

# Symposium: Food Assistance and the Well-Being of Low-Income Families

## Has the WIC Incentive to Formula-Feed Led to an Increase in Overweight Children?<sup>1,2</sup>

Donald Rose,<sup>\*3</sup> J. Nicholas Bodor\* and Mariana Chilton<sup>†</sup>

*\*Department of Community Health Sciences, Tulane University School of Public Health and Tropical Medicine, New Orleans, LA 70112 and <sup>†</sup>Center for Community Health and Prevention, Drexel University School of Public Health, Philadelphia, PA 19102*

**ABSTRACT** We explored the relationship between the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and overweight status in children, with a focus on WIC's provision of infant formula, through secondary analyses and review of existing literature. Because of the complexity involved and the lack of previous research on the combined link between WIC, breast-feeding, and overweight status, we considered evidence for each of these relations separately. Using food-cost data from the WIC's 1996 Participant and Program Characteristics Survey, we found that the state-level average for 1 y of program benefits for women who formula-fed was over twice the value of program benefits for those who breast-fed (BF). This difference in benefit levels, or formula incentive, was negatively associated with both the in-hospital and 6-mo BF rates in state-level multiple regression models. Despite WIC's efforts to promote BF, other large-scale studies have found a negative association of program participation with BF rates. An inverse association of BF on subsequent overweight in children also has been shown in a number of studies. Despite this accumulating evidence for the protective effect of BF, it has not been seen in African American or Latino populations. In sum, there is reason to be concerned that WIC's incentive to formula-feed may have led to an increase in overweight children; yet there is too much uncertainty about the issue to conclude that this is so. Further research is needed to understand this relationship, as is the development of applied interventions to increase BF rates. *J. Nutr.* 136: 1086–1090, 2006.

**KEY WORDS:** • *women, infants, and children* • *WIC* • *breast-feed* • *BF* • *food package cost* • *overweight*

The nation's domestic food assistance program has arisen as a key topic in trying to find a solution to the problem of obesity. Because overweight rates are particularly high in the low-income population served by these programs, some have suggested that the programs themselves are part of the obesity problem (1), while others argue that they offer an opportunity to reach a vulnerable population and are therefore part of the solution (2). In this article, we explore the relation between the Special Supplemental Nutrition Program for Women, Infants,

and Children (WIC)<sup>4</sup> and overweight status in children, with a particular focus on WIC's provision of infant formula as a key mediating factor in this relationship. We hypothesize that infant formula, distributed through WIC, negatively influences breast-feeding (BF) rates, and that BF protects against an overweight status later in childhood. We also look at the overall connection between WIC participation and overweight in children. Our approach in this article is to synthesize our own analyses of secondary data with a review of the existing literature. The final section summarizes what we learned and makes suggestions for future research.

**Does WIC offer an economic incentive to formula-feed?** National-trend data provides a reason for concern that WIC might negatively influence BF. After reaching a peak in 1982, BF rates in the U.S. decreased throughout the rest of the decade (3) and did not fully recover until the late 1990s. The BF decline in the 1980s came precisely at the time of a substantial expansion in the WIC program, particularly in the numbers of participating infants. By 1990 (the lowest point in BF rates over the last 25 y), WIC was serving 1.4 million infants monthly (approximately one-third of all live births in the U.S.), up from the 26,000 it served monthly at its inception in 1974 (4).

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<sup>3</sup> To whom correspondence should be addressed. E-mail: diego@tulane.edu.

<sup>4</sup> Abbreviations used: BF, breast-feeding; WIC, women, infants, and children.

Throughout the 1990s and continuing into the present, the WIC program has made substantial strides in increasing BF promotion efforts (5,6). However, a number of authors have remarked on the mixed incentives offered by the program: BF promotion, on the one hand, and free formula, on the other (7,8). Certainly the current size of the program draws attention to the issue insofar as close to half of all infants in the country participate in WIC (4,9), and over half of all infant formula consumed in the country is purchased through the WIC program (10). The provision of free formula to low-income women could negatively influence BF rates if a woman who feeds her baby with formula receives more from the program than one who breast-feeds. As part of our overall hypothesis, we investigated whether WIC offered an economic incentive to formula-feed and, if so, whether it could be quantified in a way that would allow us to study its association with BF.

In addition to nutrition education and health referrals, WIC benefits include a supplemental food package that varies according to participant category (5). After birth, women can enroll their babies in the program and receive infant formula for 1 y in addition to a postpartum package of foods (milk and/or cheese; eggs; cereal; a choice of peanut butter, dried peas, or beans; and juice) for themselves for up to 6 mo. Alternately, women can decide to breast-feed and forgo WIC's infant formula, and receive an enhanced package for up to 1 y, which includes tuna and carrots and greater amounts of food in the post-partum package. BF women can enroll their infants at 4-mo of age and receive infant cereal and juice, which is also available to formula-fed infants at the same age.

We calculated the difference in value of the 2 alternatives over the period of 1 y, using food package cost data reported by state WIC programs in the USDA's (United States Department of Agriculture's) WIC Participant and Program Characteristics, 1996 (11). These biennial reports are the only source of state-level data on WIC food costs for the whole country. We chose the 1996 version of this report because the USDA no longer requires this kind of reporting from states, and the 1998 and 2000 reports had a large number of missing observations. For the BF alternative, we multiplied the monthly cost of the BF food package for each state by 12 to determine the cost for a full year. We then added in the value of 8 mo of infant cereal and juice. Because we did not have access to disaggregated data for cereal and juices by state, we used a fix cost for each state, based on maximum monthly quantity allowances for the infant food and the average price based on scanner data from 2 states (12). For the formula-feeding alternative, we multiplied the cost of the postpartum package by 6, the cost of the full infant food package by 12, and summed the 2 products. State WIC programs receive rebates from formula companies for each can of formula sold by WIC. For our calculations, we used the pre-rebate cost of the infant food package, which reflects the value to the participant, rather than the post-rebate cost, which reflects the overall cost to the WIC program. There are many variations of program participation besides these 2 alternatives, including partial BF. We chose the fully formula-fed and fully breast-fed alternatives, because they represent the 2 ends of WIC's BF continuum.

Our results from this simple analysis are presented in **Table 1**. At first glance, it appears that WIC did well at giving a greater incentive to BF women. The average monthly cost of the BF package in 1996 was \$43, which was 39% higher than that of the postpartum package for mothers. But the infant package, on average, cost \$82. The total value of the formula-feeding option, including infant and postpartum packages, was, on average, \$1166 per year. This was \$585 more than the value of the BF option. We refer to this amount, i.e., the difference

**TABLE 1**

*Mean dollar value of various WIC food packages for state WIC programs in 1996<sup>1</sup>*

	<i>n</i>	Mean	Minimum	Maximum
Monthly value				
All women	47	37	25	80
Postpartum women	45	31	20	64
BF women	45	43	26	99
Infants	47	82	55	109
Annual value				
Exclusive formula-feeding <sup>2</sup>	45	1166	902	1526
Exclusive BF <sup>3</sup>	44	576	375	1251
Formula incentive <sup>4</sup>	44	585	176	845

<sup>1</sup> Data are averaged for all states reporting food package cost information in (11). Data from U.S. territories and Indian tribal organizations were not used in this analysis.

<sup>2</sup> Monetary value of WIC food package for a woman who formula-feeds her baby for the first year of life. Calculated for each state by multiplying monthly value of postpartum package by 6, infant package by 12, and adding these 2 products.

<sup>3</sup> Monetary value of WIC food package for a woman who exclusively breast-feeds her baby for the first year of life. Calculated for each state by multiplying monthly value of BF package by 12, infant cereal and juice costs [from scanner data (12)] by 8 and adding these 2 products.

<sup>4</sup> Calculated for each state by taking the difference in monetary value of WIC food packages for women who exclusively formula-feed and those who exclusively breast-feed.

between the values of food package benefits in the 2 options, as the WIC formula incentive. The WIC participant does not receive this amount in cash. In the absence of WIC, however, formula-feeding would be a more expensive alternative to BF. By making formula available for free, WIC removes an economic barrier to its use.

**Are WIC formula incentives associated with BF rates?** We investigated whether the formula incentives calculated above were associated with state-level BF rates for 1996. We used data from the Ross Mothers Survey (13) to develop 2 multiple regression models (14) in which the dependent variables were either the state-wide in-hospital BF rate, or the 6 mo BF rate for WIC mothers. The Ross survey is the only comprehensive source of state-level data from the 1990s and includes rates for WIC participants as well as other new mothers (13). Although it was based on a mail-in survey, the Ross survey over-sampled in low-income areas and used statistical weights for nonresponses. Various authors have demonstrated a strong concordance with government-sponsored nationally representative surveys (15–17). With the state as the unit of analysis, our models controlled for the number of live births, the percentage of births to non-Hispanic blacks, Hispanics, and women  $\leq 19$  y of age, the percentage of low birth-weight (<2.5 kg) babies, and the percentage of women who worked full time. Birth statistics were obtained from the National Center for Health Statistics (9), and employment statistics were obtained from the Bureau of Labor Statistics (18). The results of our regression models showed negative and statistically significant associations between the formula incentive and state-level BF rates among WIC participants, whether they were assessed in the hospital or 6-mo later (data not shown). For every \$100 increase in formula incentive, there was a 2.3 percentage-point decline in the in-hospital BF rate (a proxy for initiation) and a 1.1 percentage-point decline in the 6-mo rate. Models that also controlled for state-level poverty rates, educational levels, and smoking rates of women during pregnancy yielded similar results. Models that used

dependent variables for BF rates based on all women in the state (i.e., not just WIC participants) gave similar results.

A number of studies report on the direct relation between WIC and BF (7,19–25). All but Schwartz (24) and Tuttle (22) found negative associations between WIC and BF. Two of the studies attempted to control for a bias that might be due to the self-selection of individuals participating in the WIC program. Schwartz et al. (24) analyzed data from the 1988 National Maternal Infant and Health Study and found that women in the WIC program who received advice to breast-feed were more likely to do so than eligible nonparticipants. These authors also found that women in the WIC who did not receive advice were less likely to BF. Chatterji (7), in the only recent study, analyzed 1989–1995 data from the National Longitudinal Survey of Youth and found that WIC was negatively related to BF initiation in both a regular multivariate regression model and one that controlled for selection bias. In summary, despite WIC's objective to promote BF, the weight of the evidence, though inconclusive, indicates that it does the opposite.

**Does BF protect against pediatric overweight?** Dewey (26) found BF was associated with reduced risk of overweight in 8 of 11 studies and concluded that the “evidence to date suggests that BF reduces the risk of child overweight to a moderate extent.” Several large-scale studies have been published since Dewey's review. Bogen et al. (27), using data from the Ohio WIC program, found a strong and significant protective effect of BF on the later overweight of 4 y old children of white nonsmoking women. Grummer-Strawn et al. (28), using CDC pediatric surveillance data, also found that BF for >6 mo had a protective effect on the overweight status of 4 y old white children. A similar protective effect was not seen among non-Hispanic blacks or Hispanics. In summary, large-scale studies generally indicate the protective effect of BF on the subsequent overweight status of white children.

**Is there evidence for a link between WIC and overweight status in children?** We studied the association of earlier WIC participation with overweight status in 5–6 y old children by analyzing data from the kindergarten cohort of the Early Childhood Longitudinal Study (29). No other nationally representative survey has information on previous WIC participation and anthropometric data on a very large (>15,000) cohort of similar-age children. Duplicate height and weight measurements, using standard procedures (29), were taken on children in the spring of their kindergarten year (1999), along with demographic, socio-economic, and behavioral information from parental interviews. We classified children who were  $\geq 95\%$  of their sex-specific BMI-for-age chart as being overweight, and all other children as not overweight. This dichotomous variable was the dependent variable in a logistic regression model in which WIC participation, also constructed as a dichotomous variable and indicating previous participation of the child, was the key independent variable. We controlled for sex and age of the child. We used 2 indicators to control for low (<2.5 kg) and high (>4.0 kg) birth weight. We used several dichotomous indicators to control for activity levels relative to children of the same age (based on parental perceptions) as well as for television watching >2 h/d. Two different indicators were used to control for whether the family ate together on a majority of days per week for the evening or morning meals. We also controlled for maternal schooling, household income, and household food insecurity status, using a dichotomous variable based on the full 18-item USDA scale [see Rose and Bodor (30) for additional details on the form of these independent variables]. We ran this model separately for whites, African Americans, and Latinos, using statistical weights supplied with the Early Childhood Longitudinal Study and

replicate techniques of WesVar (31) to estimate standard errors for a complex sample design. For both African Americans and Latinos there was no significant relation between WIC and overweight status. White children who previously participated in WIC were 48% more likely to be overweight [adjusted odds ratio = 1.48 (95% CI, 1.01–2.16)] than those who had not. We were unable to control for possible selection effects and did not know if WIC participation was during infancy or early childhood, so we could not infer a relation among WIC participation, formula-feeding, and subsequent overweight status. But the results do suggest a relation between WIC and overweight status in white children that is not explained by standard control variables.

There are a handful of other studies that explore the connection between overweight status and WIC participation (23,32–37). None of these studies have produced significant results, nor have indications for the WIC participation variable been consistent. The studies were all cross-sectional and examined current WIC participation, so the potential effect of WIC formula on later overweight status of children is unknown.

**Summary, limitations, and future opportunities.** Despite the fact that the WIC program has increased the value of the BF package over other packages provided to women, the monetary value of the formula provided in the infant package is worth even more. Our calculations, based on 1996 state WIC information, showed that, on average, a woman choosing to formula-feed would receive WIC packages worth 2 times the monetary value of packages allotted to women who choose to breast-feed. This is consistent with a recent report that used grocery store–scanner data for 1999–2001, which found the value of the fully formula-feeding option to be 2.1 times that of the fully BF option (38). We found a significant inverse association of the formula incentive with WIC participants' BF rates, even after controlling for usual predictors, such as ethnicity, age, low birth-weight status, and employment. Other studies also tend to indicate a negative association of WIC with BF. Many large-scale studies, as well, indicate the protective effect of BF on the subsequent overweight status of children, especially for white children.

There are a number of limitations to this work. Even though the overall data for BF rates and WIC infant participation are intriguing, particularly the inverse trends in the 1980s, they do not tell the whole story. Many other factors shape BF rates besides WIC, including physicians' advice, hospital practices, and even demographic trends. Our results on the correlations of state WIC formula incentives and BF rates, while suggestive, also are inconclusive. In our cross-sectional analysis, we cannot assert that higher formula incentives lead to lower BF rates. State and local agencies had some leeway in the food packages that they offer to women. States that were more aggressive toward promoting BF via support groups or with increased social marketing might also have offered food packages that were worth more to BF women (i.e., a lower formula incentive). Increased BF rates in these states may have been due to promotional activities rather than lower formula incentives. Also, our data source only provided a single average cost of the BF package for each state. Women who breast-fed exclusively would be expected to receive a higher-valued package than women who partially breast-fed and received formula. Thus, states with more women who exclusively breast-fed would have incurred a higher average cost for their BF package and a lower apparent formula incentive. Although this would not have affected our finding an inverse association of formula incentives with in-hospital BF rates, it could have confounded the association with the 6-mo rates insofar as exclusive BF has been

associated with longer duration (39). Although a number of other studies have indicated a negative relation between WIC and BF, strong evidence of causality is lacking. Finally, although evidence for the link between BF and a subsequent overweight status in children has been accumulating, the protective effect of BF has not been seen in African Americans or Latinos.

In conclusion, there is reason to be concerned that WIC's incentive to formula-feed may have led to an increase in overweight children, yet there is too much uncertainty about the issue to conclude that this is so. There are a number of possibilities for research intervention to clarify this. First, more research is needed to examine the links between formula incentives and BF behavior. Some of this could be done with existing secondary data. Another option is to try new combinations of incentives and test their effects. The economic value of the BF package could be increased, either with food or breast pumps. The value of the formula alternative could be decreased, either by decreasing the amount of formula provided or by decreasing the value of the postpartum package. An expert committee of the Institute of Medicine has recently reviewed the WIC food package and has made recommendations that would increase the relative value of WIC benefits to BF women (38).

In this article we have focused on the apparent economic incentive to the WIC mother. We have assumed, as does much of the economics literature, that consumers have access to information on the prices of different goods and that they have a reasonable sense for the value of composite goods (e.g., 6 mo of a postpartum package plus 12 mo of an infant package). We think this is a reasonable assumption for frequently purchased goods like milk, cheese, or formula. What may be less clear is how well consumers estimate hidden costs or the cost of less frequently consumed services. For example, in addition to the routine costs of bottles, nipples, and heating sources, bottle use has been tied to an increased probability of infections, which brings with it the additional costs of medicine, doctor's visits, travel time, and lost work (40). One way to approach BF promotion and formula-incentive issues in WIC is to develop and test educational campaigns that can demonstrate the true costs of formula use to new mothers.

More research is needed to explain why African American or Latino mothers differ on the likelihood of choosing to BF, the protective effects of BF on weight, and the relation between WIC and overweight children. Qualitative approaches are likely to be helpful here. Bentley et al. (41,42) illustrated how ethnic and cultural influences shape infant-feeding choices of African American women. Grummer-Strawn et al. (28) argue that ethnic group differences in infant-feeding practices may explain why the protective effect of BF on subsequent overweight in children has been seen only in whites. African American women are more likely to introduce solids in the first few weeks of life (43,44), a behavior that might cancel the beneficial effects of BF on subsequent weight status. If such behaviors are commonplace among both WIC participants and non-participants, this might explain why we found no effect of WIC on the subsequent overweight status of African American children.

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