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Infant feeding practices and perceived optimal breastfeeding interventions among low-income women delivering at a Baby-Friendly Hospital

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Abstract

Objective: To determine infant feeding practices of low-income women at a Baby-Friendly Hospital and to ascertain breastfeeding interventions they believe would increase exclusive breastfeeding.

Study Design: This cross-sectional study occurred at a tertiary-care Baby-Friendly Hospital. Low-income women without breastfeeding contraindications were recruited at scheduled Ob/Gyn appointments within six to nine months of delivering a term, non-anomalous infant. Participants completed a survey. Outcomes included infant feeding patterns and perceived usefulness of proposed breastfeeding interventions.

Results: Of 149 participants, 129 (86.6%) initiated breastfeeding. By postpartum day #2 (PPD2), 47 (31.5%) exclusively breastfed, 51 (34.2%) breastfed with formula, and 51 (34.2%) exclusively formula fed. On a scale of 1 (“strongly agree”) to 5 (“strongly disagree”), women who supplemented with formula on PPD2 were significantly more likely than those who exclusively formula fed to agree education on neonatal behavior (1 (Interquartile Range (IQR) 1,2) versus 2 (IQR 1,3); $p=0.026$) and on-demand access to breastfeeding videos on latch or positioning ((1 (IQR 1,2) versus 2 (IQR 1,3), $p=0.043$; 1 (IQR 1,2) versus 2 (IQR 1,3), $p=0.021$; respectively) would have helped them exclusively breastfeed.

Conclusion: Though low-income women at a Baby-Friendly Hospital had high breastfeeding initiation rates, the majority used formula by PPD2. To increase breastfeeding rates among low-income women, future interventions should provide appropriate and effective breastfeeding interventions.

Keywords

Baby-Friendly Hospital Initiative; breastfeeding; breastfeeding educational interventions; health disparities; low-income women

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Introduction

The World Health Organization and UNICEF's Baby-Friendly Hospital Initiative certifies health facilities that follow evidence-based breastfeeding guidelines.^{1,2} This program is the most widely implemented system-level breastfeeding intervention worldwide^{1,3} and has been associated with higher breastfeeding rates in most,^{4–6} but not all,⁷ observational studies globally, including in the United States.^{8–10} Unfortunately, the amount of high-quality data supporting this initiative is limited: the two large randomized-controlled trial evaluating the program were conducted in developing countries—suggesting these findings may not be generalizable to developed countries^{11,12}—and whether all Baby-Friendly guidelines must be implemented to increase breastfeeding rates remains unclear.^{13,14} Perhaps for these reasons, the most recent breastfeeding recommendations of the United States Preventive Services Task Force (USPSTF) fall short of endorsing the Baby-Friendly Hospital Initiative,¹ and instead call for more research on the impact of system-level breastfeeding interventions in the United States.^{1,15}

The USPSTF also notes that additional research is needed to examine the impact of existing breastfeeding interventions on women from communities with low breastfeeding rates and to explore the role of modern technology in providing breastfeeding support.¹ Our university-based, tertiary care hospital delivers nearly 3000 low-income women annually, and, prior to applying for certification as a Baby-Friendly Hospital, the breastfeeding initiation rate in this population was less than 40%. This low rate is consistent with national statistics¹⁶ and highlights a current health disparity in the United States: low-income women are significantly less likely to initiate breastfeed compared to the national average (in 2013, the national rate was 75%, and the rate among low-income women was 66.1%).¹⁷ The differences in breastfeeding rates may reflect structural inequities that make breastfeeding more difficult for low-income women, including being more likely to return to work sooner after giving birth, to be employed in positions making pumping breastmilk more difficult compared to women with higher incomes, and to have decreased social support.¹⁷ In response to the USPSTF's call for further research, we conducted a breastfeeding study of low-income women delivering at a Baby-Friendly Hospital. We aimed to determine rates of breastfeeding initiation and exclusivity by the time of hospital discharge and frequency of reported breastfeeding challenges within two weeks of birth among low-income women. In addition, we aimed to ascertain whether they believed additional breastfeeding educational interventions—including technology-based, hospital-based, and community-based initiatives—that would have helped them exclusively breastfeed in addition to standard Baby-Friendly Hospital standards. We hypothesized that women who initiated breastfeeding but transitioned to formula supplementation on postpartum day 2 (PPD2) were more likely to have breastfeeding challenges compared to those who exclusively breastfeed on PPD2 and that women who did not exclusively breastfeed on PPD2 would be likely to believe technology-based breastfeeding support interventions would have helped them do so.

Materials and Methods:

This cross-sectional study was conducted at a single university-based, tertiary care Baby-Friendly Hospital from December 2016 until March 2017. Women who presented to routine

obstetric or gynecologic clinic appointments at the hospital's affiliated outpatient Medicaid clinic were screened for eligibility. Being seen at this clinic signified that the patient had Medicaid insurance, was Medicaid-eligible, or uninsured; her insurance status was used as a proxy for income. All women without breastfeeding contraindications who delivered liveborn, term singleton infants without anatomic malformations within the prior six to nine months were approached by research assistants. We chose these inclusion criteria for multiple reasons: they mirror those from prior breastfeeding studies,^{4,18} our study questionnaire has been validated for low-income women during this postpartum period,¹⁹ and they ensured all women in our study population were exposed to Baby-Friendly Hospital practices (our hospital became certified in 2016). Written informed consent was obtained from all participants before they participated in this study, which was approved by the Washington University Institutional Review Board.

Consenting women were administered an in-person questionnaire modified from the Infant Feeding Practices Study II, a validated survey created by the Centers for Disease Control and Prevention (CDC).¹⁹ The survey is included as Appendix 1. Women were asked whether they initiated breastfeeding, whether they initiated formula feeding, and whether their infant was exclusively breastfed or fed formula with or without breastmilk on postpartum day #2 (PPD2), which was a proxy for hospital discharge. In our study, exclusive breastfeeding was defined as providing no other liquid or solid food besides breast milk (given directly to the infant via breast or given via bottle after being pumped or expressed), as per the World Health Organization's definition.² Women also reported which, if any, common breastfeeding challenges they experienced in the first 14 days after birth. Lastly, participants rated on an agreement scale whether they believed proposed breastfeeding interventions would have helped them exclusively breastfeed. The list of breastfeeding interventions included in the survey was created by a multidisciplinary group of lactation consultants and Perinatologists in response to the USPSTF's call for further research on established interventions and new technology-based initiatives. When proposed to a focus-group of postpartum low-income women, each intervention that was perceived unanimously as potentially supporting increased exclusive breastfeeding rates was included in the final survey.

The primary outcome was breastfeeding initiation. Secondary outcomes included frequency of breastfeeding challenges, patient-perceived usefulness of other proposed breastfeeding interventions, infant age at first formula feeding, and exclusive breastfeeding on PPD2, which allowed us to examine the impact of Baby-Friendly Hospital breastfeeding support on infant feeding practices in this population.

All patients meeting eligibility criteria were included, and no a priori sample size calculation was performed. Continuous variables were compared by using the Student's *t*-test, Mann-Whitney *U* test, ANOVA, or Kruskal-Wallis test as appropriate. Categorical variables were compared by using the χ^2 or Fisher's exact test as appropriate. Analyses were performed using STATA (Special Edition 14; StataCorp LP; College Station, TX) and SAS software (Version 9.2; SAS Institute, Inc., Cary, NC).

Results:

For this study, 175 women were approached, and 152 women consented. Three women did not complete the survey; as such, 149 women were included in the final analysis. Figure 1 describes infant feeding practices from birth until PPD2. Most women (86.6%) reported breastfeeding initiation; however, by PPD2, only 47 (31.5%) were still exclusively breastfeeding, with 51 (34.2%) supplementing breastmilk with formula and 51 (34.2%) exclusively formula feeding (including 20 women who did not attempt breastfeeding). More than half of those who exclusively breastfed on PPD2 initiated formula by 3 months postpartum ($n=24$ [51.1%]). The rate of exclusive breastfeeding at six months postpartum was 9.3% ($n=14$).

Sociodemographic Characteristics

Baseline sociodemographic and obstetric characteristics of the 149 women included in our study population are presented in Table 1. Women who exclusively formula fed on PPD2 were significantly more likely to have received a high school degree or less compared to those who exclusively breastfed or breastfed with formula supplementation on PPD2 (54.9% or 17.6% versus 29.8% or 8.5% versus 39.2% or 11.7%, respectively; $p=0.042$). Other sociodemographic factors like maternal age, race/ethnicity, annual household income, and parity were similar among women who breastfed exclusively, breastfed with formula supplementation, or exclusively formula fed on PPD2. The majority of our study population was Black (79.8%), multiparous (93.3%), and had an annual household income under \$25,000 (59.1%). Though all groups attended antenatal breastfeeding classes at similar rates, those who fed their infants formula by PPD2 (exclusively or as supplementation) were significantly more likely to have enrolled in the Women, Infants, and Children (WIC) Special Supplemental Nutrition Program than those who exclusively breastfed (96.1%, 98.0%, and 83.0%, respectively; $p=0.012$).

Reported Breastfeeding Challenges Among Women Initiating Breastfeeding

The frequency of reported breastfeeding challenges in the first 14 days after delivery is reported in Table 2. Women who exclusively breastfed on PPD2 were equally likely to endorse breastfeeding challenges as those who breastfed with formula supplementation on PPD2. Latch difficulty and concern for low breastmilk supply were the most common issues reported in both groups (31.9% versus 43.1%, $p=0.25$; 29.8% versus 37.3%, $p=0.44$). Those who exclusively breastfed on PPD2 were less likely to believe that breastmilk let down took too long compared to those who supplemented breastmilk with formula on PPD2, but this difference was not statistically significant (10.6% versus 25.5%; $p=0.058$).

Compared to women who initiated breastfeeding but exclusive formula fed on PPD2, those who exclusively breastfed on PPD2 were significantly more likely to report that their baby lost too much weight or nursed too often, to express concern for low breastmilk supply, or to report having sore, cracked, or bleeding nipples (14.9% versus 0%, $p=0.038$; 23.4% versus 0%, $p=0.003$; 29.8% versus 3.2%, $p=0.003$; 34.0% versus 0%, $p<0.001$, respectively). Similarly, when compared to women who initiated breastfeeding but exclusively formula fed, those who breastfed with formula supplementation were also significantly more likely

to endorse breastfeeding challenges. More than 20% of those who supplemented with formula endorsed having latch difficulty, concern for low breastmilk supply or that their breastmilk letdown took too long, engorgement, or sore, cracked, or bleeding nipples; conversely, the majority of women who initiated breastfeeding but exclusively formula fed on PPD2 did not report any breastfeeding issues.

Table 2 also describes the rate that women asked for or received breastfeeding help while admitted in the hospital. Compared to women who supplemented with formula on PPD2, those who exclusively breastfed were equally likely to ask for breastfeeding help but had a higher rate of receiving support, though this difference was not statistically significant (73.2% versus 55.1%; $p=0.076$). There were otherwise no differences between the infant feeding groups in terms of asking for or receiving breastfeeding support. Of note, less than two-thirds of women believed the help they received in the hospital solved their breastfeeding issue; this rate was similar in all three groups.

Interventions Low-income Women Believe May Help with Exclusive Breastfeeding

Table 3 describes patient-perceived usefulness of proposed educational breastfeeding interventions, as measured on an agreement scale of 1 to 5 (1 being “strongly agree” and 5 being “strongly disagree”) that a breastfeeding intervention would have helped them exclusively breastfeed. Overall, most low-income women “agreed” or “strongly agreed” that each proposed intervention would have helped them exclusively breastfeed regardless of their infant feeding practices on PPD2. There were no significant differences between those that exclusively breastfed on PPD2 and those who breastfed with formula supplementation. However, there were significant differences between those who fed their infants formula and did or did not continue to breastfeed.

Compared to women who initiated breastfeeding but exclusively formula fed on PPD2, those who breastfed with formula supplementation on PPD2 were significantly more likely to “strongly agree” that technology-based interventions such as on-demand videos on breastfeeding latch or position would have helped exclusively breastfeed ($p=0.043$ and $p=0.021$). Similarly, those who supplemented with formula were more likely to “strongly agree” that education on breastfeeding benefits, neonatal behavior, legal issues related to breastfeeding and work, or available breastfeeding resources would have helped them exclusively breastfeed ($p=0.0061$, $p=0.0027$, $p=0.0044$, and $p=0.013$, respectively). The agreement score between the two groups was similar for interventions involving education on pumping or in-person peer support.

We also compared perceived usefulness of these interventions among women who did not attempt breastfeeding at all ($n=20$) and those who initiated breastfeeding but exclusively formula fed on PPD2 ($n=31$). Women in these two groups had similar scores on the agreement scale: they were equally likely to agree that each proposed intervention would have helped them exclusively breastfeed.

Comment:

In this study of infant feeding practices among low-income women at a Baby-Friendly Hospital, the rate of breastfeeding initiation was higher than the national average for this population (86.6% versus 66%¹⁷). However, less than one third of our patients exclusively breastfed by PPD2, and less than two-thirds believed the breastfeeding help they received in the hospital resolved their breastfeeding problems. These findings suggest that low-income women may require additional breastfeeding support—via both reinforcing the Baby-Friendly Initiative's Ten Steps and providing other resources that further complement these guidelines—in order to best increase exclusive breastfeeding rates on PPD2 and beyond. We also identified multiple interventions that low-income women believed would have helped them exclusively breastfeed at hospital discharge, including more education on breastfeeding benefits and neonatal behavior and access to technology-based support via on-demand breastfeeding videos.

Our high rate of breastfeeding initiation supports prior observational studies^{8–10} and a recent comparative effectiveness review²⁰ identifying a positive association between Baby-Friendly Hospital certification and rates of breastfeeding initiation. However, the impact of the Baby-Friendly Hospital Initiative on low-income American women's rates of exclusive breastfeeding at hospital discharge is less clear. Though the Baby-Friendly Hospital Initiative has been associated with higher rates of exclusive breastfeeding at hospital discharge in one study,⁸ another concluded that the Baby-Friendly Hospital Initiative was less effective at increasing exclusive breastfeeding rates for low-income American women compared to higher-income American women.²¹ Our exclusive breastfeeding rate on PPD2 (31.5%) was within the range of published rates of exclusive breastfeeding at hospital discharge among low-income American women who did not deliver at Baby-Friendly Hospitals (22%²² to 40%²³), adding weight to the concern that this Initiative may not increase exclusive breastfeeding rates for low-income American women.

The fact that the majority of women in our study initiated formula in the immediate postpartum period at a Baby-Friendly Hospital has significant public-health implications. First, the Baby-Friendly Hospital Initiative and other national public health campaigns like Healthy People 2020 highlight breastfeeding initiation as an important marker for evaluating the success of breastfeeding interventions.^{2,24} While women must obviously initiate breastfeeding in order to exclusively breastfeed, our findings suggest that rates of breastfeeding with or without formula at PPD2 or hospital discharge may be a more accurate marker of infant feeding habits for low-income women. We propose that future breastfeeding interventions incorporate this outcome as a primary measure of their effectiveness, which supports the Joint Commission and the National Quality Foundation's Perinatal Care Performance Measure PC-05 (Exclusive Breast Milk Feeding), which tracks exclusive breastfeeding during the newborn hospitalization.²⁵

Second, the majority of women in our study who exclusively formula fed on PPD2 did so in the absence of any breastfeeding issues, supporting prior evidence that infant feeding decisions may not be based on breastfeeding difficulty alone.^{1,17} Indeed, it is possible that women who exclusively formula fed on PPD2 were significantly less likely than those who

continued to breastfeed to have breastfeeding challenges because many breastfeeding challenges occur after PPD2. However, women can have difficulties with latching, believe their infants are nursing too often or uninterested in nursing, believe their milk supply is too low or that their milk letdown took too long (among other challenges) within the first few days of birth as well. Thus, it is more likely that women chose to choose exclusive formula feeding not because of breastfeeding challenges but because of personal preference. This finding supports prior literature suggesting that low-income women's decision to not breastfeed may include the need to return to work shortly after birth, a lack of social support, lack of accessible or affordable lactation support from providers with shared experiences, and a lack of knowledge regarding the normal physiology of lactation and normal neonatal behavior.^{2,17} To increase exclusive breastfeeding rates in this population, providing additional support within the evidence-based Baby-Friendly Hospital guidelines^{2,3} and novel educational interventions may be needed.

By reporting low-income women's rating of the utility of proposed evidence-based breastfeeding interventions in terms of increasing exclusively breastfeeding rates, we provide a framework for future public-health initiatives. Meta-analyses have suggested individual-level education and support interventions that are available during pregnancy and after birth result in the highest increases in breastfeeding rates on a population-level;¹ these findings have been confirmed among low-income women.²⁶ Education and support interventions have historically referred to in-person teaching sessions, and a recent comparative effectiveness review suggested that peer-support may improve rates of breastfeeding initiation and duration among women enrolled in WIC.²⁰ The desired educational initiatives that low-income women in our study population believed would have helped them exclusively breastfeed could be provided in this manner.

However, technologically innovative breastfeeding initiatives like web-based education or on-demand videos could also be considered to be individual-level support interventions available during pregnancy and postpartum.²⁷ Data remain limited and conflicting on the impact technology-based initiatives has on breastfeeding: an interactive postpartum texting program increased exclusive breastfeeding rates²⁸ but a breastfeeding video viewed one time did not.²⁹ The consensus is more clear within the Obstetrics literature: technology-based interventions have improved antepartum glycemic control among women with gestational diabetes,³⁰ increased intrauterine device uptake rates,³¹ and decreased rates of postpartum smoking.³² We found that most low-income women believed on-demand videos would have helped them exclusively breastfeed and thus recommend more research on the impact of interactive, technology-based interventions on exclusive breastfeeding rates in this population.

Our study had several strengths. First, our study population was exclusively composed of low-income women, who are less likely to initiate breastfeeding compared to higher income women,¹⁷ and we analyzed infant feeding practices after they delivered at a Baby-Friendly Hospital. As such, our study directly responded to the USPSTF's call for additional research on the impact of system-wide interventions on breastfeeding in communities with low baseline breastfeeding rates.¹ Second, we used a well-validated questionnaire on infant feeding practices,³³ which was administered by an in-person research assistant at

participants' scheduled outpatient clinic visits. Conducting in-person surveys decreased the impact that poor health literacy may have had on our results because a research assistant could ensure participants understood each question prior to responding. Finally, the high rate of study enrollment among eligible women (>85%) likely reduced the potential of selection bias altering our findings.

However, our study is not without potential limitations. First, an a priori power calculation was not conducted: logistical limitations restricted enrollment for this cross-sectional study to a pre-specified four-month period. Because our analysis noted multiple statistically significant differences between infant feeding groups for our primary and secondary aims, it is less likely that inadequate power resulted in a type II error in our analyses. Second, recall or social desirability biases may have impacted our results. We decreased this risk by limiting recruitment to women who had delivered within the prior nine months and by framing the study as a survey about perceptions on postpartum experience, not on breastfeeding. Furthermore, the presence of recall or social desirability bias in a breastfeeding study should falsely elevate breastfeeding rates. In our study, the rate of exclusive breastfeeding at six months postpartum was less than half that of the national rate (9.3% versus 18.8%³⁴), suggesting our findings were likely not significantly impacted by recall or social desirability bias.

Third, because our postpartum unit reports more than 90% adherence to the Baby-Friendly Initiative's protocols each month, we did not measure which, if any, of the Baby-Friendly Ten Steps that women in our study population were not exposed to. Thus, it is possible, though unlikely, that women who used formula on PPD2 were more likely than those who exclusively breastfed to not be exposed to some of the Ten Steps. Lastly, though antenatal intention to breastfeed and prior history of exclusive breastfeeding have been identified as predictor of exclusive breastfeeding¹ and preterm birth, NICU admissions, and elective cesarean section have been identified as predictors of formula use,^{1,17,35} our survey did not assess these factors. Breastfeeding rates in our population may have been affected by these factors, but this impact would have affected each feeding group similarly, resulting in non-differential misclassification.

In summary, our study demonstrated that the majority of low-income women who delivered at a Baby-Friendly Hospital initiated breastfeeding but less than a third exclusively breastfed by PPD2. Low-income women believed that having more education on breastfeeding and newborn behavior and access to on-demand videos on breastfeeding latch or positions have helped them exclusively breastfeed. Though some of these measures are part of the Baby-Friendly Hospital Initiative, the technology-based initiatives would be novel. By providing insight into low-income women's infant feeding practices and their ideal breastfeeding interventions, our findings can inform future breastfeeding initiatives to more effectively encourage exclusive breastfeeding in this population at PPD2 and beyond.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Bibbins-Domingo K, Grossman DC, Curry SJ, Davidson KW, Epling JW, García FAR, et al. Primary Care Interventions to Support Breastfeeding. *JAMA*. 2016;316:1694–1705. [PubMed: 27784101]
2. World Health Organization & UNICEF. Baby-Friendly Hospital Initiative: Revised, Updated, and Expanded for Integrated Care.; 2009.
3. National Implementation of the Baby-Friendly Hospital Initiative, 2017. Licence CC. Geneva: World Health Organization; 2017.
4. Merten S. Do Baby-Friendly Hospitals Influence Breastfeeding Duration on a National Level? *Pediatrics*. 2005;116:e702–e708. [PubMed: 16263985]
5. Hofvander Y. Breastfeeding and the Baby Friendly Hospitals Initiative (BFHI): Organization, response and outcome in Sweden and other countries. *Acta Paediatr Int J Paediatr*. 2005;94:1012–1016.
6. Venancio SI, Saldiva SRDM, Escuder MML, Giugliani ERJ. The Baby-Friendly Hospital Initiative shows positive effects on breastfeeding indicators in Brazil. *J Epidemiol Community Health*. 2012;66:914–918. [PubMed: 22080818]
7. Brodrigg W, Kruske S, Miller YD. Baby-Friendly Hospital Accreditation, In-Hospital Care Practices, and Breastfeeding. *Pediatrics*. 2013;131:685–692. [PubMed: 23478863]
8. Nobari TZ, Jiang L, Wang MC, Whaley SE. Baby-Friendly Hospital Initiative and Breastfeeding among WIC-Participating Infants in Los Angeles County. *J Hum Lact*. 2017;33:677–683. [PubMed: 28793204]
9. Merewood A. Breastfeeding Rates in US Baby-Friendly Hospitals: Results of a National Survey. *Pediatrics*. 2005;116:628–634. [PubMed: 16140702]
10. Whalen BL, Kelly J, Holmes AV, et al. The New Hampshire Ten Steps to Successful Breastfeeding Collaborative: A Statewide QI Initiative. *Hosp Pediatr*. 2015;5:315–323. [PubMed: 26034163]
11. Kramer MS. Promotion of Breastfeeding Intervention Trial (PROBIT): A Randomized Trial in the Republic of Belarus. *JAMA*. 2001;285:413–420. [PubMed: 11242425]
12. Yotebieng M, Labbok M, Soeters HM, Chalachala JL, Lapika B, Vitta BS, et al. Ten Steps to Successful Breastfeeding programme to promote early initiation and exclusive breastfeeding in DR Congo: A cluster-randomised controlled trial. *Lancet Glob Heal*. 2015;3:e546–e555.
13. Taylor EC, Nickel NC, Labbok MH. Implementing the Ten Steps for Successful Breastfeeding in hospitals serving low-wealth patients. *Am J Public Health*. 2012;102:2262–2268. [PubMed: 23078473]
14. Munn AC, Newman SD, Mueller M, Phillips SM, Taylor SN. The Impact in the United States of the Baby-Friendly Hospital Initiative on Early Infant Health and Breastfeeding Outcomes. *Breastfeed Med*. 2016;11:222–230. [PubMed: 27082284]
15. Patnode CD, Henninger ML, Senger CA, Perdue LA, Whitlock E. Primary Care Interventions to Support Breastfeeding: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA*. 2016;316:1694–1705. [PubMed: 27784101]
16. CDC. Racial and Socioeconomic Disparities in Breastfeeding --- United States, 2004. *Morb Mortal Wkly Rep*. 2006;55:335–339.
17. American College of Obstetricians and Gynecologists Women's Health Care Physicians; Committee on Health Care for Underserved Women. Breastfeeding in Underserved Women: Increasing Initiation and Continuation of Breastfeeding. *Obs Gynecol*. 2013;122:423–428.
18. Anstey EH, Chen J, Elam-Evans LD, Perrine CG. Racial and Geographic Differences in Breastfeeding — United States, 2011–2015. *MMWR Morb Mortal Wkly Rep*. 2017;66(27):723–727. doi:10.15585/mmwr.mm6627a3. [PubMed: 28704352]

19. Thompson AL, Mendez MA, Borja JB, Adair LS, Zimmer CR, Bentley ME. Development and validation of the Infant Feeding Style Questionnaire. *Appetite*. 2009;53:210–221. [PubMed: 19576254]
20. Feltner C, Weber RP, Stuebe A, Grodensky CA, Orr C, Viswanathan M. Breastfeeding Programs and Policies, Breastfeeding Uptake, and Maternal Health Outcomes in Developed Countries Comparative Effectiveness Review No. 210. (Prepared by the RTI International–University of North Carolina at Chapel Hill Evidence-based Practic. In: Agency for Rockville, MD; 2018.
21. Patterson JA; Keuler NS; Olson B. The effect of Baby-friendly status on exclusive breastfeeding in U.S. hospitals. *Matern Child Nutr*. 2018;epub Ahead of print.
22. Furman L, Combs BC, Alexander AD, O’Riordan MA. Breast-feeding rates at an inner-city pediatric practice. *Clin Pediatr (Phila)*. 2008;47:873–882. [PubMed: 18648076]
23. Hundalani SG, Irigoyen M, Braitman LE, Matam R, Mandakovic-Falconi S. Breastfeeding among inner-city women: from intention before delivery to breastfeeding at hospital discharge. *Breastfeed Med*. 2013;8:68–72. [PubMed: 22849375]
24. Healthy People 2020. U.S. Department of Health and Human Services O of DP and HP. Healthy People 2020 2010.
25. Specifications Manual for Joint Commission National Quality Measures. Measure Information Form. Measure Set: Perinatal Care. <https://manual.jointcommission.org/releases/TJC2018A/MIF0170.html>. Published 2018 Accessed June 6, 2018.
26. Schreck PK, Solem K, Wright T, Schulte C, Ronnisch KJ, Szpunar S. Both Prenatal and Postnatal Interventions Are Needed to Improve Breastfeeding Outcomes in a Low-Income Population. *Breastfeed Med*. 2017;12:142–148. [PubMed: 28394657]
27. Whitehead L, Seaton P. The effectiveness of self-management mobile phone and tablet apps in long-term condition management: A systematic review. *J Med Internet Res*. 2016;18:e97. [PubMed: 27185295]
28. Martinez-Brockman JL, Harari N, Pérez-Escamilla R. Lactation Advice through Texting Can Help: An Analysis of Intensity of Engagement via Two-Way Text Messaging. *Journal of Health Communication*. 2017:1–12.
29. Kellams AL, Gurka KK, Hornsby PP, Drake E, Riffon M, Gellerson D, et al. The Impact of a Prenatal Education Video on Rates of Breastfeeding Initiation and Exclusivity during the Newborn Hospital Stay in a Low-income Population. *J Hum Lact*. 2016;32:152–159. [PubMed: 26289058]
30. Miremberg H, Ben-Ari T, Betzer T, Raphaeli H, Gasnier R, Barda G, et al. The impact of a daily smartphone-based feedback system among women with gestational diabetes on compliance, glycemic control, satisfaction, and pregnancy outcome: a randomized controlled trial. *Am J Obstet Gynecol*. 2018. doi:10.1016/j.ajog.2018.01.044.
31. Gilliam ML, Martins SL, Bartlett E, Mistretta SQ, Holl JL. Development and testing of an iOS waiting room “app” for contraceptive counseling in a Title X family planning clinic. *Am J Obstet Gynecol*. 2014;211:481.e1–8. [PubMed: 24881829]
32. Lowe JB, Barnes M, Teo C, Sutherns S. Investigating the use of social media to help women from going back to smoking post-partum. *Aust N Z J Public Health*. 2012;36:30–32. [PubMed: 22313703]
33. Fein SB, Labiner-Wolfe J, Shealy KR, Li R, Chen J, Grummer-Strawn LM. Infant Feeding Practices Study II: study methods. *Pediatrics*. 2008;122 Suppl:S28–S35. [PubMed: 18829828]
34. Center for Disease Control and Prevention. Breastfeeding Report Card 2013. *Cent Dis Control Prev*. 2016:8.
35. Prior E, Santhakumaran S, Gale C, Philipps LH, Modi N, Hyde MJ. Breastfeeding after cesarean delivery: a systematic review and meta-analysis of world literature. *Am J Clin Nutr*. 2012;95:1113–1135. [PubMed: 22456657]

Figure 1:
Infant feeding practices on postpartum day #2 (PPD2) from Labor & Delivery among study participants

Table 1:

Comparison of baseline characteristics among women exclusively breastfed, who breastfed with formula supplementation, or who exclusively formula fed on postpartum day #2

	Exclusive Breastfeeding (n =47)	EFF (n=51)	BF with Formula Supplementation (n =51)	P value
Maternal age at due date (mean years ($\pm$SD))	25.2 $\pm$ 4.6	27.1 $\pm$ 5.1	26.1 $\pm$ 6.0	0.22
Race/Ethnicity (n (%))				0.44
White	9 (19.2)	4 (7.8)	7 (13.7)	
Black	35 (74.5)	45 (88.2)	39 (76.5)	
Hispanic	0 (0.0)	(0.0)	1 (2.0)	
Other	3 (6.4)	2 (3.9)	4 (7.8)	
Education (n (%))				0.042
Less than High school	4 (8.5)	9 (17.6)	6 (11.7)	
High school degree	14 (29.8)	29 (54.9)	20 (39.2)	
Some college (no degree)	26 (55.3)	11 (21.6)	21 (41.2)	
College degree	3 (6.4)	2 (3.9)	3 (5.9)	
Professional or graduate degree	0 (0.0)	0 (0.0)	0 (0.0)	
Declined	0 (0.0)	1 (2.0)	1 (2.0)	
Annual household income (n (%))				0.09
Under \$25,000	25 (54.4)	34 (66.7)	29 (56.9)	
\$25,001 to \$50,000	13 (28.3)	4 (7.8)	24 (27.5)	
Over \$50,001	0 (0.0)	0 (0.0)	0 (0.0)	
Declined	5 (10.9)	11 (21.6)	6 (11.8)	
Enrollment in WIC Special Supplemental Nutrition Program (n (%))	39 (83.0)	49 (96.1)	50 (98.0)	0.012
Attending breastfeeding class while pregnant (n (%))	8 (17.0)	10 (19.6)	6 (11.8)	0.96
Obstetric Characteristics (n (%))				0.16
Nulliparous	1 (2.1)	6 (11.8)	3 (5.9)	
>1 live birth	46 (97.9)	45 (88.2)	48 (94.1)	

Table 2:

Comparison of reported breastfeeding (BF) issues and obtaining help for BF among low-income women who initiated BF and chose exclusive BF, BF with formula supplementation, or exclusive formula feeding at hospital discharge

	Exclusive BF (n = 47)	BF with formula (n = 51)	P value	Exclusive BF (n = 47)	Exclusive formula after BF* (n = 31)	P value	BF with formula (n=51)	Exclusive formula after BF* (n = 31)	P value
Frequency of reported BF issues during first 2 weeks (n (%))									
Difficulty with latch	15 (31.9)	22 (43.1)	0.25	15 (31.9)	4 (12.9)	0.065	22 (43.1)	4 (12.9)	0.006
Baby lost too much weight	7 (14.9)	6 (11.8)	0.65	7 (14.9)	0 (0.0)	0.038	6 (11.8)	0 (0.0)	0.078
Baby not interested in nursing	2 (4.3)	8 (15.7)	0.094	2 (4.3)	0 (0.0)	0.51	8 (15.7)	0 (0.0)	0.022
Baby nursed too often	11 (23.4)	8 (15.7)	0.33	11 (23.4)	0 (0.0)	0.003	8 (15.7)	0 (0.0)	0.022
Concern for low breastmilk supply	14 (29.8)	19 (37.3)	0.44	14 (29.8)	1 (3.2)	0.003	19 (37.3)	1 (3.2)	<0.001
Milk letdown took too long	5 (10.6)	13 (25.5)	0.058	5 (10.6)	2 (6.5)	0.70	13 (25.5)	2 (6.5)	0.039
Sore, cracked, or bleeding nipples	16 (34.0)	12 (23.5)	0.25	16 (34.0)	0 (0.0)	<0.001	12 (23.5)	0 (0.0)	0.003
Engorgement	6 (12.8)	11 (21.6)	0.25	6 (12.8)	0 (0.0)	0.076	11 (21.6)	0 (0.0)	0.005
Breast infection	0 (0.0)	1 (2.0)	1.0	0 (0.0)	0 (0.0)	1.0	1 (2.0)	0 (0.0)	1.0
Breastmilk leaking	4 (8.5)	4 (7.8)	1.0	4 (8.5)	0 (0.0)	0.15	4 (7.8)	0 (0.0)	0.29
BF help in the hospital (n (%))					(n=7)			(n=7)	
Did you ask for help for these issues?	31 (75.6)	29 (60.4)	0.13	31 (75.6)	5 (71.4)	0.81	29 (60.4)	5 (71.4)	0.58
Did you receive help for these issues?	30 (73.2)	27 (55.1)	0.076	30 (73.2)	4 (57.1)	0.40	27 (55.1)	4 (57.1)	0.92
Did the help solve the problem?	27 (65.9)	26 (53.1)	0.69	27 (65.9)	4 (57.1)	0.69	26 (53.1)	4 (57.1)	0.82

* Among women who initiated breastfeeding

Table 3:

Comparison of usefulness of proposed educational interventions to improve exclusive breastfeeding (BF) rates, as perceived by low-income women

	Exclusive BF (n =47)	BF with formula (n=51)	P value	BF with formula (n=51)	Exclusive formula after BF (n=31)	P value	Exclusive formula after not BF (n = 20)	Exclusive formula after BF (n = 31)	P value
Agreement with usefulness of proposed educational intervention *									
Knowing more about BF benefits for mom and babies	1 (1,2)	1 (1,2)	0.72	1 (1,2)	2 (1,3)	0.0061	1 (1,2)	2 (1,3)	0.45
Knowing more about normal newborn behavior	1 (1,1)	1 (1,2)	0.72	1 (1,2)	2 (1,3)	0.0027	1 (1,2)	2 (1,3)	0.39
Watching on-demand videos showing ways to improve BF latch	1 (1,2)	1 (1,2)	0.72	1 (1,2)	2 (1,3)	0.043	2 (1,2)	2 (1,3)	0.52
Watching on-demand videos showing different BF positions	1 (1,2)	1 (1,2)	0.85	1 (1,2)	2 (1,3)	0.021	1 (1,2)	2 (1,3)	0.18
Knowing more about my legal rights with BF and work	1.5 (1,3)	1 (1,2)	0.09	1 (1,2)	2 (2,3)	0.0044	1 (1,3)	2 (2,3)	0.068
Learning how insurance helps pay for a breast pump	1 (1,3)	1 (1,3)	0.57	1 (1,3)	2 (1,3)	0.29	1 (1,3)	2 (1,3)	0.69
Learning how to order a breast pump	1.5 (1,3)	1 (1,3)	0.10	1 (1,3)	2 (1,3)	0.25	2 (1,3)	2 (1,3)	0.49
Learning more about available BF resources during pregnancy, in the hospital after delivery, and at home	1 (1,2)	1 (1,2)	0.53	1 (1,2)	2 (1,3)	0.013	1 (1,4)	2 (1,3)	0.65
Meeting women like me who are successfully BF	1 (1,2)	2 (1,2)	0.67	2 (1,2)	2 (1,3)	0.081	2 (1,4)	2 (1,3)	0.81

* As measured from an agreement scale of 1–5 with 1 being “strongly agree” and 5 being “strongly disagree.” Data represents mean (interquartile range) as calculated with Kruskal-Wallis Test, with chi-square as ties when appropriate.