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Sara L. Gill, *University of Texas Health Science Center at San Antonio*
Elizabeth Reifsnider, *Arizona State University*
Joseph F. Lucke, *State University of New York at Buffalo*

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Effects of Support on the Initiation and Duration of Breastfeeding

Sara L. Gill
University of Texas Health Science Center, San Antonio
Elizabeth Reifsnider
University of Texas Medical Branch, Galveston
Joseph F. Lucke
University of Texas Health Science Center, Houston

Researchers attempted to increase the initiation of breastfeeding and its duration to 6 months among a group of low-income, Hispanic women through an intervention program which included prenatal education and home based postpartum support. All participants were telephoned after delivery to determine infant feeding method. Duration of breastfeeding was determined by counting the number of days from initiation to the last day the baby was put to the breast. The Bayesian approach was used for the statistical analyses. In the intervention group, the propensity to initiate breastfeeding exceeded that of the control group. Results indicate the intervention group had twice (2.31) the odds of starting breastfeeding, twice (1.84-3.15) the odds of continuing to breastfeed for 6 months, and only half (.50-.54) the tendency to quit at any one time than did the control group.

Keywords: *breastfeeding; infant nutrition; home support; social support*

Substantial evidence is available documenting the superiority of breastfeeding for mothers and breast milk for babies. Knowledge that breastfeeding, however, is the optimal method of infant feeding is not enough to encourage women to nurse their young. Support from others is a major factor affecting breastfeeding success. Mothers often lack the education and support necessary to initiate and continue breastfeeding. Providing adequate

Authors' Note: This work was supported by a grant from the South Texas Health Research Center. Please address correspondence to Sara L. Gill, University of Texas Health Science Center School of Nursing, 7703 Floyd Curl Drive, San Antonio, TX 78229; (210) 567-3014; e-mail: gills@uthscsa.edu.

support and ongoing encouragement for breastfeeding mothers can increase the rates for both initiation and continuation.

Hispanic Breastfeeding

In *Healthy People 2010*, the surgeon general identified improved rates for breastfeeding as a priority for the nation. The goal is to increase the percentage of mothers initiating breastfeeding to 75% and the percentage of mothers continuing breastfeeding for 6 months to 50% (U.S. Department of Health and Human Services, 2000). Currently 66% of Hispanic mothers in the South begin breastfeeding, but only 31% continue to breastfeed for 6 months (Ryan, Zhou, & Gaston, 2004). In Texas, 50.6% of Women, Infant, and Children Supplemental Nutrition Program (WIC) mothers initiate breastfeeding, and 19% continue to breastfeed for 6 months, reflecting a downward trend which has been evident among WIC mothers since 1998 (Ross Products Division, n.d.). Breastfeeding rates in Bexar County, where this study was conducted, are lower than the national average, with only 66.2% of mothers ever breastfeeding and 29.1% continuing for 6 months (U.S. Department of Health and Human Services, 2004).

Hispanic immigrants are more likely to breastfeed compared to their U.S. born counterparts (Denman-Vitale & Murillo, 1999; Gibson-Davis & Brooks-Gunn, 2006). Additionally Gibson-Davis and Brooks-Gunn (2006) noted that for each year a Hispanic immigrant mother lived in the United States her odds of breastfeeding decreased by 4%. College educated women, women living with a partner, and women who received any prenatal care are more likely to intend to breastfeed (Byrd, Balcazar, & Hummer, 2001; Humphreys, Thompson, & Miner, 1998). Hispanic women who have previously breastfed have higher rates of breastfeeding (Byrd et al., 2001). Education and income were not associated with initiation among a group of Hispanic women on the Texas/Mexico border (Rassin et al., 1994).

In a sample comprised predominantly of Hispanic women, Whaley, Meehan, Lange, Slusser, and Jenks, (2002) identified four variables related to longer durations of breastfeeding. These included intending to breastfeed exclusively, delaying the introduction of infant formula, attending breastfeeding support groups, and having breast pumps available at the work site (Whaley et al., 2002). Early and frequent introduction of infant formula contributes to early weaning (Gonzalez-Perez, Vega-Lopez, & Cabrera-Pivaral, 1998).

Hispanic mothers are aware of the benefits of breastfeeding but identify several concerns related to breastfeeding. These include embarrassment about feeding in public, lack of confidence, loss of freedom, lifestyle restrictions, and lack of support from family and friends (Gill, Reifsnider, Mann, Villarreal, & Tinkle, 2004). Additional obstacles to breastfeeding include inconvenience of breastfeeding, pain during breastfeeding, and insufficient milk (Stopka, Segura-Perez, Chapman, Damio, & Perez-Escamilla, 2002). Less acculturated Hispanic women cite their infants' physical or medical condition as a reason for not breastfeeding whereas more acculturated Hispanic women cite their infants' preference for a bottle (Gibson, Diaz, Mainous, & Geesey, 2005).

New mothers have indicated that support during breastfeeding is one of the most crucial aspects of initiating and continuing to breastfeed (Grummer-Strawn, Rice, Dugas, Clark, & Benton-Davis, 1997). In some studies, husbands' or partners' support is most crucial (Cohen, Brown, Rivera, & Dewey, 1999) whereas other studies name support from mothers, friends, and others in the woman's social network (Balcazar, Trier, & Cobas, 1995; Bentley et al., 1999).

Investigators have conducted numerous intervention studies in an attempt to increase breastfeeding initiation and continuation rates. Professionals (nurses, lactation consultants, dieticians) have provided prenatal, in-hospital, and postpartum support for breastfeeding with mixed results (Dennis, 2002; Sikorski, Renfrew, Pindoria, & Wade, 2003). The majority of the studies reviewed found significant differences in initiation and duration rates of mothers receiving a variety of interventions ranging from prenatal lactation education, in-hospital support, postpartum home visits by professionals, and peer support (Anderson, Damio, Young, Chapman, & Perez-Escamilla, 2005; Arlotti, Cottrell, Lee, & Curtin, 1998; Caulfield, et al., 1998; Haider, Ashworth, Kabir, & Huttly, 2000; Morrow et al., 1999; Porteus, Kaufman, & Rush, 2000).

Purpose

The purpose of this study was to increase the initiation of breastfeeding and its duration to 6 months among a group of low-income, Hispanic women through an intervention program which included prenatal education and home-based postpartum support.

Design

Using a quasi-experimental design, the effects of a culturally specific breastfeeding intervention designed to increase the initiation and duration of breastfeeding among low-income, Mexican American women was examined. The sample was comprised of two preexisting groups who received prenatal care at health department–based maternity clinics at the same site as a WIC clinic. Participants were not randomized to the intervention. To prevent information sharing among participants, investigators maintained intact groups. No lactation consultants or lactation educators were employed at either the maternity or WIC clinic.

Sample and Setting

Participants were recruited from the waiting rooms at two public health department maternity clinics in a large city in the southwestern United States. All participants were Hispanic (Mexican descent). One hundred mothers were recruited for each group. Recruitment ceased when 100 mothers meeting the study criteria were enrolled in each group. Ninety-four women in the intervention group and 88 women in the comparison group completed the study. Loss in both groups was because of lost follow-up after delivery. No significant differences were found among study groups in demographic characteristics. Groups were comparable in terms of participants' ages and educational levels, number of participants who were married, number of previous children who were breastfed, number of women who worked outside the home, and number of women who were born in Mexico.

The research team consisted of two bilingual International Board Certified Lactation Consultants (IBCLC) and three certified lactation educators, two of whom were bilingual and bicultural. Institutional Review Board approval was obtained from the University and the Metropolitan Health District prior to data collection.

Women were enrolled in the study during their second trimester of pregnancy. Clinic nurses identified potential participants. One researcher approached the pregnant woman in the waiting room, explained the study, and obtained consent. Plans were to drop women who delivered premature infants (< 37 weeks), low-birth weight infants (< 2500 grams), and any infants with major congenital anomalies or conditions requiring intensive care after birth. No participants were dropped from the study.

Method

Investigators developed the intervention (prenatal education/postpartum telephone calls and home visits) after conducting focus groups with low-income women and with WIC staff (Gill et al., 2004; Reifsnider, Gill, Villarreal, & Tinkle, 2003). Women participating in the focus groups knew the benefits of breastfeeding but the perceived problems, pain, embarrassment, and inconvenience discouraged them from initiating or continuing to breastfeed. Issues such as embarrassment were discussed with participants in the intervention group. Discrete methods of breastfeeding were demonstrated; information about pumping and feeding expressed milk in public were discussed. If requested, mothers were given battery operated breast pumps to express milk during times of separation from the baby. Some mothers requested breast pumps because they did not want to breastfeed in public places. In an attempt to prevent sore nipples, correct latch-on and positioning, using a soft breast model and breastfeeding doll, were demonstrated prior to delivery. Feeding frequency and duration and breast care were also discussed.

In preparation for breastfeeding and breast care, the women in the intervention group met individually with an IBCLC during a prenatal visit to discuss breast changes during pregnancy. Opportunities were provided to ask questions. Between 36 weeks gestation and time of delivery, women in the intervention group had the opportunity to meet once again with an IBCLC to discuss breastfeeding in the hospital and to ask questions. All prenatal contact took place in the health department maternity clinic.

At 4 days, 2 weeks, 3 weeks, 4 weeks, and 6 weeks postpartum, women in the intervention group received telephone calls from a member of the research team to ascertain how the mother and infant were managing breastfeeding. At the mothers' requests or if any member of the research team deemed it necessary, the IBCLC and/or the lactation educators visited the participants in their homes. At 3, 4, 5, and 6 months postpartum, mothers again received telephone calls from a member of the research team and a home visit if requested. Information provided at each intervention telephone contact was based on the participant's responses to a breastfeeding problem assessment tool designed by the researchers. Investigators weighed infants at each home visit using a Medela Baby Weigh Scale.

Home visits were made to any woman in the intervention group who complained of pain; strategies were employed to correct the problems. Follow-up telephone calls by the lactation consultant followed the home

visit. Babies were weighed at home visit using a Medela Baby Weigh Scale if mothers were concerned about milk supply or weight gain. All mothers in the intervention group received at least one home visit.

If participants encountered no problems, they continued breastfeeding. If problems were uncovered, a home visit was scheduled for the next day. Depending on the mother's situation, the IBCLC provided specific interventions. For example, if the participant had sore nipples, she was given assistance with proper latch and positioning techniques. Participants in the intervention group received bra pads, nipple cream, or a battery operated breast pump if the IBCLC thought it was necessary. Participants in the comparison group received an incentive, a cash card for a local grocery store.

Mothers in the comparison group received standard breastfeeding education. Breastfeeding classes were available through the WIC clinic if the mothers chose to attend.

Measurement

Initiation of breastfeeding. A research team member called each woman at 3 day intervals when she was close to her delivery date. Additionally, the women in the study were provided with the cell phone numbers of the research team and advised to call when they had delivered. All women, intervention group as well as control, were contacted by the research team when they were discharged from the hospital after delivery to determine method of infant feeding that the mother had selected. Each participant told the researcher when she put the baby to the breast and how many times a day she was feeding the baby at the breast.

Duration of breastfeeding. The intervention participants who were breastfeeding received telephone calls as noted above. The comparison participants who were breastfeeding were called weekly to determine if they were still breastfeeding or had weaned. When a woman in either the intervention or comparison group informed the research team that she had discontinued breastfeeding, she was asked for the date that she last put her infant to breast, and that day was counted as the last day of lactation. The days of breastfeeding were then counted from delivery to that day.

Analysis of Data

The Bayesian approach was adopted for the statistical analyses. This approach is widespread in many areas (Berger, 2000), but has only recently

been applied in nursing research (Lucke, 2004; Rudy, Lucke, Whitman, & Davidson, 2001). Under the Bayesian approach, probabilities are *subjective* judgments quantified as *coherent* betting rates. The *posterior* distributions of the parameters of a statistical model are obtained via Bayes's Theorem from the *likelihood* of the data based on the parameters combined with the *prior* distributions of the parameters.

There were two sets of analyses. The first analysis assessed the impact of the intervention on the initiation of breastfeeding, which for each participant was measured as a binary outcome, *started* versus *did not start.* Initiation was assumed to follow a Bernoulli distribution with incidence parameters π_0 and π_1 for the control and intervention groups respectively. The impact of the intervention was assessed in a standard Bayesian approach by the log odds ratio, log ω, where $\omega = \pi_1(1-\pi_0)/\pi_0(1-\pi_1)$. The log odds ratio was determined by logistic regression using indicator coding for group membership. Accordingly, $\omega > 1$ or $\log \omega > 0$ indicated the intervention incidence exceeded the control. The prior distribution for the log odds parameter was a normal distribution with mean 0 and variance 100.

The following two hypotheses were tested: H_0: $\log \omega \leq 0$ versus H_1: $\log \omega > 0$. Under the Bayesian approach, hypotheses are tested by determining their posterior probabilities. The posterior probability is determined by finding the area under the posterior density that is relevant to the claim of the hypothesis. The given prior distribution also implies that the prior probability of H_0 was equal to that for H_1, thereby favoring neither hypothesis. Note that H_1 is equivalent to $\omega > 1$ which is equivalent to $\pi_1 > \pi_0$ and similarly for H_0.

The second analysis assessed the impact of the intervention on the duration of breastfeeding by the subgroup of women who started. The basic statistical method was survival analysis with *survival* being the duration of breastfeeding and *death* being quitting breastfeeding. The duration of breastfeeding was measured as the number of days from start to quit. The participants were each terminated at 178 days, creating fixed, right-censored observations for those women who had not quit before that time. Exploratory analyses, including log-time versus log-survival plot and log-time versus log-survival-odds plots, revealed that these data followed a log–logistic distribution (Collett, 1994) with separate shape and scale parameters for each group. Let $S_x(t)$ denote the probability of breastfeeding beyond Day t for Group x, where $x = 0$ denotes the control group and $x = 1$ denotes the intervention. The log–logistic model considers the logarithm of the duration odds at time t to be a linear function of $\log t$: $-\log\{S_x(t)/[1-S_x(t)]\} = \alpha\eta^x(\log t - \mu - \delta x)$. In this model μ and α represent the baseline location and scale parameters of the duration curve, and δ and η assess the effects of the

intervention. This model allows the computation of the probability, the odds, and the quit rate of breastfeeding at time t for both groups. Of particular importance is the *quit function* (*hazard function),* which may be interpreted as the tendency of the mother to quit breastfeeding immediately after time t. The median duration time is $t_{50} = \exp(\mu - \delta x)$, which is a function solely of the location parameters. Therefore, the effect of the intervention on breastfeeding duration was assessed by comparing the median durations for the two groups. The hypotheses tested were J_0:$\delta \leq 0$ versus J_1:$\delta > 0$. The location parameters μ and δ were given diffuse normal priors, and the scale parameters μ and δ were given diffuse log-normal priors. The prior distributions for the location parameters rendered the prior probabilities for the hypotheses J_0 and J_1 equal.

The use of Bayes's Theorem for either the logistic regression or the survival analysis yields probability densities that are not analytically tractable. Therefore, Markov chain Monte Carlo methods were employed to obtain the posterior distributions (Gelman, Carlin, Stern, & Rubin, 2004). All computations were conducted in WinBUGS Version 1.4 (Spiegelhalter, Thomas, Best, & Lunn, 2002) and R Version 2.3.0 (R Development Core Team, 2006). The Markov chain Monte Carlo simulations for the incidence data comprised 2000 burn-in samples followed by 20,000 inferential samples, and the simulations for the duration data comprised 4000 burn-in samples followed by 40,000 inferential samples. All convergence standard errors were less than one hundredth of the corresponding parameters' sampling standard errors. Post-simulation diagnostics revealed no convergence problems.

Findings

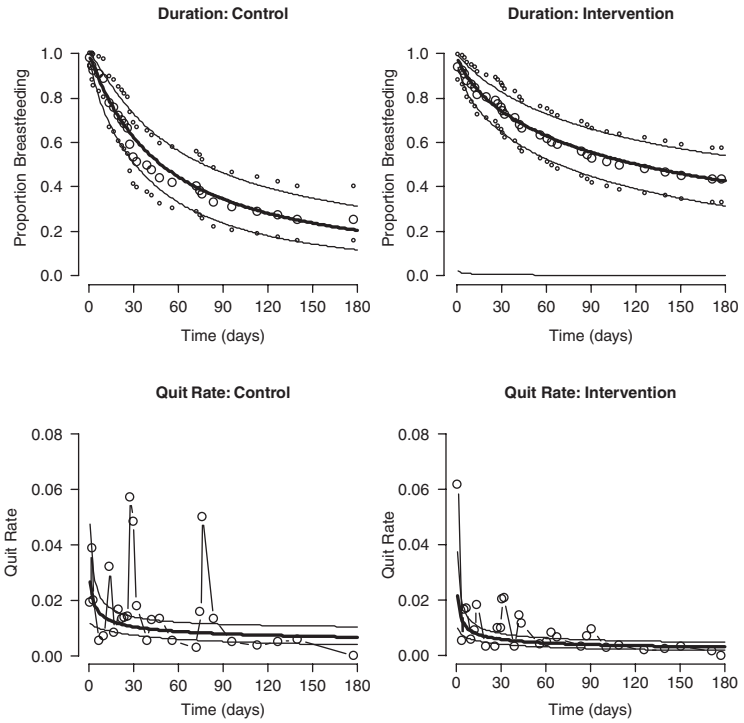
Initiating Breastfeeding

A total of 158 women completed the study, with 79 in each group (the equal sample sizes were coincidental). In the intervention group, 65 women initiated breastfeeding (82.3%), whereas 53 initiated in the control (67.1%). The posterior median odds ratio was $\omega = 2.31$ with a 95% credible interval of 1.10:4.96. The posterior probability of H_1 was .98.

Duration of Breastfeeding

As previously noted, 65 women in the intervention group and 53 in the control group initiated breastfeeding. The posterior means for the parameters of the log–logistic model were $\mu = 3.89$, $\delta = 0.93$, $\alpha = 1.04$, and $\eta = 0.72$. The

Figure 1
Duration of Breastfeeding



upper panels of Figure 1 present the empirical duration curves (larger circles) for the control (left) and intervention (right) groups together with the empirical 95% confidence intervals (smaller circles). The estimated duration curve is shown by the darker line, with the 95% credible intervals represented by upper and lower lighter lines. Visual inspection together with other diagnostics methods, not presented, indicated that this model provided an excellent fit to the data.

The duration curve for the control group shows a steeper slope and a lower ultimate duration rate than that for the intervention group. Table 1 displays the proportion of women breastfeeding in the control and intervention groups, together with the probability, odds, and quit ratios for the intervention group relative to the control. The left two columns of Table 1

Table 1
The Proportion of Women Breastfeeding in the Control and Intervention Groups

	Duration Probabilities		Ratios		
Day	Control	Intervention	Probability	Odds	Quit
30	0.62	0.74	1.19	1.84	.51
60	0.45	0.63	1.42	2.24	.50
90	0.35	0.56	1.61	2.53	.51
120	0.28	0.50	1.79	2.77	.52
150	0.24	0.46	1.94	2.97	.53
180	0.21	0.43	2.08	3.15	.54

show that the proportion of mothers who breastfed was greater in the intervention than in the control group throughout the 178 days of observation. During the first 30 days, relative probability of those breastfeeding in the intervention group was 1.19 times that of the control, and the odds of breastfeeding in the intervention group were 1.84 times those in the control. By the end of the study, the intervention group's probability rose to 2.08 times that of the control and the odds to 3.15 times that of the control. The median duration time for the intervention group was 122.1 days versus 48.8 days for the control group. The posterior probability of J_1 was 0.99.

The left lower panel of Figure 1 presents the empirical and estimated hazard curves, along with the latter's 95% credible interval, for the control group. The tendency to immediately quit breastfeeding fell rapidly during the first 2 weeks and leveled off thereafter. The empirical curve shows three spikes at approximately 15, 30, and 90 days, indicating a greater tendency to quit at that time period. Likewise, the right lower panel presents the empirical and estimated hazard curves, along with the latter's 95% credible interval, for the intervention group. Again there is a precipitous drop in the tendency to immediately quit during the first few weeks followed by a leveling off for the remainder of the study. There are small spikes in the empirical hazard curve at 15, 30, and 45 days, indicating a greater tendency to quit at that time period. The tendency to immediately quit in the intervention group relative to that in the control is given in the rightmost column of Table 1. Throughout the study period, the tendency in the intervention group remained approximately one half of that for the control. In summary, results indicate the intervention group had twice (2.31) the odds of starting breastfeeding, twice (1.84-3.15) the odds of

continuing to breastfeed for 6 months, and only half (.50-.54) the tendency to quit at any one time than did the control group.

Discussion

Study findings support an approach that includes prenatal breastfeeding education and postpartum support as a way to increase breastfeeding initiation and duration. Encouragement provided by a breastfeeding support team consisting of lactation consultants and lactation educators, nurses, and nutritionists, has clear benefits. The breastfeeding support team provided specific education to the intervention group throughout pregnancy about the benefits of breastfeeding and techniques that promote successful breastfeeding. This information was in addition to the standard breastfeeding education which was provided by the maternity clinic and WIC clinic staff to both the intervention and the comparison groups. The standard breastfeeding education stressed the benefits of breastfeeding, with little specific breastfeeding management given. The targeted intervention, prenatal education, was evidently sufficient to encourage a larger number of intervention mothers to begin breastfeeding, but the close monitoring of breastfeeding concerns and potential problems was most likely the factor which created the difference between the duration of breastfeeding in the intervention group and control group. The postpartum follow-up of frequent and planned telephone calls and home visits based on information obtained through the phone calls, provided a two-step process of providing lactation support in a systematic manner.

Prenatal breastfeeding education has been shown in a Cochrane review to have significant effects on increasing the initiation rates of breastfeeding compared to routine care (Dyson, McCormick, & Renfrew, 2005). The authors conclude that the effect is especially effective for initiation among low-income women, such as were in the current study. However, increased education does not necessarily translate into prolonged duration. Kluka (2004), in a Canadian study, found that at 24 weeks, or roughly 6 months postpartum, there was no difference between women who received targeted breastfeeding education and planned to breastfeed and women who planned to breastfeed but received usual maternity education. However, receiving a home visit from a public health nurse within 2 weeks after birth was shown in a sub-analysis to significantly prolong lactation, even when there was no difference in duration for the women who received prenatal education on breastfeeding. Forster et al. (2004) found that targeted breastfeeding

education given during midpregnancy did not increase the duration of breastfeeding in an Australian sample where the 6 month rate of breastfeeding was 50% or higher for intervention and control groups. It could be that as both groups showed (in comparison to the United States) relatively high rates of breastfeeding, a more intensive intervention such as was provided in this current study, was needed to show a difference.

Postpartum telephone calls alone are not always sufficient to promote lactation. A prospective study of 696 women in Australia from both a public and a private hospital was conducted to evaluate the effect of weekly telephone calls on women who gave birth between January and July 2003 (Fallon et al., 2005). The duration of breastfeeding was compared to a similar group of 625 women who delivered at the same hospital in 2002. There was no effect shown for telephone calls on the duration of breastfeeding for women from the public hospital. Exclusive breastfeeding was increased during the first 4 weeks for the women from the private hospital, but there was no difference in duration by 3 months postpartum. In our study, telephone calls were followed by home visits if there was any indication during the telephone conversation that the mother was experiencing breastfeeding difficulties. The combinations of telephone calls for follow-up and screening, with targeted home visits for problem solving, may be the approach that increases duration of breastfeeding.

Kang, Song, Hyun, and Kim (2005) demonstrated increased rates of lactation duration with an intervention that included information given before and after delivery to new mothers, both when they were seen in clinic visits and on home visits. Health care professionals and successful breastfeeding mothers who served as peer counselors delivered the intervention to the mothers. However, in the Netherlands, a study comparing usual care to enhanced breastfeeding intervention using women from randomized birthing centers found no difference (Kools, Thijs, Kester, van den Brandt, & de Vries, 2005). Both the intervention and control groups received breastfeeding instruction and home visits (usual maternity care in the Netherlands), but the intervention group also received referrals to lactation consultants as needed. The most predictive factor for longer duration of breastfeeding was the mother's prenatal intention to breastfeed. The lack of significance from this intervention may have been because of the high level of support for breastfeeding that is provided in the Netherlands, as evidenced by routine home visits for new mothers.

A randomized study of postpartum home visiting for new adolescent mothers showed no statistical difference in the initiation or duration of

breastfeeding (Quinlivan, Box, & Evans, 2003). Many of the adolescents reported feeling embarrassed by breastfeeding and/or reporting that their partners did not like it and wanted them to stop breastfeeding. The authors noted that many of the adolescent new mothers had ceased breastfeeding before the first home visit was made, which was 1 week postpartum. In our study, the mothers were tracked by research staff from delivery forward so intervention could begin before 1 week postpartum. Additionally, more contacts (through phone calls and a home visit if requested by the new mother) were made during the first months postpartum.

The time from delivery to 2 weeks postpartum is crucial for supporting breastfeeding (Bergh, 1993; Hughes & Cox, 1999). This is the time when lactation is being established, and the mother and infant are learning how to feed the infant at breast. Difficulties during this time period, such as breast engorgement, leaking of milk, fatigue from childbirth, perceived insufficient milk supply, and a crying or sleepy infant, can make lactation harder to maintain and make bottle feeding seem an attractive choice. The provision of lactation support through phone calls and a home visit if desired can tip the balance in favor of continuing lactation (Riordan & Gill-Hopple, 2001). This approach was shown in our study to be effective in increasing duration of breastfeeding.

Callen and Pinelli (2004), in their systematic review of breastfeeding initiation and duration in the United States, Canada, Europe, and Australia, noted that the United States has the lowest rates of breastfeeding initiation and duration of any of the countries reviewed. The reviewed literature documents that women who initiate breastfeeding and continue for a longer duration are older, more educated, have higher family incomes, have a preventive health outlook, less postpartum depression, and deliver full-term infants of normal weight. These individual characteristics demonstrate that a longer duration of breastfeeding may result from life-long health habits and health and cultural attitudes.

In addition, social and economic factors also impact the duration of breastfeeding. The WIC program has been considered in the past as a socioeconomic factor which provides a negative reinforcement to breastfeeding as it issues vouchers for free infant formula to new infants of low-income mothers who are at nutritional risk (Piper & Parks, 1996). The incidence of breastfeeding among mothers participating in the WIC program has increased in the last decade, possibly showing evidence of the WIC's breastfeeding promotion programs (Ryan, Wenjun, & Acosta, 2002). The women in our study were low income, had lower educational attainment,

and received WIC. Nonetheless, the women who received the multifaceted intervention initiated breastfeeding and breastfed for longer than the women who did not receive it.

Limitations of the study included the use of existing groups at two clinics. Both clinics are in close geographic proximity and serve a demographically similar population. However, as the women were not randomized to groups, existing biases that would affect breastfeeding initiation or duration could have been present. Strengths of the intervention included research staff that was bilingual and bicultural, home visits that were provided whenever the intervention women desired them, and close telephone follow-up.

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