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Human milk expression in the first year postpartum among persons with low incomes

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Abstract

Background: Expressing milk (i.e., human milk) is common in the USA, but practices are unknown among families in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). This study of a WIC population explores the practice of and reasons for expressing milk in the first year postpartum.

Methods: We analysed data from a longitudinal study to examine milk expression at 1, 3, 5, 7, 9, 11, and 13 months postpartum among breastfeeding persons enrolled in WIC with term singletons. We cross-sectionally analysed the weighted prevalence of milk expression at each survey month and report reasons for milk expression in the first 7 months.

Results: Among the study participants who reported feeding human milk at Month 1, 70.4% expressed milk in the first 13 months postpartum. The prevalence of milk expression was 56.8% at Month 1 and decreased to 13.9% at Month 13 among those feeding any human milk that month. Reasons for expressing milk changed over time; in the first month, increasing milk supply, relieving engorgement, and having an emergency supply of milk were common. In later months, having a supply of milk available so that someone else could feed their infant was common.

Conclusions: Clinicians, health educators, WIC staff, and others working with WIC families can promote optimal expressed milk feeding and storage practices. Extra attention and support

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AUTHOR CONTRIBUTIONS

Jasmine Y. Nakayama conceptualised and designed the study, carried out the initial analyses, drafted the initial manuscript, and reviewed and revised the manuscript. Heather C. Hamner and Kristin J. Marks conceptualised and designed the study and reviewed and revised the manuscript. Andrea McGowan analysed the data and critically reviewed the manuscript for important intellectual content. Ruowei Li conceptualised and designed the study and critically reviewed the manuscript for important intellectual content. All authors read and approved the final manuscript submitted for publication and agree to be accountable for all aspects of the work.

CONFLICTS OF INTEREST STATEMENT

The authors declare no that there are conflicts of interest.

may be especially important in the first months postpartum when milk expression is common. Support for persons who are expressing milk can be tailored for reasons of milk expression.

Keywords

breast feeding; breast milk expression; food assistance; maternal behavior; human milk

INTRODUCTION

Human milk (also known as breastmilk and hereafter referred to as ‘milk’) is the optimal source of nutrition for most infants.^{1,2} Some infants do not feed directly at the breast for every feeding for various reasons, including medical conditions, separation from the lactating parent, or parental needs and preferences (e.g., to gauge milk supply, to avoid mental or emotional discomfort with feeding directly at the breast).^{3,4} Lactating parents may choose to express milk to feed it to their infants, a common practice in the USA.^{5,6} A 2005–2007 US study indicated that, among persons who breastfed their infants in the early postpartum period ($N = 1564$), 85% of them had expressed milk during the first year after birth.⁷ That sample was more likely to be White, more educated, employed, and have fewer children than a nationally representative group. However, more current milk expression practices are unknown among other populations, such as families with low income participating in the US Department of Agriculture’s (USDA) Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

WIC is a federal program that serves over 6 million people and provides supplemental foods, nutritional education, peer counselling, and health services referrals for eligible pregnant, postpartum, and breastfeeding persons, infants, and children aged < 5 years.^{8,9} Individuals are eligible if they meet certain criteria, including having lower income (i.e., $\leq 100\%$ – 185% of federal poverty level) or participating in certain programs (e.g., Medicaid or Supplemental Nutrition Assistance Program) and being at nutritional risk.¹⁰ WIC supports breastfeeding families who practice milk expression by providing health education and breast pumps.¹¹ Understanding the characteristics, practices, and reasons of persons with low income who express milk in the first year postpartum can provide information for interventions to support families in optimal expressed milk feeding and storage practices. The present study aimed to examine the prevalence of, characteristics associated with, and reasons for milk expression in the first year postpartum among breastfeeding persons with term singletons who were enrolled in WIC.

METHODS

Study design

We used data from USDA WIC Infant and Toddler Feeding Practices Study-2, a longitudinal study examining maternal and child feeding practices that enrolled study participants 1 July to 18 November 2013 (registered at [ClinicalTrials.gov \[NCT02031978\]](https://clinicaltrials.gov/ct2/show/study/NCT02031978)).¹² We used a two-stage stratified sampling strategy to select participants. The first stage used a probability proportional to size sampling design to select 80 WIC clinics (projected to enroll ≥ 30 participants per month) from 27 states and territories, representing 37% of WIC sites and

87% of the total WIC population.^{12,13} The second stage identified all eligible participants from selected WIC clinics; eligibility criteria included: aged ≥ 16 years, able to speak English or Spanish, and enrolling in WIC services for their current pregnancy or enrolling their infant aged < 2.5 months.^{12,13}

Of the 6775 persons referred to the study by WIC staff, 4367 were interested in participating in the study and enrolled following screening eligible^{12,13} (Figure 1). Interviewers conducted telephone interviews with enrolled participants prenatally and every other month through 13 months postpartum. Response rates among those enrolled ranged from 53.7% at Month 11 to 77.8% at Month 1. Participants provided written informed consent and received incentives for each completed interview. The WIC Infant and Toddler Feeding Practices Study-2 received approval from Westat Institutional Review Board and, if needed, local and state institutional review boards.

Analytic sample

For each survey month, we included participants who had a term singleton live birth, completed that month's interview, fed their infant any human milk at the month of the interview (i.e., answered 'only breast milk' or 'both breast milk and formula' to the question 'Are you/Is anyone currently feeding breast milk either from the breast or from a bottle, formula, or both?'), and were not missing data for milk expression or the survey weight for that month's interview. Analytic samples for each survey month ranged from 364 for Month 13 to 1811 for Month 1 (Figure 1). Survey weights were used so that results represent national estimates of the WIC population under study. Briefly, weights are assigned to each person sampled and are a measure of the number of people in the population represented by that sampled person.¹³ Except for the weighted monthly totals shown in Figure 1, we present unweighted sample sizes and weighted percentages throughout.

Milk expression practices

At Months 1, 3, 5, 7, 9, 11, and 13 (i.e., survey months), participants who reported feeding any human milk were asked 'Are you currently pumping breastmilk?' Among participants who reported feeding any human milk at Month 1, we determined the percentage who expressed milk at any point in the first 13 months. For each survey month, we cross-sectionally determined the percentage of participants who expressed milk that month among all participants who reported feeding any milk that month.

At each survey month, those who expressed milk provided a numeric response to the question, 'Thinking about the past two weeks, how many times did you pump milk?' For each survey month, we categorised participants into three groups: participants who did not express milk, participants who expressed milk an average of once a day or less in the past 2 weeks (≤ 1 per day), and participants who expressed milk an average of more than once a day in the past 2 weeks (> 1 per day).

Sociodemographic and perinatal characteristics by frequency of milk expression

At Month 1, we examined participants' sociodemographic and perinatal characteristics by frequency of milk expression (i.e., not expressing milk, expressing milk ≤ 1 per day,

expressing milk > 1 per day). Characteristics included participant's age at childbirth (16–19, 20–25, ≥ 26 years), participant's race/ethnicity (Hispanic or Latino, non-Hispanic White, non-Hispanic Black or African American, non-Hispanic Other), participant's education level (≤ high school, > high school), household poverty level (≤ 75% of poverty guideline, > 75% but ≤ 130% of poverty guideline, > 130% of poverty guideline), history of breastfeeding another child (no history, ≤ 3 months, > 3 months), delivery type (vaginal, caesarean), and number of months worked for pay while pregnant (0, 1–7, 8–9 months).

Breast pump use and receipt

At Month 1 only, participants who expressed milk reported what they used most often to express milk (i.e., an electric pump, a manual pump, pumping by hand, or something else) and how they received their breast pump (i.e., loaned from WIC, bought or rented, borrowed, given as gift, or provided by a hospital, employer, or someplace else).

Milk expression reasons

Interviewers at Months 1, 3, 5, and 7 presented participants with potential reasons for milk expression; participants could select multiple reasons, refuse to answer the question, or state 'I don't know'. Reasons included: to increase milk supply, to relieve engorgement, to have an emergency supply of milk, to get milk so that someone else can feed their infant, to keep milk supply up when their infant could not nurse, and to mix with cereal or other food. We calculated the percentage of participants reporting each reason at Months 1, 3, 5, and 7. Interviews after Month 7 did not include questions about milk expression reasons.

Statistical analysis

For this analysis, we used data from survey Months 1, 3, 5, 7, 9, 11, and 13 postpartum. Because data were analysed cross-sectionally at each survey month, estimates were independently assessed at each survey month and not compared across different months. We used SAS PROC SURVEY procedures to account for the complex sampling design.¹² For each survey month, we used the respective survey month weight, accounting for differential selection and non-response. We used chi-square tests to determine differences between categorical characteristics by frequency of milk expression. $p < 0.05$ was considered statistically significant. The Centers for Disease Control and Prevention determined that this secondary analysis of de-identified data was not human subjects research and did not require institutional review board review.

RESULTS

Milk expression practices

Overall, 62.0% (95% confidence interval [CI] = 52.7%–71.3%) of participants reported feeding human milk at Month 1. Among those participants who reported feeding human milk at Month 1, 70.4% (95% CI = 66.7%–74.1%) of participants expressed milk at some point in the first 13 months postpartum. Figure 2 presents the percentages of participants not expressing milk, expressing milk > 1 per day, expressing milk ≤ 1 per day, and expressing milk at an unknown frequency at each survey month in the first year postpartum among those feeding human milk at that month. Among participants who fed their infants human

milk at that given month, the percentages of those who expressed milk was 56.9% (95% CI = 53.1%–60.6%) at Month 1, 55.7% (95% CI: 50.6%–61.0%) at Month 3, 46.3% (95% CI = 39.7%–52.9%) at Month 5, 40.1% (95% CI = 35.6%–44.7%) at Month 7, 32.4% (95% CI = 26.6%–38.3%) at Month 9, 23.3% (95% CI = 18.7%–27.9%) at Month 11, and 13.9% (95% CI = 9.1%–18.7%) at Month 13.

Sociodemographic and perinatal characteristics by frequency of milk expression

At Month 1, the majority of participants were Hispanic or Latino, had completed $\leq$ high school, had a household income $\leq$ 75% of poverty guideline, and had a vaginal delivery; almost half of participants were aged $\geq$ 26 years or had no breastfeeding history, and 39.0% had not worked for pay while pregnant (Table 1). At Month 1, we identified statistically significant differences in several participant characteristics by frequency of milk expression: age at childbirth, race/ethnicity, education level, and household poverty level. Participants with no breastfeeding history were more likely to express milk > 1 per day than those who previously breastfed. Participants who worked for pay for 1–7 or 8–9 months while pregnant were more likely to express milk than those who did not work for pay while pregnant. We identified no statistically significant differences in delivery type by frequency of milk expression at Month 1.

Breast pump use and receipt

Among the 1034 participants who expressed milk at Month 1, 63.5% (95% CI = 58.7%–68.3%) used an electric pump, 31.2% (95% CI = 27.1%–35.2%) used a manual pump, 5.3% (95% CI = 3.8%–6.8%) expressed by hand, and 0.1% (95% CI = 0.0%–0.2%) expressed milk with another pumping device most often. Among the 974 participants who used an electric pump, a manual pump, or another pumping device at Month 1, 33.6% (95% CI = 29.2%–38.1%) bought or rented it, 23.1% (95% CI = 20.1%–26.1%) received it as a gift, 18.6% (95% CI = 14.1%–23.1%) were provided it by a hospital, place of work, or someplace else, 16.5% (95% CI = 12.9%–20.2%) received it from WIC, 8.0% (95% CI = 6.0%–10.0%) borrowed it from a friend or relative, and 0.2% (95% CI = 0.0%–0.4%) did not know how they received it (These data are not visually displayed).

Milk expression reasons

At Month 1, the three most frequently reported reasons for milk expression were to increase milk supply, to relieve engorgement, and to have an emergency supply of milk (Table 2). At both Months 3 and 5, the three most frequently reported reasons for milk expression were to have an emergency supply of milk, to increase milk supply, and to get milk so that someone else can feed their infant. At Month 7, the three most frequently reported reasons were to get milk so that someone else can feed their infant, to have an emergency supply of milk, and to keep milk supply up when their infant could not nurse. The most common reasons were similar if we restricted analyses to only participants who completed all interviews for Months 1, 3, 5, and 7 (results not displayed).

DISCUSSION

We aimed to understand the prevalence of and characteristics associated with milk expression among a sample of WIC enrollees during the first year postpartum. We also examined the reasons for milk expression. Milk expression was common in this sample, with 70% expressing milk at some point in the first year among those who fed their infants milk in the first month postpartum. Our findings of milk expression in the first year postpartum were slightly lower (70% vs. 85%) than those from a 2005–2007 study of a non-nationally representative sample of persons who breastfed their infants in the early postpartum period (1.5–4.5 months).⁷ Among participants who fed their infants human milk at Month 1 and among those who did so at Month 3, over half at each time period expressed milk, and that proportion decreased throughout the first year. By Month 13, only 14% were expressing milk among those feeding human milk at that month.

We identified differences in sociodemographic and perinatal characteristics, such as breastfeeding history and working for pay while pregnant, among persons who did not express milk, who expressed milk ≤ 1 per day, or who expressed milk > 1 per day in the first month. As has been documented previously,⁷ persons with no breastfeeding history were more likely to express > 1 per day than those who previously breastfed. This finding may reflect a lack of comfort or confidence in the ability to breastfeed successfully among persons who are new to breastfeeding and the desire to have an emergency supply. Furthermore, persons who expressed milk at Month 1 reported working for pay while pregnant for more months than those who did not express milk. Evidence indicates that parents who worked while pregnant are likely to return to the workforce within the first year postpartum.^{14,15} It is possible that these persons were expressing milk to allow others to feed their infants with expressed milk and to build an emergency milk supply in anticipation of returning to work.

Reflecting the dynamic relationship between parent and growing infant, reasons for milk expression changed over time throughout the first year postpartum in this study, similar to previous studies.^{4,7} In our analysis, the most common reason varied throughout the first 7 months from ‘to increase milk supply’ and ‘to relieve engorgement’ in earlier months to ‘to get milk so that someone else can feed their infant’ and ‘to keep milk supply up when their infant could not nurse’ in later months. A previous study assessing reasons for milk expression at various time points in the first 9.5 months postpartum indicated ‘for someone else to feed infant’ as the most common reason at each time point.⁷ Our results are consistent with a previous study that identified decreasing percentages of persons reporting ‘to relieve engorgement’ and increasing percentages of persons reporting ‘to mix with cereal or other food’ over time during the first year.⁷

Clinicians, health educators, WIC staff, and others working with WIC families can be mindful of these milk expression practices and reasons as they design and implement interventions that promote optimal infant feeding practices. Extra attention and support may be particularly important in the first months postpartum when milk expression rates are high and infants are more vulnerable to illness. Recognition of sociodemographic and perinatal differences among groups by frequency of milk expression can help identify

groups that may especially benefit from additional support. Education, equipment, and other support for persons who are expressing milk can be tailored for reasons of milk expression. Emphasising safe practices for milk expression, handling, storage, and feeding can help prevent illness of the caregiver and infant.^{16,17} Supportive environments and cultures for milk expression, such as clean places and clear policies for milk expression and storage at the workplace, can also assist families. Additionally, people working with WIC families can provide information on responsive bottle feeding of expressed milk, which can affect infants' nutrition, feeding habits, and healthy weight.^{18,19} Of concern, some study participants reported expressing milk to mix with cereal or other food at Months 1 and 3, when the introduction of complementary foods (anything other than human milk or infant formula) is considered too early.²⁰ Education on appropriate introduction of complementary foods and the risk of choking when adding cereal or other foods to milk in a bottle can be reinforced to prevent adverse health outcomes.²

At Month 1, over 90% of persons who expressed milk primarily used an electric or manual breast pump. WIC provided breast pumps to about 17% of those persons, and over half bought, rented, or were gifted a breast pump. We collected our data around the time that the Affordable Care Act, which mandated that health insurance companies cover breast pumps and supplies at no cost to pregnant or postpartum members, went into effect.²¹ With potentially increased access to breast pumps, it is possible that more persons are currently using breast pumps than the present study estimates. Specific instruction can be given to persons using breast pumps to reinforce how to use, clean, and store breast pumps and associated parts properly.²²

The present study has several strengths and limitations. The longitudinal study design minimised recall bias with prospective data collection and allowed for unique analyses of milk expression practices in the first year postpartum. Cross-sectional analysis of these data allowed for larger sample sizes and less missing data for each survey month; however, because we calculated estimates from different samples for each survey month, we did not follow the same persons over time. These recent data provide an updated estimate on characteristics, practices, and reasons of milk expression in a sample representative of WIC enrollees who were eligible to enroll in WIC services for the first time during their current pregnancy or enroll an infant aged < 2.5 months at a large WIC site, were aged ≥ 16 years, and spoke English or Spanish. However, the results may not be generalisable to WIC enrollees at small WIC sites, such as those in rural areas. These data were collected before the COVID-19 pandemic, which affected maternity care and infant feeding practices in hospitals and access to lactation services in the community, and it is possible milk expression practices have changed since the data were collected.²³ We were unable to distinguish additional reasons for milk expression if the study participant reported another reason that was not provided by the interviewer. Data on expressed milk feeding, milk storage, and breast pump cleaning behaviors were unavailable; therefore, we were unable to analyse whether study participants were following recommended practices.

CONCLUSIONS

Milk expression was common among WIC enrollees in the first year postpartum. Among WIC enrollees who reported feeding human milk at Month 1, 70% expressed milk at some point in the first 13 months postpartum. Among participants who fed their infant human milk at Month 1 and among those who did so at Month 3, over half at each time period expressed milk, and that proportion decreased throughout the first year. Reasons for milk expression changed throughout the first year; increasing milk supply, relieving engorgement, and having an emergency supply of milk were common reasons in the first month, and obtaining milk so that someone else can feed their infant was common in later months. These results may guide clinicians, health educators, WIC staff, and others working with these families to support optimal expressed milk feeding and storage practices, such as responsive bottle feeding of expressed milk. Future research can explore associations between these milk expression practices and breastfeeding outcomes, such as duration and exclusivity.²⁴

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Biographies

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DATA AVAILABILITY STATEMENT

The WIC ITFPS-2 dataset is publicly available.

REFERENCES

1. Meek JY, Noble L, Meek JY, Noble L. Technical report: breastfeeding and the use of human milk. *Pediatrics*. 2022;150(1):e2022057989. [PubMed: 35921641]
2. U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary guidelines for Americans, 2020–25. 9th ed. U.S. Department of Agriculture and U.S. Department of Health and Human Services; 2020. Accessed May 12, 2022. Available from: https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf
3. Bowman KG. When breastfeeding may be a threat to adolescent mothers. *Issues Ment Health Nurs*. 2007;28(1):89–99. [PubMed: 17130009]
4. Felice JP, Geraghty SR, Quagliari CW, Yamada R, Wong AJ, Rasmussen KM. ‘Breastfeeding’ without baby: a longitudinal, qualitative investigation of how mothers perceive, feel about, and practice human milk expression. *Matern Child Nutr*. 2017;13(3):e12426. [PubMed: 28078789]
5. Geraghty SR, Sucharew H, Rasmussen KM. Trends in breastfeeding: it is not only at the breast anymore. *Matern Child Nutr*. 2013;9(2):180–7. [PubMed: 22625407]
6. Rasmussen KM, Geraghty SR. The quiet revolution: breastfeeding transformed with the use of breast pumps. *Am J Public Health*. 2011;101(8):1356–9. [PubMed: 21680919]
7. Labiner-Wolfe J, Fein SB, Shealy KR, Wang C. Prevalence of breast milk expression and associated factors. *Pediatrics*. 2008;122(suppl 2):S63–8. [PubMed: 18829833]
8. Food and Nutrition Service. WIC data tables. 2022. Accessed April 27, 2022. Available from: <https://www.fns.usda.gov/pd/wic-program>
9. Food and Nutrition Service. Special supplemental nutrition program for Women, Infants, and Children (WIC). 2022. Accessed April 27, 2022. Available from: <https://www.fns.usda.gov/wic>
10. Food and Nutrition Service. WIC eligibility requirements. 2022. Accessed April 27, 2022. Available from: <https://www.fns.usda.gov/wic/wic-eligibility-requirements>
11. Food and Nutrition Service. Finding a breast pump | WIC breastfeeding support. Accessed September 2, 2022. Available from: <https://wicbreastfeeding.fns.usda.gov/finding-breast-pump>
12. May L, Borger C, Weinfield N, MacAllum C, DeMatteis J, McNutt S, et al. WIC Infant and Toddler Feeding Practices Study-2: Infant year report. 2017 [cited 2021 Sept 15]. Available from: <https://www.fns.usda.gov/wic/wic-infant-and-toddler-feeding-practices-study-2-infant-year-report>
13. Westat. WIC. Infant and Toddler Feeding Practices Study-2 (WIC ITFPS-2): data file training manual. Westat; 2021.
14. Han WJ, Ruhm CJ, Waldfogel J, Washbrook E. The timing of mothers’ employment after childbirth. *Mon Labor Rev*. 2008;131(6):15–27. [PubMed: 21701695]
15. Wallace M, Saurel-Cubizolles MJ. Returning to work one year after childbirth: data from the mother-child cohort EDEN. *Matern Child Health J*. 2013;17(8):1432–40. [PubMed: 23054452]
16. Castro-Blanco KA, Marks RM, Geraghty SR, Felice JP, Rasmussen KM. Information available online that answers common questions about breast pumping: a scoping review. *Breastfeed Med*. 2020;15(11):689–97. [PubMed: 32845741]
17. Yamada R, Rasmussen K, Felice J. Mothers’ use of social media to inform their practices for pumping and providing pumped human milk to their infants. *Children*. 2016;3(4):22. [PubMed: 27809227]
18. Li R, Magadia J, Fein SB, Grummer-Strawn LM. Risk of bottle-feeding for rapid weight gain during the first year of life. *Arch Pediatr Adolesc Med*. 2012;166(5):431–6. [PubMed: 22566543]
19. Li R, Scanlon KS, May A, Rose C, Birch L. Bottle-feeding practices during early infancy and eating behaviors at 6 years of age. *Pediatrics*. 2014;134(Suppl 1):S70–7. [PubMed: 25183759]
20. Pérez-Escamilla R, Jimenez EY, Dewey KG. Responsive feeding recommendations: harmonizing integration into dietary guidelines for infants and young children. *Curr Dev Nutr*. 2021;5(6):nzab076. [PubMed: 34104850]
21. Hawkins SS, Horvath K, Noble A, Baum CF. ACA and Medicaid expansion increased breast pump claims and breastfeeding for women with public and private insurance. *Women’s Health Issues*. 2022;32(2):114–21. [PubMed: 34802860]

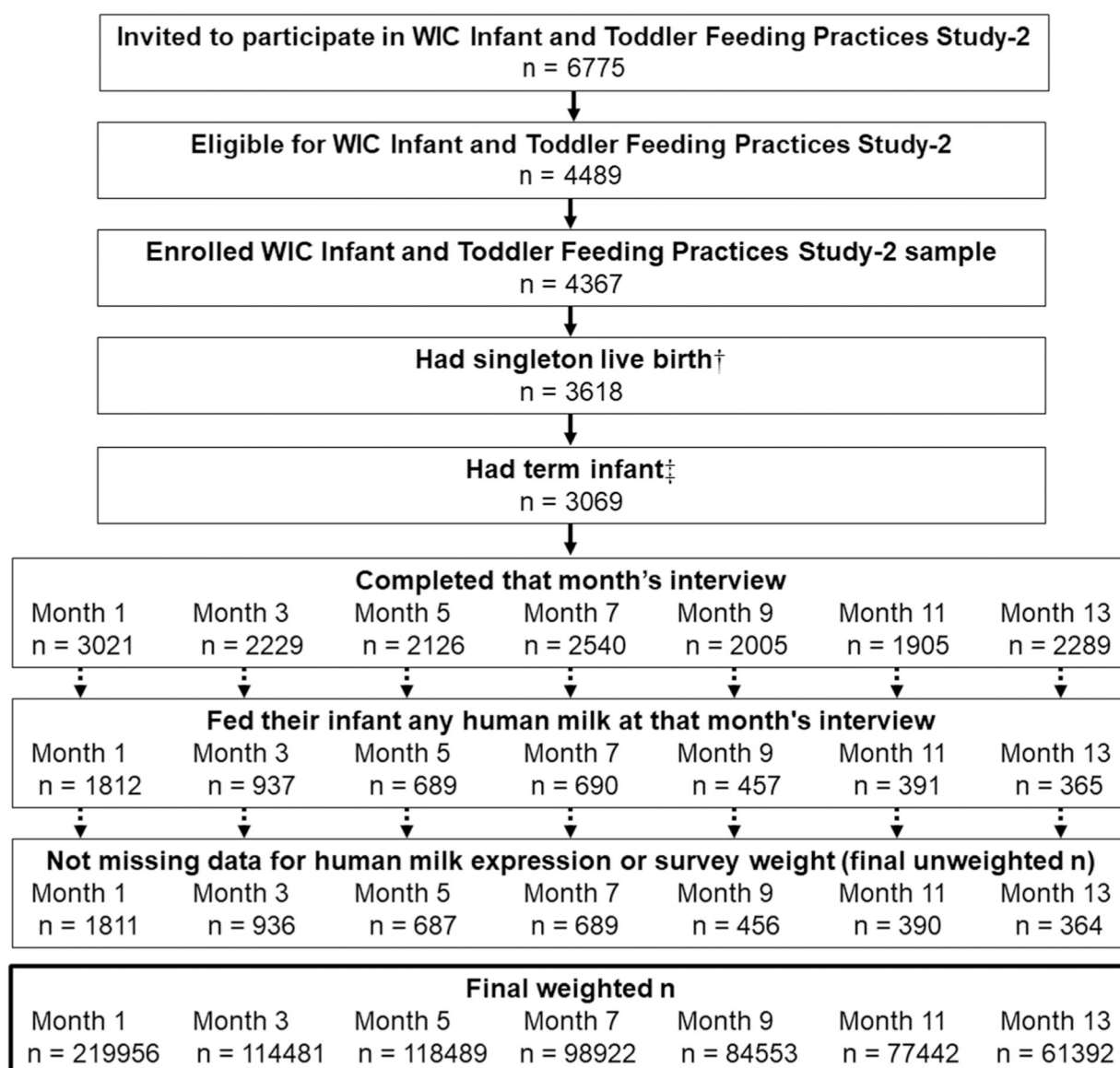
22. Centers for Disease Control and Prevention. How to keep your breast pump kit clean: the essentials. 2022. Accessed April 8, 2022. Available from: <https://www.cdc.gov/healthywater/hygiene/healthychildcare/infantfeeding/breastpump.html>
23. Perrine CG, Chiang KV, Anstey EH, Grossniklaus DA, Boundy EO, Sauber-Schatz EK, et al. Implementation of hospital practices supportive of breastfeeding in the context of COVID-19 - United States, July 15-August 20, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(47):1767–70. [PubMed: 33237892]
24. Johns HM, Forster DA, Amir LH, McLachlan HL. Prevalence and outcomes of breast milk expressing in women with healthy term infants: a systematic review. *BMC Pregnancy Childbirth*. 2013;13:212. [PubMed: 24246046]

Key points

- Human milk expression was common among Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) enrollees in the first year postpartum.
- The prevalence of milk expression decreased over the first year postpartum.
- Among those who fed human milk, 56.8% expressed milk in Month 1 and 13.9% expressed milk in Month 13.
- Reasons for expressing milk changed over time.

KEY MESSAGES

Human milk expression was common among WIC enrollees with 70% expressing milk at some point in the first 13 months among those who fed their infants milk in the first month postpartum. Clinicians, health educators, WIC staff, and others working with WIC families can promote optimal expressed milk feeding and storage practices during this time. Extra attention and support may be especially important in the first months postpartum when milk expression is common. Future research can explore associations between common milk expression practices and breastfeeding outcomes in this population.

**FIGURE 1.**

Flowchart of selection of unweighted analytic samples from US Department of Agriculture's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Infant and Toddler Feeding Practices Study-2 in the first year postpartum. [†]This criterion excluded 58 participants with multiple births, 106 participants with pregnancy loss, and 585 participants with missing data on whether they had a singleton or multiple birth. [‡]This criterion excluded 320 participants with preterm births and 229 participants with missing data on whether their infant was term or preterm.

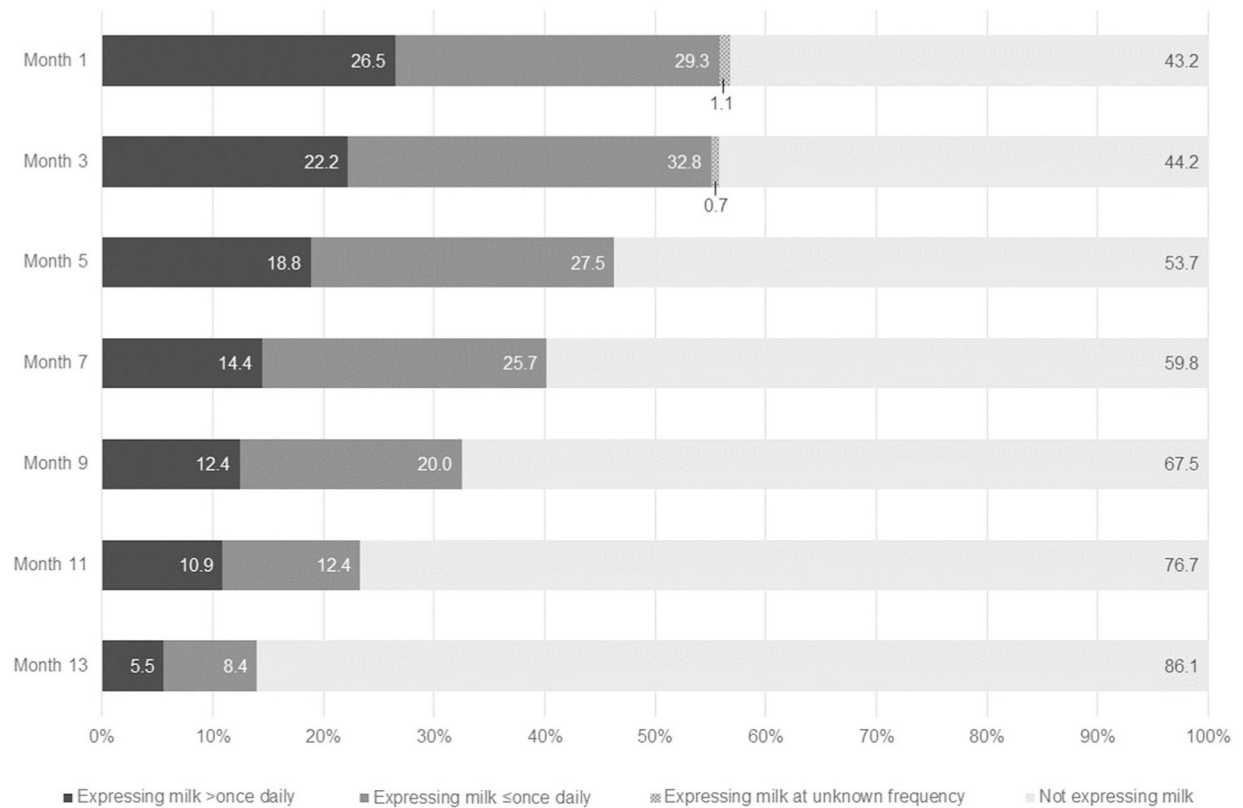


FIGURE 2.

Frequency of human milk expression at each survey month among participants feeding their infants human milk that month in the first year postpartum, Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Infant and Toddler Feeding Practices Study-2. Frequency of human milk expression was defined as the average number of times per day of milk expression in the past 2 weeks. We used four categories: participants who expressed milk an average of more than once a day in the past 2 weeks (>1 per day), participants who expressed milk an average of once a day or less in the past 2 weeks (≤1 per day), participants who expressed milk at an unknown frequency, and participants who did not express milk. Data were analysed cross-sectionally at each survey month. Estimates were independently assessed at each survey month and not compared across different months. Percentages do not add up to 100% as a result of rounding.

Sociodemographic and perinatal characteristics by frequency of human milk expression^a at Month 1 among participants feeding their infants human milk at Month 1, WIC Infant and Toddler Feeding Practices Study-2.

TABLE 1

Characteristic of participants	n (%) 1789 ^b (100)	Frequency of milk expression			p value
		Not expressing milk (%) 11.1	Expressing milk ≤1 per day (%) 39.0	Expressing milk >1 per day (%) 49.9	
<i>Age at childbirth (years)</i>					
16–19	183 (11.1)	36.2	33.6	30.3	< 0.0001
20–25	734 (39.0)	35.1	34.6	30.3	
26 or older	872 (49.9)	52.0	24.8	23.2	
<i>Race/ethnicity</i>					
Hispanic or Latino	808 (53.2)	50.0	27.6	22.4	0.0002
Non-Hispanic White	506 (24.6)	33.7	33.5	32.8	
Non-Hispanic Black or African American	369 (16.5)	39.4	28.4	32.1	
Non-Hispanic Other	106 (5.8)	38.6	35.5	26.0	
<i>Education level^c</i>					
≤High school	1004 (58.3)	47.4	27.4	25.2	0.03
>High school	779 (41.7)	38.1	32.7	29.2	
<i>Household poverty level</i>					
≤75% of poverty guideline	1027 (58.1)	46.1	29.8	24.1	0.03
>75% but < 130% of poverty guideline	557 (29.7)	40.0	28.4	31.6	
>130% of poverty guideline	205 (12.1)	40.7	31.6	27.8	
<i>Breastfeeding history</i>					
No history	856 (47.1)	32.8	31.8	35.3	<00001
≤3 months	327 (18.6)	43.0	33.3	23.7	
>3 months	606 (34.3)	58.8	24.6	16.7	
<i>Delivery type</i>					
Vaginal	1276 (69.1)	43.4	29.5	27.1	0.92
Caesarean	513 (30.9)	44.2	29.8	26.0	
<i>Number of months worked for pay while pregnant^d</i>					
0	680 (39.0)	51.1	25.2	23.7	0.002

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Characteristic of participants	n (%)	Frequency of milk expression			p value
		Not expressing milk (%)	Expressing milk ≤1 per day (%)	Expressing milk >1 per day (%)	
Total	1789 ^b (100)	11.1	39.0	49.9	
1–7	504 (26.9)	42.7	30.6	26.7	
8–9	603 (34.2)	35.9	33.9	30.2	

^aFrequency of human milk expression was defined as the average number of times per day of milk expression in the past 2 weeks. We used three categories: participants who did not express milk, participants who expressed milk an average of once a day or less in the past 2 weeks (≤1 per day), and participants who expressed milk an average of more than once a day in the past 2 weeks (>1 per day).

^bTwenty-two participants from the Month 1 analytic sample of 1811 were excluded because they were missing data on frequency of milk expression.

^cSix participants were excluded because they were missing data on education level.

^dTwo participants were excluded because they were missing data on number of months worked for pay while pregnant.

Abbreviation: WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

TABLE 2

Percentage of participants reporting reasons for milk expression at Months 1, 3, 5, and 7 among participants expressing milk that month, WIC Infant and Toddler Feeding Practices Study-2^{a,b}.

Reasons for milk expression	Time of survey							
	Month 1 (n = 1034) CI)	% (95% CI)	Month 3 (n = 531) CI)	% (95% CI)	Month 5 (n = 332) CI)	% (95% CI)	Month 7 (n = 280) CI)	% (95% CI)
To increase your milk supply	69.1	(65.1–73.1)	63.2	(58.3–68.1)	60.5	(54.2–66.8)	52.0	(45.4–58.6)
To relieve engorgement	65.1	(61.0–69.3)	59.4	(54.0–64.8)	47.5	(40.6–54.5)	43.6	(34.5–52.7)
To have an emergency supply of milk	62.1	(57.5–66.8)	71.2	(65.9–76.5)	69.3	(63.5–75.1)	67.7	(61.1–74.4)
To get milk so that someone else can feed your infant	50.1	(46.0–54.2)	64.3	(58.6–70.0)	70.9	(64.4–77.5)	70.5	(64.2–76.7)
To keep your milk supply up when your infant could not nurse, such as while you were away from your infant or when your infant was too sick to nurse	50.0	(46.0–54.1)	54.6	(49.1–60.1)	58.0	(52.4–63.6)	56.3	(48.5–64.0)
To mix with cereal or other food	2.4	(1.3–3.5)	6.3	(3.6–9.0)	21.3	(16.1–26.5)	53.7	(44.6–62.9)
Other reason you have pumped breastmilk in the past month (unspecified)	11.6	(8.5–14.7)	9.2	(5.6–12.8)	7.0	(3.7–10.2)	7.4	(3.7–11.1)

^a Percentages do not add up to 100% because participants were able to choose multiple reasons for milk expression.

^b Sample sizes presented for each survey month are unweighted and exclude participants missing data on reasons for milk expression.

Abbreviations: CI, confidence interval; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.