# Prenatal WIC and Birth Outcomes: The Role of Pregnancy Intention and Timing of Participation

**Alison Jacknowitz, Tracy Fox Salmons, and Laura Tiehen**

## Background and Significance

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides nutritious food, nutrition counseling, and referrals to health and other social services to low-income pregnant and postpartum women, infants, and children. The program's overarching objective is to counteract the negative effects of poverty on prenatal and child health. Since its inception, WIC has grown from serving 88,000 participants in fiscal year 1974 to serving approximately 8.1 million participants in fiscal year 2006 [US Department of Agriculture (USDA), 2007].

A substantial body of research finds that women who participated in WIC during their pregnancy experience better birth outcomes than low-income women who did not. Reviewing 38 studies conducted since the late 1970s, Fox, Hamilton, and Lin (2004) conclude that the evidence suggests that WIC has a positive impact on several key birth outcomes such as low birthweight, mean birthweight, and mean gestational age. More recent studies provide further evidence of the positive impact of WIC on birth outcomes (e.g., Bitler and Currie, 2005).

Despite studies that support the positive effect of WIC on birth outcomes, debate remains over the role WIC participation itself plays in the improvement in these outcomes (Besharov and Germanis, 2001; Joyce et al., 2005; Joyce et al., 2007). This debate was highlighted in a recent issue of the *Journal of Policy Analysis and Management* (*JPAM)* (Ludwig and Miller, 2005). Two methodological issues are central to the debate on the effectiveness of WIC. One issue is the role of selection bias in evaluating WIC. WIC participants may differ from nonparticipants in unobservable or unmeasurable ways that influence birth outcomes. If, researchers do not adequately control for these differences, they may incorrectly attribute differences in birth outcomes to WIC participation. Another important issue in assessing the effect of WIC is the role of gestational age bias. Women whose pregnancies last longer have more opportunity to enroll in WIC, which could lead researchers to attribute the improved birth outcomes that result from a longer gestation to WIC participation.

## Study Objectives

Given the strong link between birth outcomes and child and adult health and productivity, it is important to ensure that programs like WIC are effective in improving birth outcomes. This research contributes to the debate on the effectiveness of WIC by examining the effect of prenatal WIC participation on birth outcomes, with a focus on controlling for selection bias and gestational age bias using a large nationally-representative data set, the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B).

## Data and Methodology

Collected by the National Center for Education Statistics, the ECLS-B follows a nationally representative sample of approximately 10,700 children born in 2001, sampled from birth certificates, from 9 months of age through first grade. We use the first wave of the ECLS-B data, which includes information from birth certificates as well as survey information on children who are 9 months of age and their mothers. These data are appropriate for our study for several

reasons. Survey data are merged with data from birth certificates, which contain reliable information on a rich set of birth outcomes including birthweight, gestation, and congenital anomalies. We can identify both a woman's WIC participation during pregnancy and the trimester in which she enrolled in WIC, allowing us to address the issue of gestational age bias. In addition, the data provide information on a rich set of demographic and attitudinal characteristics, which we use to try to minimize the effect of selection bias.

To answer the research question, we estimate either ordinary least squares (OLS) or logit regressions depending on the nature of the dependent variable to examine investments in prenatal care and birth outcomes. Our measures of prenatal care investments include: (1) smoked in the last three months of pregnancy, (2) drank alcohol in the last three months of pregnancy, (3) took vitamins for three months after pregnancy recognition, (4) received adequate plus prenatal care, (5) received inadequate prenatal care, and (6) weight gain during pregnancy. To measure birth outcomes, we examine: (1) birthweight, (2) indicator of low birthweight, (3) indicator of very low birthweight, (4) indicator for preterm birth, (5) indicator for very premature birth, and (6) indicator for small for gestational age.

While past research has attempted to address selection bias using WIC state policies as instruments for WIC participation, Bitler and Currie (2005) show that these are not valid instruments. Therefore, to control for selection bias, we create a comparison group of eligible nonparticipants that is as closely matched as possible to eligible WIC participants. We do this by creating subsamples of women based on pregnancy intention and plannedness, which has been shown to strongly influence birth outcomes and has not been utilized in previous research. To control for gestational age bias, we estimate models on two additional subsamples: those whose pregnancies were full-term and those who began WIC in the first trimester. For the subsamples specified above, we will examine two specifications of the independent variable of interest (WIC participation). The first is an indicator of any prenatal WIC participation among eligible pregnant women, and the second is an indicator of early prenatal WIC participation among prenatal WIC participants. Control variables include: maternal race and ethnicity, maternal education, maternal age at birth, marital status, pre-pregnancy body mass index (BMI), gender of child, twin birth, first birth, household income, and region of residence.

**Preliminary Findings**

Table 1 presents preliminary regression results from the estimation of equations explaining prenatal care investments and birth outcomes using the full sample. Each row represents an outcome variable, and each cell represents the odds ratio or OLS coefficient (for weight gain during pregnancy and birthweight) on the WIC participation variable. Table 1 indicates that WIC participants are .83 times as likely to deliver a low birthweight baby and are .61 times as likely to deliver a very low birthweight baby when compared to eligible nonparticipants, a finding consistent with earlier literature. More surprising, we find no effects of WIC participation on overall birthweight, prematurity, or being small for gestational age, which is a departure from previous literature.

When we examine the timing of WIC participation, we find some evidence that gestational age bias is influencing the estimates of WIC's effect on the likelihood of having a low or very low birthweight baby. Third trimester WIC enrollment is associated with a larger decline in the probability of a low or very low birthweight baby than first trimester enrollment. In addition, third trimester WIC enrollment is associated with improved birth outcomes, such as

having a higher birthweight baby and a lower likelihood of a very premature baby, that do not appear to be influenced by overall prenatal WIC participation.

Overall, our baseline regressions indicate that WIC participation increases the adequacy of prenatal care, particularly among early participants. However, we also find, despite better prenatal care, WIC participation has limited influence on other positive prenatal behaviors and birth outcomes. We find some evidence of gestational age bias in our examination of the timing of WIC participation, and the possibility remains that these findings are affected by selection bias. The findings in Table 1 do not address selection or gestational bias, but replicate what previous studies have done. The next step in our research is to address these issues by conducting the subgroup analyses. Utilizing our measure for pregnancy intention, we find that among the births in our sample, 41.7 percent were wanted pregnancies, 37.6 percent were mistimed pregnancies, and 20.7 percent were unwanted pregnancies. We also classify births as planned or unplanned. A birth is considered to be planned if the mother reported that she stopped taking birth control in order to become pregnant. We find that 31.4 percent of births are planned, while 68.6 percent of births are classified as unplanned. In the next phase of our analysis, we will examine the effect of WIC participation on prenatal behaviors and birth outcomes within these subgroups. The focus on these subgroups, as well as on full-term births and early WIC entrants, will allow us to carefully address the issues of selection bias and gestational age bias.

**Works Cited**


Besharov, D.J., and P. Germanis. 2001. *Rethinking WIC: An Evaluation of the Women, Infants, and Children Program*. Washington, DC: The American Enterprise Institute Press.

Bitler, M.P., and J. Currie. 2005. "Does WIC Work? The Effects of WIC on Pregnancy and Birth Outcomes." *Journal of Policy Analysis and Management*, 24(1): 73-91.

Fox, M.K., W. Hamilton, and B. Lin. 2004. Effects of Food Assistance and Nutrition Programs on Nutrition and Health, Volume 3, Literature Review. Washington, DC: US Department of Agriculture.

Joyce, T., A. Racine, and C. Yunzal-Butler. 2007. Re-Assessing the "WIC Effect": Evidence from the Pregnancy Nutrition Surveillance System. Institute for Research on Poverty Working Paper.

Joyce, T., D. Gibson, and S. Colman. 2005. "The Changing Association between Prenatal Participation in WIC and Birth Outcomes in New York City." *Journal of Policy Analysis and Management*, 24(4): 661-685.

Ludwig, J., and M. Miller. 2005. "Interpreting the WIC Debate." *Journal of Policy Analysis and Management* 24(3): 691-701.

US Department of Agriculture, Food and Nutrition Service. 2007. WIC Program Data. Available from www.fns.usda.gov/. Accessed October 3, 2007.

**Table 1. Effects of WIC Participation and Timing on Prenatal Investments and Birth Outcomes: Odds Ratios or Coefficients on WIC Participation**

| | Any WIC Participation | 1st Trimester | 2nd Trimester | 3rd Trimester |
|---|---|---|---|---|
| ***Investments in Prenatal Care Outcomes*** | | | | |
| Smoked cigarettes in the last trimester of pregnancy | 1.536** | 1.486** | 1.662** | 1.342 |
| | [0.002] | [0.008] | [0.003] | [0.239] |
| Drank alcohol in the last trimester of pregnancy | 1.367 | 1.192 | 1.979* | 0.614 |
| | [0.278] | [0.592] | [0.046] | [0.459] |
| Took vitamins for three months after preg. recognition | 0.876 | 0.980 | 0.791 | 0.642+ |
| | [0.351] | [0.899] | [0.177] | [0.060] |
| Received adequate plus prenatal care | 1.195+ | 1.213+ | 1.277+ | 0.870 |
| | [0.079] | [0.082] | [0.053] | [0.474] |
| Received inadequate prenatal care | 0.726* | 0.476** | 0.962 | 1.562* |
| | [0.015] | [0.000] | [0.800] | [0.049] |
| Weight gain during pregnancy | -4.054 | -3.338 | -4.745 | -4.779 |
| | [0.417] | [0.546] | [0.402] | [0.473] |
| ***Birth Outcomes*** | | | | |
| Birthweight in grams | -10.634 | -25.958 | -10.593 | 92.904* |
| | [0.623] | [0.280] | [0.694] | [0.016] |
| Low birthweight | 0.834+ | 0.955 | 0.732* | 0.528** |
| | [0.071] | [0.676] | [0.017] | [0.004] |
| Very low birthweight | 0.607** | 0.781* | 0.478** | 0.141** |
| | [0.000] | [0.042] | [0.000] | [0.000] |
| Premature | 1.220 | 1.272+ | 1.318+ | 0.516** |
| | [0.111] | [0.076] | [0.079] | [0.009] |
| Very premature | 0.764 | 0.771 | 0.892 | 0.091** |
| | [0.173] | [0.150] | [0.667] | [0.001] |
| Small for gestational age | 1.216 | 1.197 | 1.289 | 1.054 |
| | [0.154] | [0.226] | [0.137] | [0.845] |
| Observations | 4,750 | 4,750 | 4,750 | 4,750 |

Notes: The table entries represent coefficient estimates for the equations explaining weight gain during pregnancy and birthweight in grams. All other entries represent odds ratios. Estimates are weighted. Standard errors are in brackets and adjusted to account for heteroskedasticity and clustered for multiple births to the same mother. Control variables are included for: race, education, age, marital status, pre-pregnancy BMI, gender, twin birth, first birth, income, and region. Sample sizes are rounded to the nearest 50 per NCES regulations.

+ significant at 10%, * significant at 5%, ** significant at 1%