

Incentive-based Intervention to Maintain Breastfeeding Among Low-income Puerto Rican Mothers

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abstract

BACKGROUND AND OBJECTIVE: Despite maternal and child health benefits, breastfeeding rates are relatively low among low-income Puerto Rican mothers. This study examined the hypothesis that monthly financial incentives would significantly increase the proportion of breastfeeding mothers at 6 months postpartum compared with Supplemental Nutrition Program for Women, Infants, and Children (WIC) services only among Puerto Rican mothers.

METHODS: A randomized, 2-arm parallel-group design, from February 2015 through February 2016. Half of the randomized participants received monthly financial incentives contingent on observed breastfeeding for 6 months (Incentive), and the other half received usual WIC services only (Control). Thirty-six self-identified Puerto Rican women who initiated breastfeeding were enrolled. Monthly cash incentives were contingent on observed breastfeeding increasing the amount given at each month from \$20 to \$70 for a total possible of \$270.

RESULTS: The intent-to-treat analysis showed significantly higher percentages of breastfeeding mothers in the incentive group at each time point compared with those in the control group (89% vs 44%, $P = .01$ at 1 month; 89% vs 17%, $P < .001$ at 3 months; 72% vs 0%, $P < .001$ at 6 months). No significant differences were detected at any time point between study groups for self-reported exclusive breastfeeding rate and infant outcomes (ie, weight, emergency department visits).

CONCLUSIONS: Contingent cash incentives significantly increased breastfeeding through 6-month postpartum among WIC-enrolled Puerto Rican mothers; however, no significant differences between the study groups were observed on exclusive breastfeeding rate and infant outcomes. Larger-scale studies are warranted to examine efficacy, implementation potential, and cost-effectiveness.



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Dr Washio conceptualized and designed the study, obtained the funding, implemented the study, analyzed the results, and drafted the manuscript; Ms Humphreys, Colchado, and Sierra-Ortiz provided administrative, technical, and material support and developed educational materials used in the research; Dr Zhang conducted statistical analyses and assisted in drafting the initial manuscript; Dr Collins helped design the study and critically reviewed the manuscript; Dr Kilby helped design and implement the study; Dr Chapman helped implement and design the study and

WHAT'S KNOWN ON THIS SUBJECT: It has been a major challenge to maintain breastfeeding among low-income Puerto Rican mothers. Professional and peer breastfeeding support has not significantly improved breastfeeding rates at 1 and 3 months.

WHAT THIS STUDY ADDS: The study describes the novel, potentially effective approach of using financial incentives contingent on observed breastfeeding behavior to help low-income Puerto Rican mothers maintain breastfeeding for 6 months.

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The American Academy of Pediatrics¹ recommends exclusive breastfeeding for ~6 months of life, with continued breastfeeding at least through the first year. However, low-income racial/ethnic-minority women breastfeed for an average duration of 4 months.² Suboptimal breastfeeding increases the risk for infant mortality in the first 6 months³ and a variety of pediatric infectious diseases, including otitis media, gastroenteritis, and respiratory infections,⁴⁻¹¹ as well as maternal postpartum weight retention,¹² type II diabetes, depression, and breast and ovarian cancer in mothers.¹²⁻¹⁵ Excessive infant weight gain as a likely result of excessive formula feeding increases the risk of childhood overweight and obesity.¹⁶⁻¹⁹ More than \$3.6 billion in annual health care costs would be saved if breastfeeding increased to the rates endorsed by Healthy People 2020, and \$13 billion would be potentially saved annually if 90% of mothers in the United States exclusively breastfed their children as recommended.⁵

Younger, less educated, and single racial/ethnic-minority mothers in the United States and Puerto Rico are at risk for early weaning from breastfeeding,^{2,20-22} perhaps related to breastfeeding-related technical issues (ie, latching issues and resulting sore nipples^{23,24}), psychosocial issues (ie, early introduction of formula milk,^{18,21} perception that infants prefer formula milk,²⁵ desire to keep infants full longer,²⁶ return to work,^{26,27} confidence in breastfeeding,^{25,28,29} and social support^{28,30}), and economic issues (ie, distribution of free infant formula by the Special Supplemental Nutrition Program for Women, Infants, and Children [WIC]^{18,23}).

Low-income Hispanic women have 6- and 12-month duration rates (45% and 25%) similar to non-Hispanic white women.²

WIC-receiving mothers in Puerto Rico maintain a median duration of 5 months for any breastfeeding¹⁸; however, a considerable disparity in breastfeeding duration has been observed among low-income Puerto Rican women in the United States, reported with a median duration of only 2 weeks in a sample.³¹

Peer support is more effective than structured education or professional support in maintaining breastfeeding.³²⁻³⁵ However, a review by Chapman and Perez-Escamilla³¹ demonstrated that the observed improvements in continuation at 1 and 3 months were generally not statistically significant, despite significantly improved initiation rates among minority women. A combination of prenatal education, social support, and self-management skills achieved the median breastfeeding duration of 12 weeks self-reported among black and Latina mothers in a recent report.³³

Despite a series of breastfeeding support provided by WIC clinics in the mid-Atlantic region including enhanced food packages, the average breastfeeding duration in this region remains relatively short (<10 weeks). WIC remains the largest distributor of free infant formula in the United States, potentially undermining efforts to promote breastfeeding.^{23,31,36-38}

Incentives that are immediately delivered contingent on verified occurrence of a specific observable behavior have been effective in encouraging healthy behavior change.³⁹⁻⁴³ Incentives have been used to attempt to increase breastfeeding continuation rates, although these were not contingent on observed breastfeeding behavior, and mixed findings have been reported.⁴⁴ Support for household chores and child care by nurses for 6 weeks postpartum and weekly gifts and vouchers for 8 weeks postpartum resulted in a nonsignificant increase in

breastfeeding rates.^{45,46} Gift packages for infant and postpartum care for attending prenatal and postpartum breastfeeding support sessions resulted in a significant increase in breastfeeding rates between 3 and 6 weeks postpartum.⁴⁷

The current study examined the effect of monthly financial incentives contingent on observed breastfeeding in addition to WIC breastfeeding support on maintaining breastfeeding through 6-month postpartum among low-income, urban Puerto Rican mothers. The study compared 2 study groups: (1) a group that received usual WIC breastfeeding support only and (2) a group that received usual WIC support and monthly financial incentives contingent on observed breastfeeding. It was hypothesized that monthly financial incentives contingent on observed breastfeeding would increase the proportion of mothers breastfeeding through 6 months postpartum among low-income Puerto Rican mothers enrolled at WIC.

METHODS

Sites and Participants

To be eligible for the study, a woman had to (1) self-identify as Puerto Rican or of Puerto Rican descent, (2) be able to read or speak Spanish or English, (3) currently live in the area and plan to stay through 6 months postpartum, (4) be enrolled in a WIC program, and (5) initiate breastfeeding. Exclusion criteria included a woman who self-reported (1) ongoing illicit drug use, (2) current active suicidal thoughts or a past suicide attempt, (3) untreated HIV (breastfeeding contraindicated), or (4) postpartum medical problems (eg, postpartum hemorrhage, infections, and serious jaundice requiring exchange transfusion).

Puerto Rican mothers who initiated breastfeeding were referred to research staff by a social worker

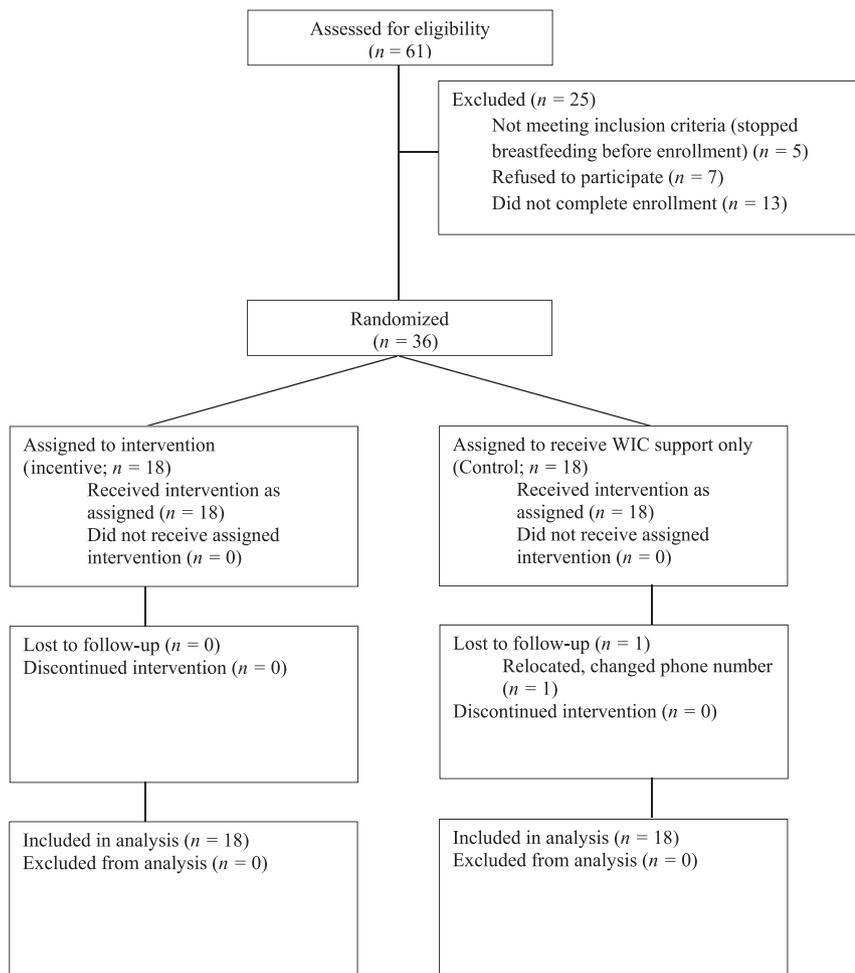


FIGURE 1
Consolidated Standards of Reporting Trials (CONSORT) diagram.

(M.O.) at the urban hospital. Among 10 WIC offices in the city of Philadelphia, Pennsylvania, 2 provide benefits and services to a large number of Puerto Rican mothers, and the urban hospital for participant referral was near these WIC offices. Research staff met potential participants at either their WIC office or their home for screening and enrollment within 2 weeks after delivery.

A total of 61 women were assessed for eligibility (Fig 1). Thirty-six women (59%) were enrolled; 5 (8%) stopped breastfeeding before enrollment, 7 (12%) declined to participate, and 13 (21%) expressed an interest but were lost before completing the enrollment process.

The study was approved by the local institutional review board at the Treatment Research Institute, where the study was funded, and all participants provided written consent.

Study Intake and Follow-up Assessments

All participants completed an interview at study entry with questions on sociodemographic characteristics, attitude toward breastfeeding, history, support, and self-efficacy of breastfeeding (ie, Breastfeeding Self-Efficacy Scale²⁹), maternal and infant health, acculturation (ie, Acculturation Rating Scale for Mexican Americans II^{48,49}), and postnatal depression (ie, Edinburgh Postnatal Depression

Scale^{50,51}). A modified version of this assessment was repeated at 1, 3, and 6 months postpartum. Breastfeeding was visually verified by research staff (ie, not based on maternal self-report), looking for 1 of the following indicators of successful breastfeeding in the infant: audible swallowing, a regular suck-swallow-breath pattern, or visible milk in the infant's mouth after he or she is not latched anymore. For a mother who pumps milk, staff observed pumping combined with the resulting milk being fed to the infant. There was no required duration of feeding at assessments other than providing visual indicators that breast milk had been fed. Research staff weighed participants' infants using a portable Health O Meter 386S Infant Scale (Precision Weighing Balances, Haverhill, MA) before feeding. Modified versions of this battery were completed at 1, 3, and 6 months postpartum either at a WIC office or the participant's home. All participants in both study groups were compensated \$25 per assessment independent of breastfeeding status, for a total potential earning of \$100 per participant for completing follow-up assessments.

Study Groups

The study used a randomized, 2-arm parallel-group design. The study was conducted from February 2015 through February 2016. Half of the participants ($n = 18$) were randomized into the WIC-only control group and the other half ($n = 18$) into the WIC + incentive (incentive group). Eighteen individuals per group has been determined to be sufficient to provide accurate estimates for clinically meaningful (ie, moderate to large) effect sizes in a pilot study with consideration for a potential attrition rate of 20% at follow-up.⁵² Because of the small sample size, the SAS PROC PLAN using allocation blocks of

2 was used by a statistician to ensure balance in the groups, and 2 research assistants who enrolled participants (M.H. and E.C.) were informed of each group assignment independently based on the randomization table.

Control Group

Participants in the control group received standard breastfeeding services from the WIC program and were asked to participate in the periodic follow-up assessments described earlier. Standard services included on-site lactation consultation, bilingual peer counseling, weekly peer support meetings, free breast pump, and enhanced food package for breastfeeding mothers. When a participant had trouble with breastfeeding, she was referred to a bilingual home-visiting breastfeeding peer counselor in the area. Participants who stopped breastfeeding received the usual WIC food package for nonbreastfed infants, which included infant formula and were encouraged to stay in the study for periodic assessments.

Incentive Group

In addition to usual WIC services and periodic assessments, participants in the incentive group were asked to demonstrate breastfeeding in front of research staff at monthly sessions completed either at a WIC office or participant's home and received financial incentives (cash) if breastfeeding was demonstrated. The incentive amount was \$20 at the end of the first month and increased by \$10 every month until the end of 6 months. The initial incentive value of \$20 was determined based on input from WIC-receiving Puerto Rican mothers as the minimum amount of monthly incentives that would motivate them to breastfeed, and an escalating schedule of monthly incentives was used based on previous incentive-based interventions to encourage continuous abstinence from

TABLE 1 Participant Characteristics

	Incentive (<i>n</i> = 18)	Control (<i>n</i> = 18)	<i>P</i>
Age, mean (SD)	24.1 (4.7)	23.0 (4.6)	.49
Education, mean (SD), y	12.2 (1.5)	11.3 (1.6)	.15
Employed, <i>n</i> (%)	4 (22)	5 (28)	.70
US born, <i>n</i> (%)	6 (33)	7 (39)	.73
Acculturation to US, mean (SD) ^a	0.1 (0.9)	0.2 (1.4)	.57
Prepregnancy BMI, mean (SD)	28.6 (7.3)	29.2 (6.2)	.43
Postpartum depression, mean (SD) ^b	3.3 (4.5)	4.6 (4.4)	.31
Smoking history last pregnancy, <i>n</i> (%)	3 (17)	2 (11)	.63
Breastfeeding self-efficacy, mean (SD) ^c	173 (20)	161 (25)	.07
Breastfed before, <i>n</i> (%)	9/18 (50)	8/17 (47)	.86
Mother breastfed, <i>n</i> (%)	11/18 (61)	7/17 (41)	.24
Primiparous, <i>n</i> (%)	7/18 (39)	8/18 (44)	.74
Infant birth weight, mean (SD), g	3110.3 (712.3)	3236.9 (885.9)	.64

^a Modified version of the Acculturation Rating Scale for Mexican Americans II (possible highest score of 3 for being a strong American orientation; reliability: $\alpha = .86-.88$; intercorrelation: $r = 0.89$).^{56,57}

^b Edinburgh Postnatal Depression Scale (possible highest score of 30; reliability: $\alpha = .91$; convergent validity with the Beck Depression Inventory: $\rho = 0.85$, $P < .001$).^{58,59}

^c Breastfeeding Self-Efficacy Scale (possible highest score of 195; reliability: $\alpha = .96$; validity: $\alpha = .94$).²⁴

substance use.⁵³ The maximum potential earning from monthly financial incentives during the course of the study was \$270 for participants who breastfed for all 6 months. When a participant did not demonstrate breastfeeding or pumping, she did not receive the incentive. The participant was given an opportunity to demonstrate breastfeeding within a week to be eligible for the monthly incentive. This was not a blinded study because the control group did not receive any monthly incentives besides the compensation for the periodic assessments, and participants were informed of the difference between the 2 groups (ie, monthly incentives contingent on observed breastfeeding) before providing written consent.

Data Analysis

Data analysis was conducted based on intention-to-treat ($N = 36$).⁵⁴ Baseline characteristics were compared by study group. Continuous and categorical variables were reported as mean \pm SD or percentages with 95% confidence interval (CI), and analyzed by Pearson χ^2 test for categorical variables and the Wilcoxon rank-sum tests for continuous variables. Fisher's exact test was used when

a cell count was <5 . The Cochran-Armitage Trend Test was used to examine the trend of breastfeeding from 1 month through 6 months postpartum.

Cohen's *h* was used to calculate effect sizes and 95% CIs for the comparison of study groups on the categorical variables, including the proportions of breastfeeding rates and emergency department visits for infants at 1, 3, and 6 months postpartum. The resampling bootstrap method for effect sizes and 95% CI via Cohen's *d* was used to examine the mean infant weight as well as standardized differences from weight for age *z* scores, based on the World Health Organization Growth Reference Standards⁵⁵ between study groups at 1, 3, and 6 months postpartum. All analyses were performed using StataCorp 2015 (Stata Statistical Software: Release 14, College Station, TX: StataCorp LP), SAS 9.3 (SAS Institute, Cary, NC), and R version 3.2.1 (R Foundation for Statistical Computing Platform).

RESULTS

Participant Characteristics

There were no significant baseline differences between study groups (Table 1).

Breastfeeding Status

All participants in the incentive group and 94% (17/18) of the participants in the control group completed all postpartum assessments. One participant in the control group was lost to follow up at the 3- and 6-month postpartum assessments because she moved out of state. No participant discontinued the intervention, leaving 36 participants available for inclusion in the intent-to-treat analyses. No study-related adverse events were reported in the incentive group. Breastfeeding status was compared between study groups at 1, 3, and 6 months postpartum (Fig 2). Significantly higher percentages of mothers in the incentive group maintained breastfeeding at each time point compared with those in the control group (89% vs 44%, $P = .01$ at 1 month; 89% vs 17%, $P < .001$ at 3 months; 72% vs 0%, $P < .001$ at 6 months). The estimated Cohen's h effect sizes and their 95% CIs were large at all 3 time points (1.03, 95% CI 0.15 to 1.87; 1.99, 95% CI 0.32 to 3.67; 2.15, 95% CI 0.62 to 3.72). Breastfeeding rates did not significantly differ by primigravida status (1 month: $P = .18$; 3 month: $P = .31$; 6 month: $P = .16$).

It is notable that all mothers who breastfed at 1 month postpartum in the incentive group continued breastfeeding at 3 months postpartum. No significant change for breastfeeding rates was observed over time ($P = .19$) for the incentive group, suggesting maintenance of breastfeeding over 6 months postpartum. In contrast, a significant decrease in breastfeeding was observed over time for the control group ($P = .001$). The mean duration of breastfeeding was 149 (54) days in the incentive group and 49 (44) days in the control group ($P < .001$). The participants in the incentive group earned on average a total of \$199 (106) for contingent monthly financial incentives during 6-month postpartum.

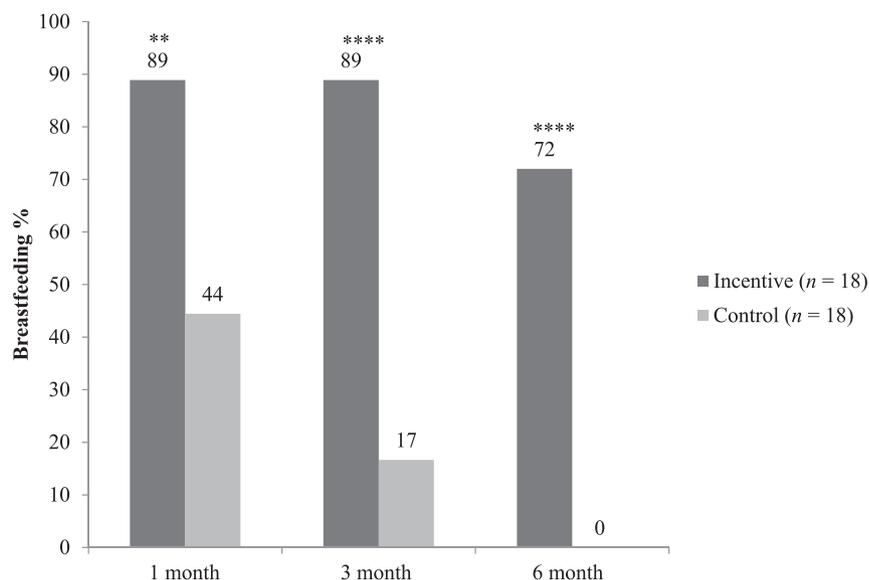


FIGURE 2 Breastfeeding status during 6 months postpartum. ** $P = .01$; **** $P < .0001$.

One participant in the incentive group and no participant in the control group exclusively breastfed through 6 months postpartum. Seventy-two percent in the incentive group and 89% in the control group started providing formula supplementation by 1 month postpartum ($P = .40$), and 89% in the incentive group and 100% in the control group by 3 months postpartum ($P = .49$). There were no significant changes of the formula introduction trends in either group ($P = .09$ for the incentive group and $P = .21$ for the control group).

Infant Outcomes

Average infant weights did not differ significantly between study groups at baseline and subsequent time points (Table 2) with weights being consistently lighter in the incentive group than the control group at each time point. The standardized differences from weight for age z scores⁵⁵ in each study group also did not significantly differ between the groups (Table 3) with the standardized differences consistently smaller in the incentive group than the control group at each time point. The estimated Cohen's d effect sizes

and their 95% CIs were moderate at 1 and 3 months postpartum and small at 6 months postpartum in both measures (Tables 2 and 3).

Although the proportion of emergency department visits for infants was consistently lower in the incentive group, no significant differences were detected between study groups (incentive versus control: 11% vs 22% at 1 month, $P = .66$; 0% vs 18% at 3 months, $P = .10$; 6% vs 12% at 6 months, $P = .60$). The estimated Cohen's h effect sizes and their 95% CIs were small at 1 month postpartum (0.28, 95% CI -0.34 to 0.94), moderate at 3 months postpartum (0.63, 95% CI 0.21 to 1.05), and small at 6 months postpartum (0.22, 95% CI: -0.43 to 0.87).

DISCUSSION

To our knowledge, the current study is the first to demonstrate evidence that providing monthly financial incentives contingent on observed breastfeeding supplemental to WIC breastfeeding support significantly increases the proportion of breastfeeding mothers through 6 months postpartum

TABLE 2 Infant Weight Measures

	Incentive, Mean (SD)	Control, Mean (SD)	Difference in Mean Weights (SD) (95%CI)	P	Effect Size (95% CI)
1 mo	3772.0 (767.2)	4223.3 (1150.7)	-451.3 (977.9) (-1117.4 to 214.8)	.13	-0.46 (-1.16 to 0.24)
3 mo	5503.2 (782.3)	5884.9 (1016.1)	-381.7 (903.2) (-1010.2 to 246.8)	.23	-0.42 (-1.14 to 0.30)
6 mo	7610.3 (950.5)	7726.4 (1294.1)	-116.2 (1130.2) (-904.5 to 672.2)	.80	-0.10 (-0.81 to 0.61)

among low-income, urban Puerto Rican mothers. Although exclusive breastfeeding was not the focus of this study, with the goals of exclusive breastfeeding by Healthy People 2020 being 46.2% at 3 months and 25.5% at 6 months,⁶⁰ future studies should consider ways to improve exclusive breastfeeding rates among low-income Puerto Rican mothers.

A total of \$270 potential earnings for 6-month postpartum is not excessively expensive, relative to other studies.⁴⁴ Tangible incentives with a lower value than \$270 (ie, \$25 for father participation in 2 breastfeeding classes⁶¹) did not result in significant differences in breastfeeding duration. Tangible incentives (eg, \$40 for dinner, \$100 for groceries⁵⁶) provided at 3 months postpartum contingent on exclusive breastfeeding resulted in significant increases; however, this was based on mothers' self-report. Future studies should also examine how provision of cash incentives psychologically affects mothers' well-being (eg, potential family pressure on breastfeeding, financial independence).

Although continuing partial breastfeeding among the participants may have helped to slow down infant weight gain and reduce emergency department visits for infants, a fully powered controlled study with more stringent measures of infant outcomes (eg, infant weighing at pre- and postfeeding, hospital records of emergency department visits or hospitalization) is likely necessary to detect a significant treatment effect.

We recognize at least 2 limitations in the study. First, the current study did not have a sample size to ensure power and examine

TABLE 3 Standardized Differences From Weight-for-Age z Scores, Based on the World Health Organization Growth Reference Standards

	Incentive, z Score, Mean (SD)	Control, z Score, Mean (SD)	P	Effect Size (95% CI)
1 mo	0.68 (0.42)	0.85 (0.79)	.96	-0.50 (-1.25 to 0.26)
3 mo	0.72 (0.47)	0.87 (0.71)	.74	-0.51 (-1.26 to 0.23)
6 mo	0.67 (0.48)	0.86 (0.77)	.76	-0.14 (-0.81 to 0.54)

potential mediators or moderators of the incentives on breastfeeding rates. A future study with a larger sample size will be necessary to further flesh out the incentive effect. Second, neither research staff nor participants were blinded to the study design. Participants in the control group realized that they were not receiving the contingent monthly incentives. A future study should provide noncontingent monthly financial incentives of an equal amount for attending WIC group or individual support to control for incentive provision and also to examine the acceptability among women for visual demonstration of breastfeeding.

The current study is novel in that cash incentives were provided contingent on visually verified breastfeeding behavior. The study is also novel in using cash incentives contingent on observed breastfeeding that systematically increased in amount every month. The current national attention on breastfeeding^{37,38} provides a window of opportunity to improve breastfeeding outcomes in the United States, establish breastfeeding as the social norm, and shape policies and legislation around breastfeeding practice through social marketing frameworks beyond individual-level support.^{37,38}

In 2013, \$58 billion was spent on commercial baby food including formula in the United States,⁵⁷

and \$40 million annually spent on promoting supplementation formula.³⁸ On average WIC-enrolled, non-breastfeeding mothers spent an extra out-of-pocket \$46 a month on formula by 4-month postpartum, which is almost equivalent to the 4-month cash incentive of \$40 in our study.⁵⁸ Breastfeeding for the first 4 months was found to prevent costly childhood infectious diseases, resulting in annual estimated cost-saving of ~\$17 million.⁵⁹ A rigorous economic analysis may substantially support breastfeeding interventions.⁶² Future studies should conduct implementation science studies to address logistical and political barriers to sustain an incentive-based approach among WIC participants, including the ethical issue of financially incentivizing breastfeeding behavior (eg, using nonmonetary tangible items such as diapers, baby wipes).⁶³⁻⁶⁵

CONCLUSIONS

A supplemental incentive-based approach to existing WIC breastfeeding support significantly increased the proportion of breastfeeding mothers through 6 months postpartum among WIC-enrolled Puerto Rican mothers. Monthly financial incentives contingent on observed breastfeeding did not significantly affect exclusive breastfeeding rates, infant weight gain, or emergency

department visits for infants during 6-month postpartum, although there was evidence suggesting a possible impact on infant outcomes. The current study provides proof of concept supporting for the efficacy of financial incentives on continued breastfeeding that warrants further investigation with a larger-scale randomized controlled trial,

implementation science studies with social marketing principles, and cost-effectiveness analyses.

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ABBREVIATIONS

CI: confidence interval
WIC: Supplemental Nutrition Program for Women, Infants, and Children

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