Breastfeeding and WIC Enrollment in the Nurse Family Partnership Program

Maya Bunik,^{1,2} Nancy F. Krebs,¹ Brenda Beaty,³ Maureen McClatchey,⁴ and David L. Olds^{1,4}

Abstract

Objective: Recent studies have raised the issue of lower breastfeeding rates for mothers enrolled in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC). We wanted to explore this association of WIC and lower breastfeeding in Nurse Family Partnership Program (NFP), a national representative group of mother–baby pairs on which extensive background data are available. Our aim was to compare breastfeeding rates at 6 and 12 months in NFP high-risk mothers who were enrolled in WIC to those who were not enrolled in WIC.

Methods: We conducted a retrospective secondary analysis in mothers and infants from this cohort for 2000–2005 ($n = 3,570$).

Results: We found that at 6 months of age, 87.8% of mothers who were not breastfeeding were enrolled in WIC as compared to 82.6% of mothers who were breastfeeding ($p < 0.001$). However, in the multivariate analysis, WIC was no longer a significant predictor of breastfeeding.

Conclusions: Prospective evaluation of this issue is warranted particularly with the implementation of changes in the WIC Food Package and Breastfeeding Promotion.

Introduction

THE SPECIAL SUPPLEMENTAL Nutrition Program for Women, Infants and Children (WIC) provides nutrition education and food for pregnant and lactating women and for infants and children up to 5 years of age who are generally below 185% of the U.S. poverty income and nutritionally at risk. The program serves about half of all infants in the United States.¹ Despite vigorous efforts in the past 2 decades to promote breastfeeding, the Centers for Disease Control and Prevention Pediatric Nutrition Surveillance System reported that in 2004 the prevalence of breastfeeding initiation rates was only 66.9% and duration rates of 33.1% at 6 months of age for WIC participants.^{2,3} These rates which are below national averages of 73.8% and 41.5%, respectively.^{4,5}

Breastfeeding attitudes are reported to be influenced by outside factors such as changes in laws, public policies, employer support, and public programs such as WIC.^{6–8} WIC participation is associated with improved birth outcomes, particularly intrauterine growth retardation, good weight gain during pregnancy, and well child care visits but less so with breastfeeding.⁸ Ryan and Zhou⁴ recently (2006) reviewed Ross Laboratories Mothers Survey data and showed

that breastfeeding rates among WIC participants have consistently lagged behind non-WIC mothers for the past 25 years. WIC enrollment can be positively associated with breastfeeding, especially if participation begins with the first trimester.⁹ It also appears that breastfeeding initiation rates have improved in WIC, but duration is still a concern.^{10,11} However, those mothers with lower socioeconomic status who are WIC eligible but not in the program have been reported to have higher breastfeeding rates than WIC participants.⁵ The reasons for this discrepancy in breastfeeding rates in similarly high-risk populations are unclear to date.

The Nurse Family Partnership (NFP) is a nationally recognized home visitation program that follows mostly primiparous, low-income mothers from pregnancy and their infants through 2 years of age. The program emphasizes parenting skills, healthy lifestyle choices, and planning for future pregnancies and return to work or school. The size of this NFP cohort and the extensive information obtained on NFP participants lend themselves to comparison of breastfeeding rates among WIC and non-WIC participants while controlling for many maternal variables. We wanted to explore the association of WIC and lower breastfeeding in a highly supported population of mothers on which extensive background data are available.

¹Department of Pediatrics and ³Colorado Health Outcomes Program, University of Colorado Denver, Aurora, Colorado.

²Children's Outcomes Research Program and ⁴The Prevention Research Center, The Children's Hospital, Aurora, Colorado.

The objectives of our study in the NFP cohort was to compare WIC mothers to non-WIC mothers on various variables available in this dataset as well as the outcomes of breastfeeding at 6 and 12 months.

Subjects and Methods

Study design

We conducted a retrospective secondary analysis of data on a cohort of 3,570 mother-child pairs followed from pregnancy through the first year of life during 2000–2005 who completed the program and the associated surveys at 6 and 12 months in the National NFP Program. All data were previously de-identified, and mothers gave informed consent at program enrollment into the NFP. This research was approved by the Colorado Institutional Review Board.

Study population: NFP

The NFP is a home nursing visitation program for low-income primiparous pregnant women and their infants that has been tested in a series of randomized controlled trials since 1977. The program has shown lasting improvement effects beyond the period of intervention for aspects of maternal life course and child outcomes and has been described extensively elsewhere.^{12–15} The program has three broad goals: (1) to improve maternal and fetal health during pregnancy by helping women improve health-related behaviors, (2) to improve the health and development of the child by helping parents provide more competent care, and (3) to enhance parents' personal development by helping them plan future pregnancies, continue their education, and find work. Home visitors adapt

visit-by-visit guidelines and detailed visit objectives to each mother's needs. Although not a specific focus, breastfeeding along with healthy feeding practices are encouraged by the nurses. Nurses do not receive additional lactation training, and no specific breastfeeding materials are used during the home visits.

Women are referred to the program through providers of primary care, WIC, and other health and human services during pregnancy and are registered before the 28th week of gestation. As part of the national replication effort, staff at the NFP National Service Office has built a clinical information system into which data are entered on every scheduled visit and that monitors maternal and child health. Variables that are tracked by the NFP are described extensively in previous publications^{16–20} include age, race/ethnicity, marital status, primary language, alcohol use, drug use, mental health (combination of questions addressing depression and well-being), domestic violence in past 6 months, age-appropriate education (this variable assesses whether the number of years of school each woman had completed was consistent with their age assuming they began first grade at 7 years of age), annual household income, wages (dollars per hour), conflict with mother or partner, attitude toward childrearing, maternal body mass index (BMI) using World Health Organization criteria, and outcomes of breastfeeding (asked as "any breastfeeding Yes/No") at 6 and 12 months.

Data were obtained from the total sample of those enrolled in the NFP from 2000 to 2005, and initial validity check was performed including de-duplication. Patterns of missing data were assessed between sites. We included those mother-infant pairs who had complete data at the 6- and 12-month-of-age surveys.

TABLE 1. STUDY POPULATION: COMPARING THOSE ENROLLED IN WIC TO NON-WIC ($n = 3,357$)

Variable	Percentage		p value
	WIC ($n = 2,492$) (74.2%)	Not on WIC ($n = 865$) (25.8%)	
Married	14.0	17.4	0.02
Enrolled in school	41.5	39.0	0.20
Working	36.2	36.4	0.91
Age-appropriate education	58.3	60.7	0.23
Cigarette smoker	37.6	36.7	0.64
Race			
White/Non-Hispanic	43.0	48.7	0.001
Hispanic	33.8	26.9	
African American	15.2	14.9	
Other	8.0	9.5	
Maternal BMI category ^a			
Underweight (<18.5 kg/m ²)	9.9	9.5	0.30
Normal (18.5–24.99 kg/m ²)	56.5	59.5	
Overweight (25–29.99 kg/m ²)	18.5	15.7	
Obese (≥ 30 kg/m ²)	15.1	15.3	
Mean (SD) number of people in household	3.8 (2.1)	3.8 (2.1)	0.91
Mean (SD) wage	6.9 (3.1)	7.4 (5.2)	0.02
Mean (SD) age in years	20.6 (4.3)	20.9 (4.8)	0.04
Mean (SD) mental Z Score	100.2 (10.0)	100.3 (9.8)	0.87

The majority of mothers are primiparous. All variables were collected at intake.

^aWorld Health Organization criteria.

Statistical analysis

Bivariate analyses included χ^2 tests for categorical variables and *t* tests for continuous data. A value of $p < 0.05$ was considered statistically significant. Multivariate logistic regression was used to model the dichotomous outcome of breastfeeding yes/no at 6 months and at 12 months for those enrolled versus not enrolled in WIC.

Results

From the initial cohort of 4,494, 924 (21%) were excluded from the initial dataset for missing data at 6 and 12 months.

Demographics of WIC and non-WIC populations

The demographic characteristics of the NFP study population are shown in Table 1, showing the comparison between WIC and non-WIC mothers. Mothers who were not enrolled in WIC were more likely to be older, married, and more commonly white non-Hispanic with higher mean wages earned. No differences were found in return to school, work, education, smoking, mean number of people living in the house, maternal mental health (Z score), or BMI.

Breastfeeding at 6 months

Of the 3,570 mothers, 2450 (69%) reported ever breastfeeding. Table 2 is the subset of mothers who ever reported breastfeeding and shows that those still breastfeeding at 6 months ($n = 727$) were more likely to report being older and married, having a higher level of education, and had lower BMI. They also reported smoking less during pregnancy, scored higher on the measure of mental health, worked or were enrolled in school less frequently, and had lower rates of participation in WIC.

Comparisons of breastfeeding rates for WIC and non-WIC infants

Breastfeeding rates were significantly higher at 6 months in the non-WIC mothers (29.5%; 95% confidence interval

25.2–34.1) than WIC mothers (19.2%; 95% confidence interval 17.8–20.6). At 12 months breastfeeding rates were also significantly higher in non-WIC mothers (16.2%; 95% confidence interval 13.3–19.5) compared to those enrolled in WIC (9.8%; 95% confidence interval 8.7–10.9). Figure 1 illustrates these rates and also shows a comparison to national WIC breastfeeding rates.

Multivariate comparisons for breastfeeding at 6 months

Table 3 shows the results of the multivariate analysis predicting breastfeeding at 6 months. Those breastfeeding at 6 months were more likely to be older, married, and not working and have a BMI <25 kg/m². Education, smoking, and WIC enrollment were not significantly different. It should be noted that 19% ($n = 466$) were excluded because of missing explanatory variables.

Discussion

Our main findings show few differences between women enrolled in WIC compared to those not enrolled in WIC within this NFP cohort. We also found lower initiation and duration rates of breastfeeding at 6 and 12 months for those enrolled in WIC. However, in the multivariate modeling for predicting breastfeeding at 6 months this association was not significant. Our study in high-risk mothers on whom which we have extensive background information adds to the literature that raises questions about the effects of the current WIC program and breastfeeding.

Teasing out the effects of WIC on breastfeeding has been problematic. WIC provides food for the breastfeeding mother, prenatal education, counseling postpartum at visits, and, in some areas, access to breast pumps, peer counseling support, and also supplemental formula if requested. Such programs, however, vary widely, not only on a state level but also locally among different county WIC sites (Bruce Rengers, personal communication). Others argue that the breastfeeding promotion through WIC has limited effect in part because of its limited scale in terms of the overall WIC budget.^{16,17} Schwartz et al.²¹ pointed out that we lack sys-

TABLE 2. COMPARISON OF NFP WOMEN STILL BREASTFEEDING TO THOSE WHO STOPPED BREASTFEEDING AT 6 MONTHS

Variable	Percentage		p value
	Still breastfeeding ($n = 727$) (29.7%)	Stopped breastfeeding ($n = 1,723$) (70.3%)	
Married at 6 months	35.2	22.0	<0.0001
Enrolled in school at 6 months	29.2	38.3	<0.0001
Working at 6 months	33.0	38.8	0.01
Age-appropriate maternal education at intake	68.2	59.2	<0.0001
Mean (SD) age in years at time of child's birth	21.9 (4.9)	20.4 (4.1)	<0.0001
Mean (SD) mental Z score at intake	101.1 (9.0)	99.7 (10.0)	0.0009
Mean (SD) gestational age at birth	39.3 (1.9)	38.9 (2.3)	<0.0001
Cigarette smoker at 36 weeks of pregnancy	24.8	30.4	0.01
Maternal BMI at intake ^a			
Underweight (<18.5 kg/m ²)	10.1	9.4	
Normal (18.5–24.99 kg/m ²)	63.7	57.1	<0.0001
Overweight (25–29.99 kg/m ²)	17.3	17.1	
Obese (≥ 30 kg/m ²)	8.8	16.4	
Currently receiving WIC at 6 months	82.6	87.8	0.001

^aWorld Health Organization criteria.

FIG. 1. Breastfeeding (BF) rates in NFP compared to national WIC rates. Brackets indicate 95% confidence intervals. All differences are statistically significant at the $p < 0.001$ level. Note that NFP WIC participants are mostly primiparous and National WIC² participants are a mixed group of primiparous and multiparous women.

tematic evaluations of WIC participation and of breastfeeding initiation and duration. Most studies fail to control for self-selection and the full range of measured and unmeasured characteristics of participants that might affect breastfeeding behavior independent of WIC participation effects. We have attempted to elucidate some maternal characteristics further in the current cohort study. It may be that within the NFP both WIC and non-WIC mothers are provided support for their complicated lives and that the participation effects seen in other studies disappear.

This study has several limitations. Although the NFP is a unique dataset of high-risk mothers and infants that includes longitudinal data, the data were collected for clinical purposes and were not intended for study of feeding. Therefore, data are not available on exclusivity, amount of breastmilk and formula, and whether expression of breastmilk was involved. Also, the NFP program does not collect follow-up data on those who have dropped out of the program. The

women for whom data are available may be different solely because they completed the study from pregnancy through the first year. Socioeconomic status is also a complex construct that is only partially captured by the indicators analyzed. Finally, the nature of secondary database analyses warrants cautious interpretation because the findings are associations and do not indicate causality.

Conclusions

The associations of lower breastfeeding rates with WIC participation within a high-risk population merits further examination through prospective interventional research. Perhaps by supporting these women in other ways the NFP is more successful with breastfeeding among other life outcomes. Our research has timely implications as the U.S. Department of Agriculture and National WIC Association review and approve proposed changes to the WIC food

TABLE 3. BREASTFEEDING AT 6 MONTHS USING MULTIVARIATE MODELING ($n = 1,984$)

Variable	Odds ratio (95% confidence interval)	p value
Married at 6 months	1.55 (1.24–1.94)	0.0002
Working at 6 months	0.76 (0.62–0.95)	0.01
Age-appropriate maternal education	1.21 (0.96–1.51)	0.11
Per year increase in maternal age at time of child's birth	1.07 (1.05–1.10)	<0.0001
Per week increased gestational age at birth	1.10 (1.04–1.16)	0.001
Cigarette smoker at 36 weeks of pregnancy	0.83 (0.66–1.04)	0.11
Maternal BMI ^a		
Underweight (<18.5 kg/m ²)	1.07 (0.75–1.51)	
Normal (18.5–24.99 kg/m ²)	Reference	
Overweight (25–29.99 kg/m ²)	0.81 (0.61–1.06)	
Obese (≥30 kg/m ²)	0.43 (0.31–0.60)	<0.0001
Receiving WIC at 6 months	0.78 (0.59–1.04)	0.09

^aWorld Health Organization criteria.

packages,²⁰ specifically limitations on supplemental formula in the first month that may affect breastfeeding continuation.

Acknowledgments

Funding for this project was provided by the Children's Outcomes Research Program. We would like to thank Patricia Shobe, MPH for her help with preparation of this manuscript.

Disclosure Statement

No competing financial interests exist.

References

1. WIC. Supplemental Nutrition Program for Women, Infants and Children 2006. <http://www.fns.usda.gov/wic/aboutwic/> (accessed October 1, 2006).
2. Centers for Disease Control and Prevention. Pediatric Surveillance Survey 2003. <http://www.cdc.gov> (accessed September 30, 2005).
3. Centers for Disease Control and Prevention. Pregnancy Risk Assessment and Monitoring 2006. http://www.cdc.gov/nccdphp/drh/srv_prams.htm (accessed September 30, 2005).
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. Centers for Disease Control and Prevention (CDC). Racial and socioeconomic disparities in breastfeeding—United States, 2004. *MMWR Morb Mortal Wkly Rep* 2006;55:335–339.
6. Ryan AS, Rush D, Krieger FW, et al. Recent declines in breast-feeding in the United States, 1984 through 1989. *Pediatrics* 1991;88:719–727.
7. Jacknowitz A. Increasing breastfeeding rates: Do changing demographics explain them? *Womens Health Issues* 2007;17:84–92.
8. Bitler MP, Currie J. Does WIC work? The effects of WIC on pregnancy and birth outcomes. *J Policy Anal Manage* 2005;24: 73–91.
9. Joyce T, Racine A, Yunzal-Butler C. Reassessing the WIC effect: Evidence from the Pregnancy Nutrition Surveillance System. *J Policy Anal Manage* 2008;27:277–303.
10. Ahluwalia IB, Morrow B, Hsia J, et al. Who is breast-feeding? Recent trends from the pregnancy risk assessment and monitoring system. *J Pediatr* 2003;142:486–491.
11. Chatterji P, Brooks-Gunn J. WIC participation, breastfeeding practices, and well-child care among unmarried, low-income mothers. *Am J Public Health* 2004;94:1324–1327.
12. Kitzman H, Olds DL, Henderson CR Jr, et al. Effect of prenatal and infancy home visitation by nurses on pregnancy outcomes, childhood injuries, and repeated childbearing. A randomized controlled trial. *JAMA* 1997;278: 644–652.
13. Kitzman H, Olds DL, Sidora K, et al. Enduring effects of nurse home visitation on maternal life course: A 3-year follow-up of a randomized trial. *JAMA* 2000;283:1983–1989.
14. Olds DL, Robinson J, Pettitt L, et al. Effects of home visits by paraprofessionals and by nurses: Age 4 follow-up results of a randomized trial. *Pediatrics* 2004;114:1560–1568.
15. Olds DL, Kitzman H, Cole R, et al. Effects of nurse home-visiting on maternal life course and child development: Age 6 follow-up results of a randomized trial. *Pediatrics* 2004; 114:1550–1559.
16. Kent G. WIC's promotion of infant formula in the United States. *Int Breastfeed J* 2006;1:8.
17. *Breastfeeding: Some Strategies Used to Market Infant Formula May Discourage Breastfeeding. State Contracts Should Better Protect Against Misuse of WIC Name.* U.S. General Accountability Office, Washington, DC, 2006.
18. McCann MF, Baydar N, Williams RL. Breastfeeding attitudes and reported problems in a national sample of WIC participants. *J Hum Lact* 2007;23:314–324.
19. Bunik M, Clark L, Zimmer LM, et al. Early infant feeding decisions in low-income Latinas. *Breastfeed Med* 2006;1:225–235.
20. Institute of Medicine. *WIC Food Packages: Time for a Change.* National Academies Press, Washington DC, 2005.
21. Schwartz JB, Popkin BM, Tognetti J, et al. Does WIC participation improve breast-feeding practices? *Am J Public Health* 1995;85:729–731.

Address correspondence to:
Maya Bunik, M.D., MPH
Children's Outcomes Research Program
The Children's Hospital
13123 East 16th Avenue, B032
Aurora, CO 80045

E-mail: bunik.maya@tchden.org