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The Association Between an Electric Pump Loan Program and the Timing of Requests for Formula by Working Mothers in WIC

Karen Meehan, MPH, RD, IBCLC, Gail G. Harrison, PhD, Abdelmonem A. Afifi, PhD, Nathan Nickel, BS, Eloise Jenks, MEd, RD, and Anthony Ramirez, BS

Abstract

An electric pump loan program designed to facilitate breastfeeding for low-income mothers returning to full-time work was evaluated. All mothers were WIC participants in the Los Angeles area. Electric pump loans were made until the infant's first birthday or until the mother requested formula from WIC. Information was provided to employers on supporting breastfeeding in the workplace. A subsample of mothers who received an electric pump on return to full-time work was compared with counterparts in a wait list control group. Mothers who received an electric pump as soon as requested did not request formula until 8.8 months on average, whereas those who did not receive an electric pump requested formula on average at 4.8 months ($P < .0001$). Mothers who received an electric pump when requested were 5.5 (95% CI 2.0-15.1) times as likely as mothers who did not receive an electric pump to not request formula at 6 months. *J Hum Lact.* 24(2):150-158.

Keywords: working mothers; electric pump; breastfeeding; WIC

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Introduction

The American Academy of Pediatrics recommends that all infants be breastfed exclusively for the first 6 months, with breastfeeding continuing with complementary foods until at least 1 year of age. Healthy People 2010 goals are for 75% of infants to be breastfed in the newborn period, 50% at 6 months, and 25% at 1 year.¹ The Healthy People 2010 Midcourse Review established a goal of 60% of infants exclusively breastfeeding through 3 months and 25% exclusively breastfeeding through 6 months.² Although breastfeeding initiation rates have risen dramatically in the United States in the last decade or so, duration, and particularly duration of exclusive breastfeeding, remains less than clinically optimal on average. This is especially true for low-income women.^{1,3} In 2003, approximately 66% of US infants were breastfed at least in the newborn period.³ However, 6-month exclusive breastfeeding rates were only 17.9% and by 1 year of age the proportion of breastfed infants was only 10.4%.³ There are also disparities associated with ethnic group, with white and Asian women having higher exclusive breastfeeding rates at 6 months (20.4% and 23%, respectively) than their Hispanic and African American counterparts (15% and 9%, respectively).² At all points in time after birth, children in Special Supplemental Nutrition Program for Women, Infants and Children (WIC) are less likely to be breastfed than are children not in WIC.⁴

More than half of women in the United States with infants under 1 year old work outside the home.⁵ For many low-income mothers, the extension of breastfeeding duration beyond the first few weeks postpartum requires dealing with the practical realities of returning to work or school. Two population-based studies clearly indicate a negative effect of employment, particularly full-time employment, on breastfeeding duration. The National Maternal and Infant Health Survey of 1988, which included more than 9000 US mothers and allowed for multivariate analyses, revealed that maternal employment was not associated with initiation of breastfeeding but returning to employment within a year postpartum was associated with shorter duration, controlling for other factors.⁶ Analyses from the Food and Drug Administration's 1993-1994 Infant Feeding Practices Study came to similar conclusions, and, in addition, found that increasing number of hours worked decreased both duration and intensity of breastfeeding.^{7,8} Expecting to work full-time, particularly among low-income mothers, decreased the probability of any breastfeeding by almost half compared with mothers who did not expect to work. Working full-time at 3 months postpartum decreased breastfeeding duration by more than 8 weeks, on average.⁸ Moreover, lower income women are more likely than their higher income counterparts to return to work soon after delivery and to be engaged in jobs that make it challenging for them to continue breastfeeding.⁹

In the face of evidence that returning to work reduces breastfeeding duration, providing support for breastfeeding in the workplace has been evaluated in several contexts and shown to be a very effective means of increasing breastfeeding duration.^{10,11} For example, a worksite support program for WIC employees that included electric pump loans had dramatic success.¹² The *CDC Guide to Breastfeeding Interventions* outlines workplace support as one of the successful evidence-based breastfeeding interventions.¹⁰ Some states (including California) have passed laws requiring employers to provide lactation accommodation in the workplace. The present study was undertaken to investigate whether, besides the legal protection of the right to pump breast milk at work and employer educational support, provision of an electric pump to low-income working women would facilitate their ability to continue breastfeeding and impact their decision on when they requested infant formula from WIC.

Methods

The Public Health Foundation Enterprises WIC Program (PHFE-WIC), the largest local WIC program in the nation, has for some years made electric pumps available to mothers of preterm infants to support the use of breast milk for those infants. In September 2001, PHFE-WIC initiated a pilot program, the Working Women Pump Program (WWPP), to make electric pumps available to mothers returning to full-time employment. At that time, 39 Ameda Egnell Elite electric pumps were available for this purpose. At the same time, PHFE-WIC anticipated passage of the California Lactation Accommodation Bill, which made provision for time and space to pump breast milk in the workplace.

WIC expected the number of women returning to full-time employment would quickly exceed the number of available electric pumps. Therefore, a priority system was established for distribution of these pumps, with first priority given to women who met the following criteria:

- the mother must be returning to paid full-time employment (at least 32 hours per week);
- the mother affirmed her desire to continue exclusive breastfeeding;
- the mother gave permission for her employer to be contacted to
 - (a) verify her full-time employment, and
 - (b) to offer the employer information on worksite breast milk expression; and
- the mother agreed to return the electric pump when she requested formula from WIC.

The original 39 electric pumps were distributed in less than 1 month. As funds became available, more electric pumps were acquired and by February 2004 the WWPP had a total of 91 Ameda Egnell Elite electric pumps for distribution.

PHFE-WIC compiled a packet of information about breastfeeding for the employers. This packet included information on the California law (Assembly Bill 1025, the California Lactation Accommodation Law took effect on January 1, 2002). The law requires employers to support breastfeeding by making reasonable effort to provide the employee with the use of a private room or other location suitable for expressing breast milk (other than a toilet stall) in close proximity to the employees' work area and adequate break time to accommodate an employee desiring to express breast milk. The materials also included

information and suggestions to help employers create a breastfeeding-friendly environment. Mothers who participated in the WWPP were contacted at work once a month by phone by a WIC staff member to provide ongoing support. The electric pumps were loaned for a limited period of time, either (1) until the infant's first birthday, or (2) until the mother began to request formula supplementation from WIC, whichever came first.

Evaluation Design

The evaluation reported here took place between August 2003 and March 2005. The ongoing program did not lend itself to randomizing individuals to electric pump loan intervention and control condition. Prior to the evaluation there was a policy of opening the program whenever there were electric pumps available and simply closing it to new recruitment when all electric pumps were in use. No waiting list had been maintained because returns of loaned pumps were unpredictable. WIC participants were made aware of the availability of electric pumps only when they were actually available. Given this reality, a nonequivalent control group quasi-experimental design was employed to explore the program's effectiveness. A control group of participants was recruited by accepting applications to the program for a period of time over and above the availability of pumps. These applications were placed on a waiting list in the order they were received. As electric pumps became available they were offered sequentially to the next woman on the wait list. When women on the wait list received an electric pump they were added to the wait list delay intervention group. Women on the wait list who were never offered an electric pump (lack of availability) or those who declined an electric pump remained in the control group. The control group never received an electric pump but met the same criteria as the intervention group (ie, intent to continue breastfeeding without requesting formula from WIC, return to work at least 32 hours per week, and consent to contact their employer). Eventually, there were 3 discrete groups of women; those who received an electric pump when requested, those who received an electric pump after a delay, and those who never received an electric pump from WIC (see Figure 1). All employers were contacted and provided access to the identical materials on behalf of women in all 3 groups. All program participants provided verbal consent for their employers to be contacted and for information contained in the PHFE-WIC information system to be used for evaluation purposes. The study protocol was approved by Institutional Review Boards at UCLA and Independent Review Consulting, Inc.

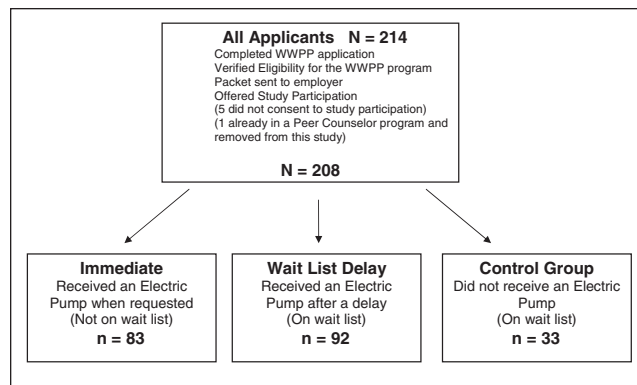


Figure 1. Distribution of participants by study group.

Outcomes Evaluated

Exclusive breastfeeding, defined as nothing except breast milk for the first 6 months,¹³ is not the norm among WIC participants in the Los Angeles area. Exclusive breastfeeding rates for hospitals in Los Angeles County at the time of this study in 2004 were only 24.4%.¹⁴ California WIC provides an “exclusive breastfeeding food package” to infants not receiving any formula from WIC. Because the infant needs only breast milk for the first 6 months, the food package actually has no food; however, it serves to designate a breastfed infant enrolled in WIC who is not receiving formula. Measurement of the length of time an infant received this food package and conversely did not receive formula is often used by California State WIC as a proxy for “exclusively breastfed” infants. There are limitations to calling this proxy measurement exclusive breastfeeding such as the over reporting of exclusive breastfeeding. It is a tool that can be used in California to measure and compare rates for partial breastfeeding where the amount of breastfeeding is inferred to be “high.”¹³ Because most infants on WIC in Los Angeles do receive some formula in the hospital and economic restraints on WIC participants result in women who need formula easily obtaining it from WIC, the authors felt that the proxy of “not taking formula from WIC” could be used as an indicator of high amounts of breastfeeding.

The principal outcomes under investigation in the present evaluation were

1. the length of time that breastfeeding women did not request formula from WIC (measured from date of infant's birth to age of the infant when the mother requested formula from WIC or censored data at infant's first birthday if formula had never been requested);

2. whether mother did not request formula from WIC for at least 6 months (≥ 182 days); and
3. whether mother did not request formula from WIC by 12 months (365 days).

Demographic, health, and workplace information were drawn from the program's administrative data and included maternal age, birthplace, ethnicity, and language preference (English or Spanish); infant gender, birth weight, and whether the infant was born at term or prematurely; source of health insurance (if any); and information on the mother's employment that included the nature of her work, the number of employees, proportion of female employees, and whether the employer had a workplace breastfeeding policy.

Statistical Analysis

Analyses were conducted using SAS v 9.1 (Cary, North Carolina). All analyses were done based on the date of formula issuance from WIC, independent of the actual date of the return of the electric pump. An α level of 0.05 was used for all statistical tests presented. Sample size requirements were originally estimated at 99 each for intervention and wait list control participants, to detect a difference of 20% in time at first formula request between groups at 4 months, and with a 20% loss to follow-up. In fact, the availability of electric pumps increased during the study and the control group ended up being much smaller. However, very little loss to follow-up occurred and the effect size was larger than we had anticipated. Prior to multivariate analyses, preliminary descriptive analyses were performed. Differences in distributions of nominal variables were evaluated with Mantel-Haenszel (where degrees of freedom ≥ 1) χ^2 tests. Differences in distributions of continuous variables were tested with 1-way factorial analysis of variance with Tukey-Kramer Honestly Significant Difference post hoc tests.

Following preliminary examination of the data, multivariate ordinary least squares or multinomial logistic regression (for continuous or binary outcomes, respectively) was used, controlling for maternal demographic and workplace characteristics described in Table 1. We confirmed our results among 3 subsamples, mothers who received an electric pump immediately, mothers who experienced some delay in receiving an electric pump, and mothers who did not receive an electric pump, via proportional hazards regression. Significance of observed differences between time-to-event curves was tested with the Wald χ^2 statistics, with hazard ratios and 95% confidence intervals calculated via proportional hazards regression (PROC PHREG) with control for maternal

demographic and employment characteristics. There was an attrition rate of 5.3% due to mothers who moved out of the service area during the course of the evaluation. For the regression analyses, those lost to follow-up were right-censored at the time of lost contact; an additional 38.5% of mothers who at 365 days were still not receiving formula from WIC were right-censored at 365 days. A total of 91 study cases (43.8%) were censored.

Finally, a rough cost-effectiveness of the electric pump loan program was explored with costs estimated as the purchase price and maintenance costs for an electric pump, plus personnel time for program administration.

Results

The Mothers and Their Jobs

Table 1 displays basic demographics and occupation-related data as well as results for the 3 study groups. For the 208 study participants, the mothers' age ranged from 18.6 to 43.8 years.

Mothers were employed in a variety of occupations. The most common occupation was office support staff (28.9%), followed by customer service workers (21.2%), professionals including teachers and social workers (18.8%), medical support staff workers (12.5%), food service workers (7.7%), and sales clerks (4.8%). An additional 5.8% reported being in managerial or supervisory positions. One mother was a college student. Places of employment ranged from very small to very large with the mean number of employees in the workplaces being 151 ± 441 persons (range, 1-3000). The mean percentage of women among employees in these workplaces was $69.9\% \pm 26.2\%$. Approximately half of mothers (49.7%) were employed in workplaces having 20 or fewer employees.

Distribution of Participants by Study Group

A total of 83 (39.9%) mothers received an electric pump on return to full-time work, on average, at 76 ± 47 days postpartum (range, 15-238). Of the 125 (60.1%) mothers on the wait list, 92 (44.2%) mothers received an electric pump after delay due to electric pump availability. A total of 33 (15.9%) mothers who were wait listed never received an electric pump because of nonavailability, constituting the quasi-experimental control group in the present evaluation. See Figure 1 for the distribution of participants in the various conditions over the course of the evaluation.

Of the mothers who received an electric pump after some time on the wait list, the mean waiting time was

Table 1. Demographic and Occupational Characteristics and Duration of Breastfeeding Without Requesting Formula, by Study Group^{a,b}

Description	Overall (N = 208)	Total Wait List (n = 125)	Electric Pump (a; n = 83)	Electric Pump Delayed (b; n = 92)	No Electric Pump (c; n = 33)	Test Statistics ^c a vs b vs c (χ^2_{MH} or ANOVA Test)
Mother's age, y ($\bar{x} \pm$ SD)	28.4 \pm 5.2	28.0 \pm 5.0	28.9 \pm 5.5	28.2 \pm 5.3	27.5 \pm 4.0	1.0 NS
Mother's ethnicity, %						0.9 NS
White	7.3	8.1	6.0	5.5	15.6	
Hispanic	77.2	78.1	75.9	78.0	78.1	
African American	11.2	9.8	13.3	11.0	6.3	
Asian American	4.4	4.1	4.8	5.5	0.0	
Mother's place of birth, %						0.8 NS
United States/Virgin Islands/Canada	55.4	56.2	54.2	56.0	56.7	
Mexico	28.9	28.1	30.1	28.6	26.7	
South/Central America	10.3	10.7	9.6	9.9	13.3	
Europe	1.5	0.8	2.4	0.0	3.3	
Asia	3.9	4.1	3.6	5.5	0.0	
Educational attainment, y ($\bar{x} \pm$ SD)	12.2 \pm 2.0	12.1 \pm 2.0	12.2 \pm 1.9	12.0 \pm 2.0	12.4 \pm 2.3	0.6 NS
Monthly household income, US\$ ($\bar{x} \pm$ SD)	1509 \pm 712	1488 \pm 683	1539 \pm 757	1544 \pm 672	1331 \pm 701	1.2 NS
Number of children in household ($\bar{x} \pm$ SD)	2.2 \pm 1.1	2.2 \pm 1.2	2.2 \pm 1.0	2.4 \pm 1.3	1.8 \pm 1.0	2.2 NS
Not proficient in English language, %	21.3	22.4	19.5	23.9	18.2	0.9 NS
Infant birth weight, oz ($\bar{x} \pm$ SD)	118.9 \pm 17.3	118.1 \pm 18.7	120.0 \pm 15.0	117.2 \pm 19.0	120.7 \pm 18.1	0.8 NS
Infant male, %	45.7	42.4	50.6	46.7	30.3	3.2 NS
Infant health coverage, %						0.003 NS
Private (eg, employer)	46.2	46.4	45.8	48.9	39.4	
Public (eg, MediCal)	46.1	48.8	42.1	45.7	57.6	
Uninsured	7.7	4.8	12.1	5.4	3.0	
Infant health problems, %	5.3	4.0	7.2	3.3	6.1	0.4 NS
Infant age at WIC enrollment, d ($\bar{x} \pm$ SD)	18.0 \pm 14.1	18.1 \pm 14.1	17.9 \pm 14.3	18.4 \pm 13.8	17.2 \pm 15.2	0.1 NS
Number of employees at workplace ($\bar{x} \pm$ SD)	151 \pm 441	178 \pm 537	112 \pm 244	205 \pm 601	104 \pm 303	1.1 NS
Percentage of female employees at workplace ($\bar{x} \pm$ SD)	69.9 \pm 26.2	70.9 \pm 25.1	67.7 \pm 27.9	71.0 \pm 23.5	70.8 \pm 29.3	0.3 NS
Days until requested formula ($\bar{x} \pm$ SD) truncated at 365 days	240 \pm 114	222.4 \pm 118.9	267.4 \pm 100.8	250.3 \pm 105.3	144.8 \pm 121.5	F = 16.5*** a > c*** b > c***

Abbreviations: SD, standard deviation; NS, not significant.

^aPublic Health Foundation Enterprises WIC Working Women Pump Program.

^b $\alpha = 0.05$.

^cNominal variables are tested with Mantel-Haenszel (where degrees of freedom ≥ 1) χ^2 statistic tests. All other variables are continuous variables and are tested with 1-way factorial ANOVA with Tukey-Kramer Honestly Significant Difference post hoc tests. All statistical tests performed on sample data via SAS v9.1. * $P < .05$; ** $P < .001$; *** $P < .0001$.

34.5 \pm 21.3 days and ranged from 9 to 181 days. With regard to maternal demographic variables or employment characteristics listed in Table 1, no statistically significant differences emerged between the initial 2 groups (electric pump vs wait list) of mothers. Similarly, no statistically significant demographic/occupational differences were found among those who received an electric pump on

request, received one after a delay, and who did not receive an electric pump (see Table 1).

Impact on Duration of No Significant Formula Use

Table 1 shows the mean days until formula was requested for mothers who received an electric pump on request, for those who received an electric pump after some delay,

and for those who never received an electric pump. Specifically, mothers who received an electric pump on request did not request formula from WIC for an average of 8 months and 24 days, whereas those who did not receive an electric pump requested formula from WIC earlier with an average of 4 months and 24 days. Mothers who received an electric pump after some delay did not request formula from WIC for an average of 8 months and 6 days, not statistically different from mothers who received an electric pump on request, but statistically different from mothers on the wait list who did not receive an electric pump.

No Request of Formula From WIC by 6 and 12 Months

The differential relationship between intervention and control groups was significant at 6 months (Group $196\chi^2_{WALD1} = 12.2, P = .002$) in the presence of demographic and workplace variables, as listed in Table 1. The odds ratios and confidence intervals for nonrequest of formula (compared with mothers who did not receive an electric pump) are presented in Table 2. Mothers who received an electric pump on request were 5.5 times as likely as mothers who did not receive an electric pump to not have requested formula by 6 months. Mothers who received an electric pump after wait list delay were 2.9 times as likely as working mothers who did not receive an electric pump to not have requested formula by 6 months. At 12 months, mothers who received an electric pump on request were 3.0 times as likely as mothers who did not receive an electric pump to still not have requested formula at 12 months. However, mothers who received an electric pump after wait list delay failed to demonstrate as statistically different from the wait list control group.

Figure 2 shows the survival (time-to-event) curves for time to WIC program formula request for the 3 groups. The curves did not differ statistically for those who received an electric pump on request and those who received an electric pump after some waiting period. However, both intervention groups' survival curves were significantly different from the nonintervention control group ($P < .0001$).

Discussion

Although WIC programs have loaned electric pumps to WIC participants for many years, little has been published about the effect of these pumps on breastfeeding. This study provides evidence that a program providing free loans of electric pumps to low-income

Table 2. No Request of Formula From WIC by 6 and 12 Months for Mothers Receiving Electric Pumps^a

	Odds Ratios (95% Confidence Intervals)	
	6 Months	12 Months
Received electric pump at time of request	5.5 (2.0-15.1) ^c	3.0 (1.2-7.2) ^b
Received electric pump after some delay	2.9 (1.1-7.7) ^c	1.6 (0.7-3.8) not significant

^aData fit assessed in hierarchical multinomial logistic regressions. Referent = no electric pump group.

^b $P < .05$.

^c $P < .002$.

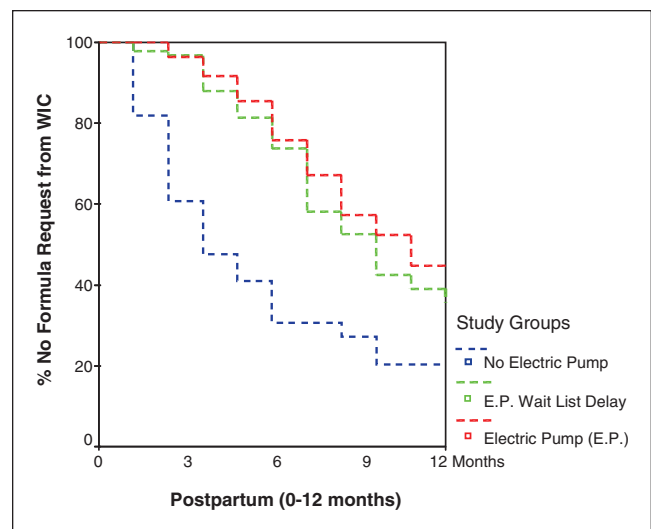


Figure 2. Survival curves by study group for time (in months) to request formula.

women who return to work full-time and who wish to breastfeed will significantly delay their requests for formula when they have use of an electric pump provided by WIC. Women expressed much gratitude for the use of the electric pumps and the vast majority followed the guidelines of the WWPP, returning the electric pump when they requested formula. Some electric pump returns were delayed; however, formula issuance was not dependent on the pump return.

A number of recent studies, of varying size and scope, have investigated the determinants of early termination of breastfeeding in various populations.¹⁵ Most of these have focused on very early termination—in the first few weeks postpartum—and on factors relating to difficulty in establishing lactation and persisting beyond common early problems of sore nipples, lack of confidence (including

perception of insufficient milk), and lack of social support.^{16,17} For many mothers, the extension of breastfeeding duration beyond the first few weeks postpartum requires dealing with the practical realities of return to work or school. Support for breastfeeding in the workplace has been shown to be a very effective means of increasing breastfeeding duration. The *CDC Guide to Breastfeeding Interventions* outlines workplace support as one of the successful evidence-based breastfeeding interventions.¹⁰ The right of women to pump breast milk in the workplace is protected legally only in some states. Without laws and incentives, few employers actually provide formal lactation support programs for their employees. Low-income women, among whom Hispanic and African American women are overrepresented, are more likely than their higher income counterparts to return to work earlier and to be engaged in jobs that make it challenging for them to continue breastfeeding.

Undoubtedly, mothers who return to work benefit from laws that protect breastfeeding in the workplace; however, women will also benefit from public health programs that can provide the type of ongoing personal support, pump interventions, and workplace involvement demonstrated by the WWPP as an effective strategy to help low-income working women achieve their goal of breastfeeding while returning to full-time employment.

A few components of the WWPP warrant highlighting. Intention to breastfeed serves as a predictor of a mother's personal commitment to breastfeeding. The WWPP focused its support on this highly motivated group of women who intended to exclusively breastfeed their infants. It should be noted that women without an electric pump did not request formula for an average of more than 4½ months suggesting a very strong commitment to breastfeeding even among the control group. The WWPP also provided mothers monthly contact with WIC staff that provided a measure of ongoing support to encourage the mother to achieve her breastfeeding goals. Also the work environment that these women returned to had a heightened awareness of the California Lactation Accommodation Law because of their contact with the WIC staff and because of the materials provided to them.

Limitations

Although this evaluation demonstrated the effectiveness of the electric pump intervention, these results may not be representative of all WIC mothers, especially among women who are less motivated to breastfeed without the use of formula. Women were informed about the WWPP guidelines and priorities at the time of application to the

program, when they received an electric pump and when they requested formula. Women in this evaluation were not interviewed about their infant feeding practices. We relied solely on the food packet issuance to determine when they began receiving formula from WIC and used the lack of formula issuance from WIC as a proxy for high amounts of breastfeeding. Some women may have viewed the electric pump as a greater economic value than formula and subsequently purchased formula instead of obtaining it from WIC. An inherent study limitation existed since women were not randomly assigned to these 3 groups. Also there were factors such as length of maternity leave, parity, previous success with breastfeeding, degree of breastfeeding support at the workplace, and so on, which were not measured that could influence the outcomes.

A surprising finding of this study was the similarity in the survival curves between women who received an electric pump when requested and those who were on the wait list yet eventually did receive an electric pump. Although we are not able to identify the exact reason for the similarities, it is possible that some women requested electric pumps much earlier than their actual return to work date indicated on their applications (not influenced by being on a wait list), delayed their return to work, or possibly found another source for maintaining their milk supply while waiting. Although the use of other types of breast pumps was not the focus of this study, we were aware that some women in all 3 groups did receive a Medela SpringExpress manual pump or a Medela PedalPump with a double pump attachment kit. The Medela PedalPump was offered to women if an electric pump was not immediately available, yet some women declined it. Use of the Medela SpringExpress manual pump was not tested due to incomplete data. However, we tested the effect of the 50 PedalPump loans (39 in wait list delay group and 11 in the control group) and found these not to be statistically significantly different from no electric pump loan (data not shown).

Costs and Effectiveness of the Electric Pump Loan

Estimating dollars saved in medical care costs and WIC formula supplementation is beyond the scope of this article. However, one study suggested that exclusively breastfeeding an infant for 3 months saves the health care system a minimum of \$331 per child.¹⁸ Administrative data indicate that the direct food supplementation cost to the WIC program is significantly lower among the breastfeeding infant-mother dyad client populations than for WIC formula supplemented

infant client populations.¹⁹ Although these data are not current, we can assume that a similar differential holds for the existing WIC food packages. Proposed changes to the WIC food packages, when implemented, will change relative costs but formula remains the single most expensive item in the WIC food packages.

It is important to recognize that there are a variety of types of electric pumps and costs for them vary widely. The costs identified for this brief analysis reflect the costs at the time of the study. The purchase price of the Ameda Egnell Elite electric pump (the only electric pump used in this study) for the California State WIC Program was \$287 per pump and an additional \$19 per mother for new personal attachment kits and additional \$50 in maintenance over the life of the electric pump. A conservative expectation would be that each electric pump could serve 5 mother–infant dyads over its lifetime at a cost of \$86.40 per program participant receiving an electric pump ($\$287 + \$50/5 + \$19 = \86.40). Administrative costs for the WWPP, after initial development, were about 5 hours (at \$20/hour) of paraprofessional staff time per participant or about \$100 per participant. (Staff time is spent providing education and ongoing support to the mother, contacting and providing materials for the employer, and tracking and cleaning pumps.) Based on this information, we estimate the dollar cost of the program to be approximately \$186 ($\$86 + \100) per participant. If loan of an electric pump among diverse populations of low-income working mothers prolongs the period of not requesting formula from WIC among mothers who intend to exclusively breastfeed as demonstrated in the present evaluation, by an average of 4 months, then the program cost would be \$46.50 ($\$186/4 = \46.50) per additional infant-month (beyond 4.8 months) of breastfeeding without requesting formula from WIC. Actual cost data for the infant food package for California WIC at the time of the study was unavailable to the authors. Therefore, a direct monthly cost comparison between the women receiving the services of WWPP (support for breastfeeding, an electric pump, and no infant formula) and women receiving the infant food package containing infant formula could not be made. It might be inferred, though, that the health care savings cost alone for an infant exclusively breastfed for 3 months as discussed earlier¹⁸ makes this type of intervention extremely cost effective.

In conclusion, our evaluation of an electric pump program among a sample of full-time working mothers who received an electric pump at WIC in Los Angeles revealed a significant proportion of these mothers not

requesting formula from WIC at 6 and 12 months, even among those who experienced some delay in receipt of the electric pump. Future research on electric pump programs that includes greater detail of actual infant feeding practices would shed light on how electric pumps in WIC can be used as an incentive to promote the desired outcome of high rates of exclusive breastfeeding, especially among working women. In addition, there may be policy considerations related to funding for electric pumps for the WIC program nationally, especially in light of the upcoming change in the WIC food package and WIC's desire to have an increasingly positive influence on breastfeeding rates among WIC participants. There are considerable disincentives for breastfeeding within a large urban area like Los Angeles. WIC will continue to need to evaluate strategies for providing breastfeeding support and to use proven effective incentives to help participants in WIC overcome the hurdles inherent in achieving exclusive breastfeeding for the first 6 months. The use of electric pumps may be one cost-effective strategy; however, further research will be needed to determine what type of electric pump programs achieves optimal results.

References

1. US Department of Health and Human Services. *Healthy People 2010: National Health Promotion and Disease Prevention Objectives*. Washington, DC: US Government Printing Office; 2000:46.
2. US Department of Health and Human Services. *Healthy People 2010: Midcourse Review*. Washington, DC: US Government Printing Office; 2007:16-30.
3. Mothers Survey, Ross Products Division of Abbott. *Breastfeeding Trends Through 2003*. Columbus, OH: Abbot Laboratories; 2003.
4. Ryan AS, Zhou W. Lower breastfeeding rates persist among the Special Supplemental Nutrition Program for Women, Infants and Children participants, 1978-2003. *Pediatrics*. 2006;117:1136-1146.
5. Bureau of Labor Statistics. *Employment of Mothers With Infants*. <http://stats.bls.gov/opub/td/1999/jun/wk2/art02.htm>. Accessed February 18, 2007.
6. Visness C, Kennedy K. Maternal employment and breast-feeding. *Am J Public Health*. 1997;87:945-950.
7. Fein S, Roe B. The effect of work status on initiation and duration of breast-feeding. *Am J Public Health*. 1998;88:1042-1046.
8. Roe B, Whittington L, Fein S, Teisl M. Is there competition between breast-feeding and maternal employment? *Demography*. 1999;36:157-171.
9. Lindberg LD. Trends in the relationship between breastfeeding and postpartum employment in the United States. *Soc Biol*. 1996;43:191-202.
10. Shealy KR, Li R, Bentn-Davis S, Grummer-Strawn LM. *The CDC Guide to Breastfeeding Interventions*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention; 2005.
11. Cohen R, Mrtek MB. The impact of two corporate lactation programs on the incidence and duration of breastfeeding by employed mothers. *Am J Health Promot*. 1994;8:436-441.
12. Whaley SE, Meehan K, Lange L, Slusser W, Jenks E. Predictors of breastfeeding duration for employees of the Special Supplemental

- Nutrition Program for Women, Infants and Children (WIC). *J Am Diet Assoc.* 2002;102:1290-1293.
13. Labbok M, Krasovec K. Toward consistency in breastfeeding definitions. *Stud Fam Plann.* 1990;21:226-230.
 14. California Department of Public Health: Genetic Disease Screening Program, Newborn Screening Data, 2004. Maternal, Child and Adolescent Health Program. September 2007.
 15. Dennis C-L. Breastfeeding initiation and duration: a 1990-2000 literature review. *J Obstet Gynecol Neonatal Nurs.* 2002;31:12-32.
 16. Ozturk Ertem I, Votto N, Leventhal JM. The timing and predictors of early termination of breastfeeding. *Pediatrics.* 2001;107:543-548.
 17. Zaghoul S, Harrison GG, Fendley HR, Pierce R, Morrissey C. Correlates of breastfeeding initiation in southeast Arkansas. *South Med J.* 2004;97:446-450.
 18. Ball T, Wright A. Health care costs of formula feeding in the first year of life. *Pediatrics.* 1999;103:870-876.
 19. Montgomery D, Splett P. Economic benefit of breast-feeding infants enrolled in WIC. *J Am Diet Assoc.* 1997;97:379-385.

Resumen

Evaluamos un programa de préstamo de bombas eléctricas para facilitar la lactancia materna a mujeres de bajos

recursos económicos que regresan a su trabajo de tiempo completo. Todas las madres son participantes en el programa WIC en el área de Los Ángeles. El programa de préstamo de bombas eléctricas se hizo hasta que el bebe cumple un año de edad o hasta que la madre solicita formula de WIC. Se dio la información a los empleadores que apoyan la lactancia materna en el trabajo. Comparamos los grupos de madres que recibieron las bombas eléctricas al volver a su trabajo de tiempo completo en contraste con aquellas en la lista de espera del grupo control. Las madres que recibieron la bomba eléctrica al solicitarla no pidieron formula hasta los 8.8 meses en promedio, mientras que aquellas que no recibieron la bomba eléctrica solicitaron formula a los 4.8% meses ($P < .0001$) en promedio. Las madres que recibieron una bomba eléctrica cuando la pidieron no solicitaron formula en 5.5 (95% CI 2.0-15.1) veces mas que aquellas que no recibieron la bomba eléctrica a los 6 meses.