employed, breastfeeding WIC ITFPS-2 mothers, 76 percent of employed breastfeeding mothers report that their employers allow reasonable breaks to pump milk. Seventy percent indicate that their workplace provides a private space to pump that is not a bathroom, and 69 percent indicate that their employer provides a reasonable place to store pumped milk.

Figure 3 shows how many of these three accommodations breastfeeding WIC ITFPS-2 mothers reported having available at their workplaces. In total, 85 percent of the employed breastfeeding women reported at least one workplace accommodation, and 57 percent reported having all three accommodations available. Nonetheless, a notable minority of working women who are breastfeeding (15%) report no accommodations at work for breastfeeding.

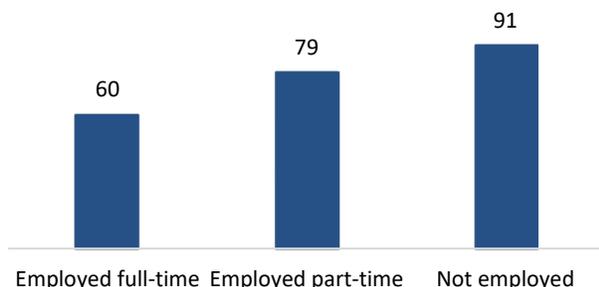
Figure 3. Number of workplace accommodations reported by employed, breastfeeding mothers



⁵ U.S. Department of Labor, Wage and Hour Division. (n.d.). *Break Time for Nursing Mothers*. Retrieved from <https://www.dol.gov/whd/nursingmothers/> on September 27, 2017.

⁶ The term “reasonable” is not defined in the legislation.

Figure 4. Among breastfeeding women, median breast-feeding duration in days, by employment status

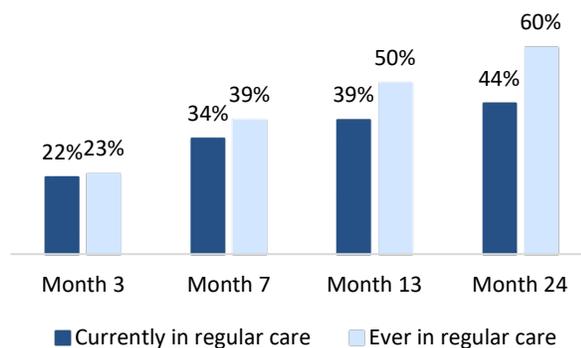


Employment status is also associated with breastfeeding duration. As shown in Figure 4, among mothers who initiated breastfeeding, median breastfeeding duration is 60 days for mothers employed FT, 79 days for mothers employed PT, and 91 days for those not employed. Women employed FT have significantly shorter breastfeeding durations than those employed PT or those not working.

Child Care and Feeding Practices

Regular child care is defined for WIC ITFPS-2 as an arrangement in which someone other than the child’s primary caregiver or the other parent cares for the child on a regular basis. Figure 5 presents the percentage of study children currently in regular child care, and the percentage who have ever been in regular child care, by month. The percentage currently in regular care is 22 percent at 3 months, and rises to 44 percent by 24 months.

Figure 5. The percentage of study children in regular child care, currently and ever, by month



At 3 months, significantly fewer infants in regular care are being breastfed (37%), as compared to children not in regular care (43%). By 13 months, these drop to 12 percent and 18 percent, respectively, which is also a significant difference. At 3 months, most breastfeeding mothers who use regular child care report providing pumped milk for their infants to consume at child care (68%). Notably, the next most common strategy for feeding breastmilk to infants in regular care is not to feed any breastmilk while in the care arrangement (20%).

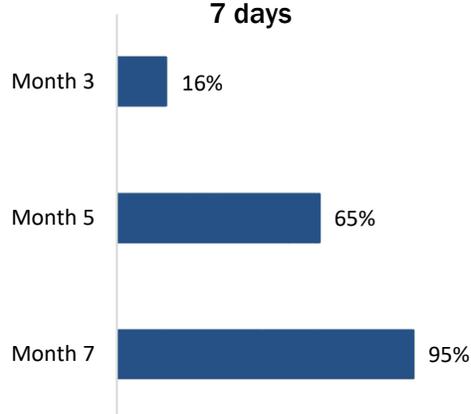
Complementary Feeding Practices

Once infants are ready to begin consuming complementary foods, there is a progression over time from assisted feeding to self-feeding. Initial complementary foods are typically fed to the infant by an adult, using a spoon. The American Academy of Pediatrics recommends discontinuing bottle use entirely before 18 months of age,⁷ and encouraging self-feeding skills as soon as the child becomes developmentally ready. These skills include: using a cup; self-feeding with fingers; and self-feeding with a spoon.

Methods of Feeding Infants and Young Children

At 3 months, few infants have started complementary foods, and spoon feeding is not yet a common feeding method. By 5 months, when more infants have started complementary foods, the percentage of caregivers reporting spoon feeding in the past 7 days increases dramatically to 65 percent. By 7 months, spoon feeding becomes a dominant practice among those feeding complementary foods (see Figure 6), with about 95 percent of caregivers spoon-feeding their infants. This jump between 5 and 7 months aligns with the age when the majority of healthy infants should have become developmentally ready to begin spoon feeding.

Figure 6. Among children receiving complementary foods, percentage fed with a spoon within the past 7 days



Self-Feeding Skills of Infants and Young Children

Self-feeding skills progress gradually over the latter half of the first year, and through the second year. WIC ITFPS-2 explored the development of self-feeding skills between 9 and 18 months, including: drinking from a cup held by someone else; drinking from a self-held open cup; picking up

⁷ Kleinman, R.E., and Greer, F.R. (2013). *Pediatric nutrition, 7th Edition*. Elk Gove Village, IL: American Academy of Pediatrics.

food with fingers to self-feed; and, self-feeding with a spoon (see Table 1). The infants are picking up food with their fingers to self-feed at 9 months, and almost all (97%) are doing it by 13 months. By 18 months, nearly half of all children are drinking from a regular cup without a lid. Self-feeding with a spoon, which requires greater fine-motor coordination, is developing more slowly with only 23 percent of children feeding themselves with a spoon at 13 months, and 66 percent doing so at 18 months.

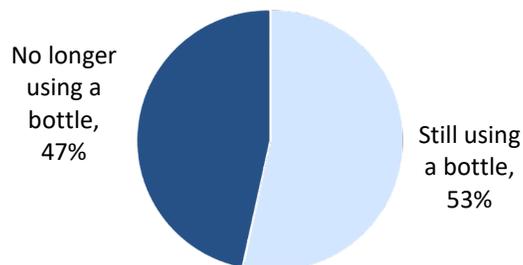
Table 1. Percentage of infants and young children who show self-feeding skills by interview month

Self-feeding skills	Month 9	Month 13	Month 18
Child drinks from a cup held by other within the last 7 days	33.8%	48.2%	46.1%
Child drinks from an open cup	4.8	17.6	48.6
Child picks up food to feed self	74.4	97.0	NA
Child feeds self with a spoon	6.4	23.4	65.6
Unweighted n	2,150	2,669	1,940
Weighted n	389,723	421,046	431,521

Note: NA denotes not applicable. The question is not asked at this age.

As infants reach their first birthdays, WIC recommends that they be weaned from the bottle to lessen the risk of early childhood dental caries.⁸ At 13 months, 47 percent of children are no longer using a bottle (see Figure 7). Among the children who are no longer using a bottle by 13 months, the average age of bottle weaning is 10.6 months.

Figure 7. Percentage of study infants using a bottle at 13 months



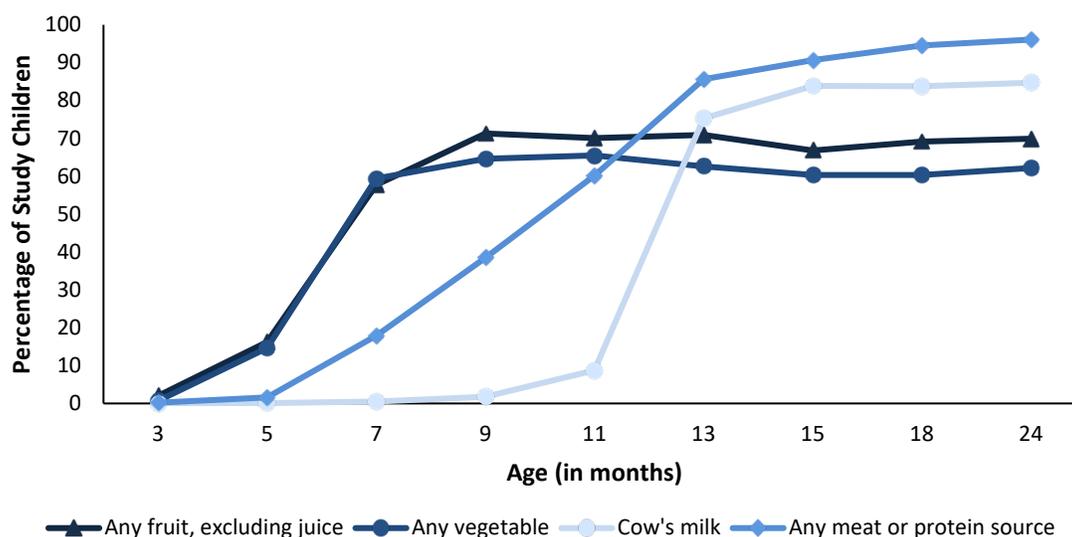
⁸ Special Supplemental Nutrition Program for Women, Infants, and Children (U.S.), Commodity Supplemental Food Program (U.S.). (2009). *Infant nutrition and feeding: A guide for use in the WIC and CSF programs*. Washington, DC: U.S. Department of Agriculture, Food and Nutrition Service, Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

Food Intake, Meals, and Snacks

Fruits, Vegetables, Cow's Milk, and Meats and Other Protein Sources

WIC ITFPS-2 study children are consuming a varied diet on a given day as they move into the second year of life, including fruits, vegetables, dairy, and meats and other proteins⁹ (see Figure 8).

Figure 8. Percentage of study children consuming any fruit, any vegetable, cow's milk, and any meat or protein source on a given day, by month



The percentage of WIC ITFPS-2 children consuming fruit on a given day increases sharply between 5 and 7 months of age, and gradually evens off after that. By 24 months, 70 percent of the children are consuming a non-juice fruit on a given day. The pattern is very similar for vegetables, with a sharp increase between 5 and 7 months, and 62 percent of the children consuming a vegetable on a given day at 24 months. Although fruit and vegetable consumption increases as the children get older, a substantial percentage at each month are still not consuming a fruit or vegetable on a given day.

Consumption of cow's milk on a given day remains at very low levels through 11 months, in line with WIC recommendations to delay introduction of cow's milk until 12 months. By 13 months,

⁹ Other protein sources include dried beans or peas; vegetarian meat substitutes; eggs; peanut butter, nuts, and seeds; cheese; yogurt; and, protein sources in mixed dishes such as: baby food dinners; beans and rice, chili, and other bean mixtures; mixtures with vegetables and/or rice or pasta.

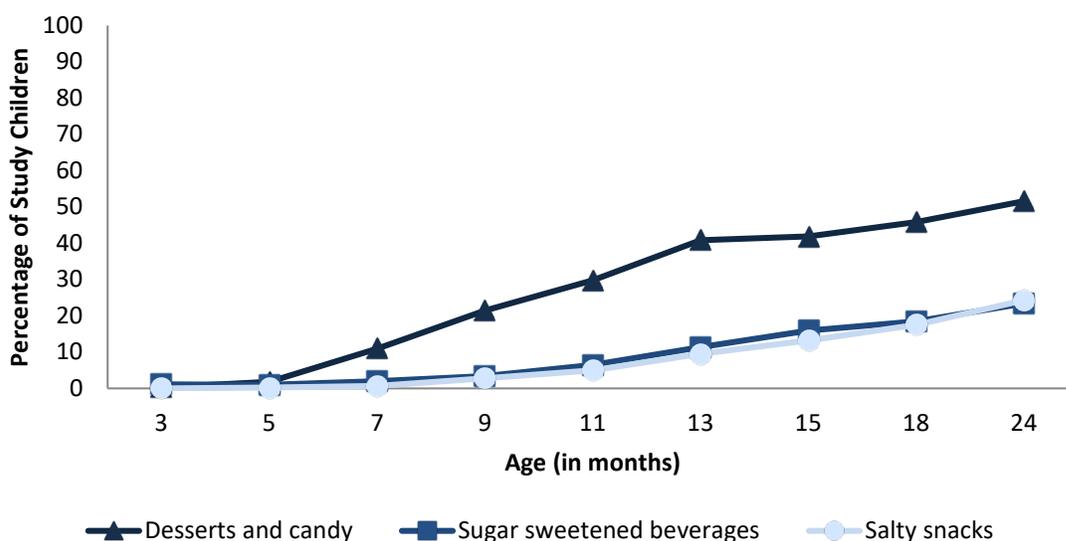
75 percent of the children's are consuming cow's milk on a given day, and by 24 months it rises to 85 percent.

Consumption of meats and other protein sources on a given day rises from 18 percent at 7 months to 86 percent at 13 months. By 24 months, nearly all WIC ITFPS-2 children (96%) are consuming a meat or other protein source on a given day.

Desserts, Sugar Sweetened Beverages, and Salty Snacks

The percentages of WIC ITFPS-2 children consuming desserts and candy, sugar sweetened beverages (SSBs), and salty snacks on a given day all increase with age (see Figure 9). Dessert and candy increase at the fastest rate, with consumption on a given day increasing from 11 percent of children at 7 months to 52 percent of children by 24 months.

Figure 9. Percentage of study children consuming desserts and candy, sugar sweetened beverages, and salty snacks on a given day, by month



The percentage of children consuming SSBs on a given day remains relatively low during the infant year, but 11 percent of WIC ITFPS-2 children are consuming an SSB on a given day at 13 months, and nearly a quarter (23%) are doing so by 24 months. Most of those sweetened beverages are fruit flavored drinks; only 4 percent of study children are consuming carbonated sodas, and only 5 percent are consuming other sweetened beverages, such as sweet tea or Gatorade, at 24 months.

Consumption of salty snacks (e.g., potato chips, popcorn, cheese curls/puffs, tortilla chips, and other types of chips and salty snacks) also rises steadily, with 24 percent of children consuming a salty snack on a given day at 24 months.

Meal and Snack Patterns

As WIC ITFPS-2 children become more established in eating complementary foods, and move into the second year of life, more children also begin consuming breakfast, lunch, dinner, and snacks as distinct eating events. By 24 months, 98 percent of the children are eating breakfast on a given day, 94 percent are eating lunch, 95 percent are eating dinner, and 80 percent are eating as least one snack.

The most commonly consumed foods or beverages at each eating occasion at 13 and 24 months appear in Table 2. At 13 months, milk and milk products (excluding breastmilk and infant formula) and fruit (excluding juice) are commonly consumed at every eating occasion, and 100 percent fruit juice is commonly consumed at lunch, dinner, and snacks. Eggs, infant cereals, and non-infant cereals (not presweetened)¹⁰ are common at breakfast. Lunches and dinners include vegetables and non-baby food meats. Snacks commonly include crackers, pretzels, rice cakes, fruit, and, for a subset of children, baby food desserts. Most of these foods are available as a part of the WIC food package. At both 7 and 15 months, approximately 9 in 10 study mothers agree that the WIC food package allows them to purchase foods they would typically feed their children.

On a given day at 24 months, many children still commonly consume milk and milk products at every eating occasion, and 100 percent fruit juice is now commonly consumed at every eating occasion. Fruit and eggs are still common at breakfast, but non-infant cereals (not presweetened) become the most commonly consumed breakfast food. Lunches include the same foods as at 13 months, although the order has changed. Rice and pasta join non-baby food meats and vegetables as common dinner foods. Snacks still include crackers, pretzels, rice cakes, or fruit, but salty snacks join the top five, and baby food desserts are no longer in the top five. Once again, many of the top five foods are available as a part of the child's WIC food package at 24 months, but other non-WIC foods, such as salty snacks, have become more common.

¹⁰ Non-infant cereals (not presweetened) are defined as breakfast cereal with no more than 21.2 g total sugars/100 g dry cereal.

Table 2. Top five foods or beverages consumed on a given day at each eating occasion by study children, at 13 and 24 months

Month 13		Month 24	
Top five foods or beverages	Percent of study children consuming	Top five foods or beverages	Percent of study children consuming
Breakfast		Breakfast	
Milk and milk products	50.4%	Milk and milk products	61.2%
Any fruit (excluding juice)	28.6	Non-infant cereal (not presweetened)	31.8
Non-infant cereal (not presweetened)	25.1	Eggs	29.1
Infant cereals	23.5	100 percent fruit juice	27.5
Eggs	20.5	Any fruit (excluding juice)	23.8
Unweighted n	2,613	Unweighted n	2,375
Weighted n	410,041	Weighted n	428,368
Lunch		Lunch	
Any vegetables	30.5%	Non-baby food meat	34.7%
Milk and milk products	28.3	100 percent fruit juice	34.6
Any fruit (excluding juice)	28.0	Any vegetables	28.1
100 percent fruit juice	27.1	Milk and milk products	25.3
Non-baby food meat	23.9	Any fruit (excluding juice)	24.7
Unweighted n	2,459	Unweighted n	2,280
Weighted n	383,586	Weighted n	410,871
Dinner		Dinner	
Any vegetables	42.9%	Non-baby food meat	45.5%
Non-baby food meat	32.0	Any vegetables	43.6
Milk and milk products	29.5	Milk and milk products	30.1
100 percent fruit juice	19.1	100 percent fruit juice	24.4
Any fruit (excluding juice)	13.7	Rice and pasta	16.1
Unweighted n	2,491	Unweighted n	2,309
Weighted n	389,063	Weighted n	415,502
Snack		Snack	
Any fruit (excluding juice)	42.1%	Any fruit (excluding juice)	50.0%
Milk and milk products	38.5	Milk and milk products	39.0
Crackers, pretzels, rice cakes	34.1	Crackers, pretzels, rice cakes	29.1
100 percent fruit juice	19.5	100 percent fruit juice	20.7
Baby food desserts	15.6	Salty snacks	19.9
Unweighted n	2,160	Unweighted n	1,999
Weighted n	329,421	Weighted n	351,307

Energy and Nutrient Intake

To examine dietary intake comprehensively, the total energy (as measured in kilocalories), macronutrient, and micronutrient contents of individuals' diets are typically calculated, and nutrient intake is compared to existing standards or references.

Evaluating young children's dietary intake can be challenging, because there are no current national dietary guidelines for children from birth to 24 months. The Dietary Guidelines for Americans for birth through age 24 months are currently in development, and are expected to be released in 2020.¹¹ Nonetheless, it is possible to evaluate the nutrient intakes of groups of children birth through 24 months using Dietary Reference Intakes (DRI). DRIs are nutrient standards, developed by the Institute of Medicine of the National Academy of Sciences,¹² that can be used as a point of comparison to estimate the prevalence of inadequate intakes.

Energy Intake

Data from WIC ITFPS-2 suggest that young children's median energy intakes increase as the children age (see Figure 10). This is consistent with the increased calorie needs children experience as they grow, develop more lean body mass, and become more mobile. Between ages 7 and 13 months, median energy intake increases by 50 percent for males, and 48 percent for females. Between ages 13 and 24 months, median energy intake increases again by 28 percent for males, and 26 percent for females. At all time points between 5 and 24 months, males consistently have a higher median energy intake than females; however, this is expected given that energy requirements for male infants are slightly higher than those of females infants.^{13,14}

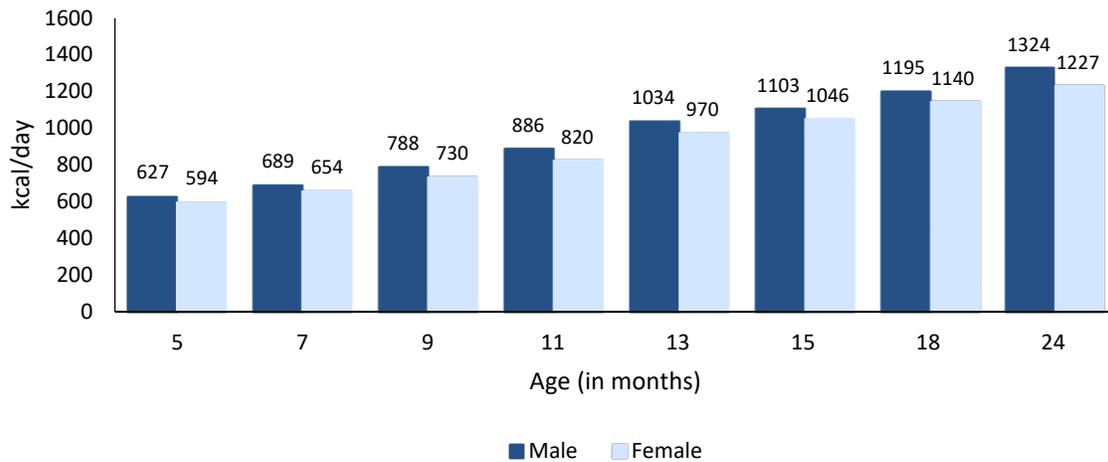
¹¹ U.S. Department of Agriculture, Center for Nutrition Policy and Promotion. (n.d.). *Pregnancy and Birth to 24 Months Project*. Retrieved from <https://www.cnpp.usda.gov/birthto24months> on September 27, 2017.

¹² Institute of Medicine (IOM). (2000). *Dietary Reference Intakes: Applications in Dietary Assessment*. Washington, DC: The National Academies Press.

¹³ Butte, N.F. (2005). Energy requirements of infants. *Public Health Nutrition*, 8(7a), 953-967.

¹⁴ Institute of Medicine (IOM). (2005). *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/10490>.

Figure 10. Median energy intake, by gender and age



Energy intakes could not be compared to energy requirements, because calculating Estimated Energy Requirements (EERs) for a child requires accurate body weight and length measurements obtained concurrently with the dietary intake data. Because WIC ITFPS-2's interviews were conducted by telephone, objective measurements of weight and length on the day of the 24-hour dietary recall could not be obtained, thus prohibiting calculation of the EER and comparisons of energy intake to the EER.

Macronutrient and Micronutrient Intake

WIC ITFPS-2 examines both macronutrient and micronutrient intake of the study children. Essential macronutrients (i.e., protein, carbohydrate, and fat) are needed in large amounts to provide energy for healthy nutrition and growth, whereas micronutrients (i.e., vitamins and minerals) are needed in smaller quantities but are still essential for various physiological and metabolic processes. When evaluating micronutrient intake of young children, it is particularly important to consider the intake of several micronutrients that are essential for growth and development, including iron, vitamin D, and zinc.

Median fat, carbohydrate, and protein intakes meet or exceed recommended levels at most ages between 5 and 24 months for which standards have been identified. During the second year of life,

they fall within acceptable levels as percentages of total daily energy intake, which are based on the ideal range necessary to reduce chronic disease risk.¹⁵

At 3 and 5 months, median levels of most micronutrients exceed the levels specified as adequate intake in the DRIs for these ages. Vitamin D is the exception, with levels consistently below the recommended level. The same pattern is seen from 7 to 11 months, with median levels of most micronutrients exceeding the levels specified as adequate intake in the DRIs for these ages. Vitamin D is again an exception, with the median level falling below recommended levels at every month. Looking specifically at iron and zinc, two micronutrients of particular concern in infancy and early childhood, estimates of the prevalence of inadequate intakes for iron are 20 percent at month 7, 16.7 percent at month 9, and 14.7 percent at month 11. Estimates of the prevalence of inadequate intakes for zinc are 17.4 percent at month 7, 11.4 at month 9, and 6.9 percent at month 11.

During the second year of life, both vitamin E and vitamin D have high estimated prevalence of inadequate intakes (see Table 3). Estimates of the prevalence of inadequate intakes for vitamin D are all above 75 percent. Estimates of inadequate intakes of vitamin E are also high. All other median levels of micronutrients, including iron and zinc, have estimates of the prevalence of inadequate intake below 5 percent.

Table 3. Estimated prevalence of inadequate intake levels^a of micronutrients among study children during the second year of life

Micronutrients	Estimated average requirement	Percentage of study children with inadequate intakes			
		Month 13	Month 15	Month 18	Month 24
Antioxidants					
Vitamin C (mg/d)	13	0.0%	0.4%	0.0%	0.0%
Vitamin E (mg/d)	5	66.6	77.4	71.8	55.0
B vitamins					
Thiamin (mg/d)	0.4	0.2	0.2	0.2	0.1
Riboflavin (mg/d)	0.4	0.1	0.1	0.0	0.0
Niacin (mg/d)	5	0.6	1.4	0.2	0.3
Vitamin B-6 (mg/d)	0.4	0.2	0.3	0.0	0.1
Folate (µg/d)	120	2.6	3.0	0.7	0.9
Vitamin B-12 (µg/d)	0.7	0.1	.3	0.0	0.9
Bone-related nutrients					
Calcium (mg/d)	500	3.6	4.9	2.8	0.9
Phosphorus (mg/d)	380	1.4	0.8	0.6	0.1
Magnesium (mg/d)	65	0.4	0.3	0.3	0.0
Vitamin D (µg/d)	10	75.6	76.3	78.8	77.6

¹⁵ These types of acceptable level standards have not yet been identified for infants.

Table 3. Estimated prevalence of inadequate intake levels^a of micronutrients among study children during the second year of life (continued)

Micronutrients	Estimated average requirement	Percentage of study children with inadequate intakes			
		Month 13	Month 15	Month 18	Month 24
Other micronutrients					
Vitamin A (µg RAE/d)	210	0.2	0.3	0.5	0.5
Iron (mg/d)	3.0	1.5	2.9	0.8	0.3
Zinc (mg/d)	2.5	0.2	0.0	0.4	0.2
Unweighted n		2,763	2,048	1,973	2,434
Weighted n		434,035	437,375	437,505	438,206

^a Estimated Average Requirements (EARs) represent levels of daily intake sufficient to meet the nutrient requirements of half of all healthy individuals, and are the standard used within each age group to estimate the prevalence of inadequate intakes. The prevalence of inadequate intakes is estimated as the proportion of the population with intakes below the EAR.

Weight and Growth

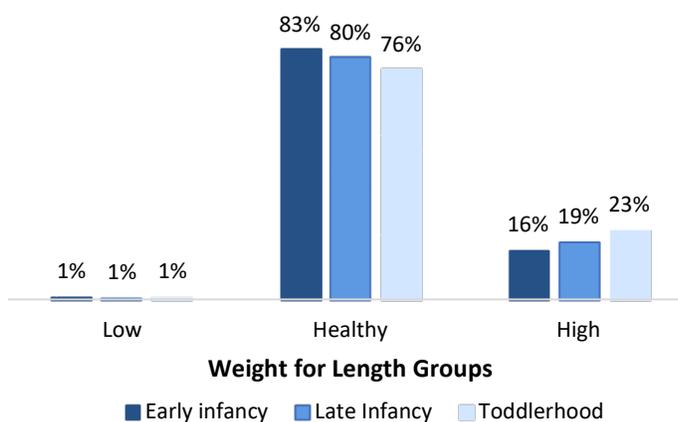
WIC ITFPS-2 explores weight-for-length among WIC infants and children, and the relationship between feeding practices and weight-for-length, in three measurement periods: early infancy (1 to less than 7 months), late infancy (7 to 15 months), and toddlerhood (20 to 28 months).

To evaluate weight-for-length in study children, WIC ITFPS-2 compared study children against international weight and length standards for children from birth to age 24 months put forward by the World Health Organization (WHO) in 2006, and adopted by the Centers for Disease Control and Prevention (CDC). The WHO standards allow categorization of study children’s weight and growth outcomes into low, healthy, and high groupings. Consistent with WHO and CDC guidelines, those in the low group have weight-for-length outcomes that fall below the 2.3rd percentile; those in the healthy group have outcomes that fall between the second and 97.7th percentile; and, those in the high group have outcomes that fall above the 97.7th percentile.

Distribution of Weight-for-Length

Figure 11 presents the percentage distribution of study children in each weight-for-length category by the three measurement age periods, early infancy (1 to <7 months), late infancy (7 to 15 months), and toddlerhood (20 to 28 months). In early infancy, 83 percent of study children fall within the healthy group; in late infancy, 80 percent do; and, in toddlerhood, 76 percent do. As the percentage of children with a healthy weight-for-length falls, the percentage of children in the high weight-for-length group rises, from 16 percent in early infancy to 19 percent in late infancy, and 23 percent in toddlerhood. These increasing rates of high weight-for-length are consistent with other research on low-income WIC children,^{16,17} but are nonetheless concerning.

Figure 11. Percentage of study children by age and weight-for-length



Predictors of High Weight-for-Length

In bivariate analyses, few socio-demographic or behavioral variables emerge as statistically significant predictors of high weight-for-length across the first 2 years of life. Breastfeeding duration, however, is positively related to weight-for-length status around the second birthday: children who are never breastfed, or breastfed less than 2 months, are significantly more likely to be high weight-for-length, whereas children who are breastfed at least 13 months are significantly less likely to be high weight-for-length.

In multivariate analyses, the only feeding practice that significantly increases the odds of high weight-for-length around the second birthday is the introduction of complementary foods prior to four months of age. Rapid weight gain into toddlerhood, time the child spends playing video games, and high birth weight also increase the odds of being high weight-for-length.

¹⁶ Aldrich, H., and Gance-Cleveland, B. (2016). Comparing weight-for-length status of young children in two infant feeding programs. *Maternal and Child Health Journal*, 20(12), 2518-2526.

¹⁷ Freedman, D.S., Sharma, A.J., Hamner, H.C., Pan, L., Panzera, A., Smith, R.B., and Blanck, H.M. (2017). Trends in weight-for-length among infants in WIC from 2000-2014. *Pediatrics*, 139(1), e20162034.

Summary, Limitations, and Next Steps

Summary of Findings

Results through the second year show that most of today's WIC families are engaging in a variety of health-promoting feeding practices:

- **Balancing work and breastfeeding.** Among WIC ITFPS-2 mothers who have returned to work full-time by 3 months, 34 percent are breastfeeding.
- **Making expected developmental progress.** At 13 months, 97 percent of WIC ITFPS-2 children are picking up food with their fingers to self-feed, and 66 percent are feeding themselves with a spoon at 18 months. These findings demonstrate that the children are making expected developmental progressions in self-feeding.
- **Eating a varied diet of healthy foods.** WIC ITFPS-2 study children are consuming a varied diet as they move into the second year, including fruits, vegetables, dairy, and meats and other proteins. Many of the most commonly consumed foods are those included in the WIC food packages.
- **Meeting recommended nutrient intake.** WIC children have median nutrient intake levels that mostly meet or exceed recommended levels through the first 2 years of life. Vitamin D is a notable exception, falling below recommended levels at all ages. Iron and zinc intake, which are nutrients of particular concern for infants and young children, each have estimated prevalence of inadequate intake below 20 percent during the first year of life, and below 5 percent during the second year of life.

Some practices and outcomes are less encouraging, and warrant monitoring as WIC ITFPS-2 continues:

- **Increasing consumption of sweetened and salty foods.** By 24 months, 52 percent of study children consume a dessert or candy, 23 percent consume a sugar-sweetened beverage, and 24 percent consume a salty snack on a given day.
- **Falling short of recommended levels of vitamin D.** WIC ITFPS-2 children have consistently high prevalence of inadequate intake of vitamin D.
- **Increasing rates of high weight-for-length.** In early infancy, about 16 percent of the children are high weight-for-length. By the time around their second birthday, 23 percent of children fall with the WHO's high weight-for-length range.

Interpreting Study Findings

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

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

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

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

Next Steps

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

There are many research topics from this report that will be carried forward and explored further in subsequent WIC ITFPS-2 reports. Two that are particularly notable are:

- WIC ITFPS-2 will continue to track median energy and nutrient intake among children beyond the first 2 years of life. Given WIC's goal of safeguarding the health of low-income children by providing nutritious supplemental foods, it will be important to continue examining participants' dietary intake.
- WIC ITFPS-2 will continue to follow the weight and height of WIC children through age 5 years, to understand the future trajectory of high weight-for-length children in this population, and determine how high weight-for-length by age 2 years relates to subsequent overweight or obesity status.