Why Wait?: Examining Delayed WIC Participation Among Pregnant Women

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Abstract

Research that identifies the factors that influence when, as well as if, a pregnant woman begins receiving benefits from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) can aid in the design of effective targeting and outreach efforts. This research uses a recently released data set, the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), to examine the factors influencing prenatal participation in WIC and the timing of prenatal WIC participation. We find that almost three-fourths of eligible pregnant women participated in WIC in 2001, which represents about 40 percent of all pregnant women who gave birth that year. Pregnant women who participate are worse off than eligible non-participants. Although the majority of eligible pregnant participants begin participating during their first trimester, there is a substantial percentage who begin later. Hispanic women, teen mothers, and women experiencing a first birth enroll in WIC later in their pregnancies. Early WIC participation also depends on the mother's early knowledge of her pregnancy.

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1. Introduction

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides nutritious foods, nutrition counseling, and referrals to health and other social services to low-income women, and their infants and children up to age five. The program was established as a pilot program in 1972, and has grown from serving 88,000 participants in 1974 to 7.9 million in 2004 (Oliveira, 2005). About 870,000 pregnant women participated in WIC during an average month in fiscal year 2005, comprising over 10 percent of WIC participants (United States Department of Agriculture (USDA), 2005a).

There is a substantial body of research that finds that women who participated in WIC during their pregnancy have better birth outcomes than low-income women who did not. Fox, Hamilton, and Lin (2004) review 38 studies conducted since the early 1980s and conclude that the research provides evidence that WIC has a positive impact on several key birth outcomes such as low birthweight, premature birth, and being small for gestational age. More recent studies provide further evidence of the positive impact of WIC on birth outcomes (Bitler and Currie, 2005; Black et al., 2004; Kowaleski-Jones and Duncan, 2002). Recently, there has been some question as to the role that WIC participation itself plays in the improvement in birth outcomes (Besharov and Germanis, 2001; Joyce et al., 2005). The underlying issue in this debate is whether WIC participants would be more likely to have better birth outcomes than eligible nonparticipants, regardless of whether they participated in WIC.[1] A more thorough understanding of the factors associated with WIC participation can contribute to the debate over the measured effectiveness of WIC.

It may be that earlier prenatal participation in WIC leads to greater improvements in birth outcomes. Brien and Swann (2001) find some evidence of this, but most studies on WIC and

[1] A related issue is the appropriate measure of birth outcomes (Joyce et al., 2005) but we do not address this issue.

birth outcomes have not had adequate information to examine this question. However, studies suggest that early receipt of prenatal care has a positive impact on birth outcomes and visits missed early in the pregnancy can have a detrimental impact on the pregnancy and birth outcomes (Evans and Lien, 2005; Kotelchuck, 1994). If early prenatal visits are beneficial to outcomes, then presumably participating in WIC earlier in the prenatal period will be as well. Hence, understanding the household characteristics associated with later enrollment may help target program resources and outreach efforts more effectively. In addition, although WIC is a federal program, states have some discretion over program design and operation. Understanding the interaction between state-level WIC policies and the timing of participation will inform decisions regarding policy design.

This research uses a recently released data set, the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), with extensive information on household characteristics to examine prenatal participation in WIC among eligible women. Specifically, the following two research questions are addressed: 1) What factors are associated with prenatal WIC participation?; and 2) What factors are associated with early prenatal WIC participation? Our findings support earlier research that prenatal WIC participants are worse-off than eligible nonparticipants, and provide further evidence of negative selection on a wider array of observable characteristics than have previously been included in studies of prenatal WIC participation. In addition, many of the factors that influence any prenatal WIC participation also influence early prenatal WIC participation, but that there are some notable differences. Hispanic women, teen mothers, and women experiencing a first birth enroll in WIC later in their pregnancies. Early WIC participation also depends on the mother's early knowledge of her pregnancy.

2. The WIC Program

2.1 Background

WIC provides food and services to pregnant and postpartum women, infants ages zero to twelve months, and children ages one to five. In addition to belonging to one of these categories, an individual must also meet two other criteria to be eligible to receive WIC: (1) live in a household with income at or below 185 percent of the federal poverty threshold or be enrolled in another income assistance program (i.e., Food Stamps, Temporary Assistance for Needy Families (TANF), or Medicaid), and (2) be assessed as nutritionally at risk. Two major types of nutritional risk are recognized for WIC eligibility: (1) medically-based risks such as anemia, underweight, maternal age, history of pregnancy complications, or poor pregnancy outcomes; and (2) diet-based risks such as inadequate dietary pattern. Furthermore, if postpartum women do not breastfeed they are eligible for WIC for up to six months postpartum, while mothers who breastfeed for six months or more are eligible for twelve months postpartum. For additional information on WIC eligibility, see the U.S. Department of Agriculture Food and Nutrition website at http://www.fns.usda.gov/wic/howtoapply/eligibilityrequirements.htm.

2.2 Literature

A number of studies have examined the factors associated with prenatal WIC participation as part of an effort to estimate the effect of WIC on birth outcomes.[2] (Bitler and Currie, 2005; Brien and Swann, 2001; Gordon and Nelson, 1995; Kowaleski-Jones and Duncan, 2000) These studies have addressed selection bias through two-stage least squares, where the first stage involves the estimation of an equation explaining WIC participation. Chatterji et al.

[2] Most of these studies also employ other techniques to address the possible selection bias in estimating the effect of WIC on birth outcomes. However, the results of their estimation of prenatal WIC participation are of primary interest to this study.

(2002) examine WIC participation as part of a two-stage technique to estimate the effect of WIC on breastfeeding. However, they use a measure of WIC participation during the year of the child's birth, and cannot distinguish between prenatal and postpartum participation. Bitler, Currie, and Scholz (2003) use three different data sources to estimate separate equations explaining WIC participation by women, infants and children. However, none of the data sources allow them to distinguish prenatal WIC participants from other women in households that participate in WIC. Joyce et al. (2005) do not estimate WIC participation but do present descriptive statistics to compare WIC participants with nonparticipants among a selective group of New York City Medicaid participants.

While the studies on prenatal WIC participation have used a number of different data sources and methodologies, they have produced some consistent findings on the factors associated with prenatal WIC participation. Prenatal WIC participation is more likely among African-Americans and Hispanics than among non-Hispanic whites, and more likely among single than among married mothers. Prenatal WIC participation decreases with age and education. In addition, studies that incorporated information on WIC program characteristics have found that prenatal WIC participation is lower among women in states in which a woman must provide income documentation to establish eligibility, and is higher in states in which receipt of cash welfare confers automatic income eligibility for WIC.

There has been very little examination of the timing of prenatal WIC participation. Brien and Swann (2001) provide evidence that African-American women who begin receiving WIC during the first trimester of pregnancy have more positive birth outcomes than those who received WIC later in their pregnancy. They use data from the 1988 National Maternal and Infant Health Survey (NMIHS). The NMIHS is sample of women who gave birth in 1988, and contains

information on the month during pregnancy in which WIC receipt began. Swann (2003) uses the same data set to focus more closely on the timing of prenatal WIC participation. He uses survival analysis and finds that early participation in WIC is associated with having low income and a low level of education, and being African-American or a single mother. Thus, many of the factors associated with any prenatal receipt of WIC are also associated with early receipt.

Swann (2003) also finds a strong positive association between previous WIC participation and early WIC participation, even among women with low levels of education, who were likely to be eligible for WIC during previous pregnancies. Among women with no reported past WIC participation, poor health and Medicaid participation are positively associated with early WIC participation. The study also finds that women experiencing their first pregnancy are more likely to participate in WIC at some time during their pregnancy, but less likely to participate early.

A number of changes have occurred since 1988 that could potentially affect the timing of prenatal WIC participation. The number of women participating in WIC increased from 815,000 in 1988 to almost 1.8 million in 2001 (USDA, 2005b). Although WIC is not an entitlement program, its funding level has increased so that waiting lists are quite rare. Furthermore, the income-eligibility criteria for pregnant women to receive Medicaid has become less stringent over time. Since Medicaid recipients are automatically eligible for WIC, this has changed the composition of the WIC-eligible population. The federal government has also instituted more uniform eligibility requirements—including mandatory income documentation and standardized nutritional risk criteria. Therefore, it is important to examine the timing of WIC participation in this new policy environment. In addition, the rich information in the ECLS-B data allows us to

explore the relationship between WIC participation and a number of factors that have not been examined previously.

3. Data

The primary data source is the Early Childhood Longitudinal Study-Birth Cohort. Information on WIC state policies is from the *WIC Participant and Program Characteristics 2000* and data on Medicaid state policies are from *Maternal and Child Health (MCH) Update: States Have Expanded Eligibility and Increased Access to Health Care for Pregnant Women and Children.*

3.1 ECLS-B

The ECLS-B is a longitudinal data set collected by the National Center of Education Statistics (NCES). The baseline sample of 10,688 children was designed to be nationally-representative of children born in 2001 with over samples of children who are American Indian, Chinese, a member of another Asian and Pacific Islander group, a twin, and low and very low birth weight children.[3] To date, the first wave of data collection is available and includes information from children and both parents, residential and non-residential, approximately nine months after birth. In addition, data are extracted from birth certificates. For additional information on the ECLS-B, see the user's guides available from NCES.[4]

Given the broad motivations of the ECLS-B including understanding children's health status, growth and development, transitions to child care and early childhood education programs, and school readiness, these data are quite rich. Data are available about the mother and

[3] Approximately 14,000 children were sampled, which resulted in 10,688 completed cases.
[4] User guides are available from NCES at http://nces.ed.gov/ecls/Birth.asp.

the household in which she resides. Pertinent to this paper, the ECLS-B contains information on the timing of WIC participation, demographic characteristics, income and assets, participation in other assistance programs, and health status and behaviors.

3.2 Additional Data Sources

Because some WIC policies vary at the state-level, we use data on state policies from the *WIC Participants and Program Characteristics 2000*.[5] State policies of interest include the benefits of WIC food packages (e.g., average value of food package and whether the participant is allowed to choose their milk type) and the costs of enrolling in WIC and receiving the food packages (e.g., whether dietary intake information is required and the frequency of the issuance of WIC vouchers). For more information on these state policies see the Appendix.

While the women studied in the ECLS-B gave birth in 2001, we use state policy data for earlier years for two reasons. First, between 1992 and 1999 there was little change in WIC state policies (Bitler and Currie, 2005). Therefore, it is highly likely that state policies did not change between 2000 and 2001.[6] Second, while all of the children in the sample were born during 2001, many of their mothers were pregnant during 2000. Women pregnant in 2000 would have faced the 2000 rules and would have potentially made participation decisions based on them in 2001.

The second additional source of data is the *Maternal and Child Health (MCH) Update: States Have Expanded Eligibility and Increased Access to Health Care for Pregnant Women and Children*. Because Medicaid participation confers adjunctive eligibility, eligibility rules vary by

[5] Hematocrit values indicating nutritional risk are extracted from *WIC Participants and Program Characteristics 1998* as this information is not available for 2000.
[6] The *WIC Participants and Program Characteristics 2002* report does not provide updated information on WIC state policies; therefore, it is not possible to compare 2000 and 2002 policies.

state, and income requirements are higher than those for WIC, Medicaid income eligibility thresholds by state are extracted and used to determine eligibility.

3.3 Coding WIC Eligibility

As discussed earlier, to be eligible to receive WIC services a pregnant woman must meet income and nutrition requirements. Income requirements include an income to poverty ratio of 185 percent or less or participation in Food Stamps, TANF, or Medicaid. To determine whether a woman's income is less than or equal to 185 percent of the poverty threshold, her household income to poverty ratio is calculated using household income over the past year, household size, and U.S. Department of Health and Human Services poverty guidelines. Because the income information is bracketed, the midpoint of each bracket is used to calculate the income to poverty ratio. All individuals who report participating in TANF, Food Stamps, or Medicaid are considered automatically income-eligible for WIC. In the cases of TANF and Food Stamps, the income to poverty ratio requirement is lower than that of WIC. However, in some states the Medicaid threshold is higher than that of WIC. Using state Medicaid policies these higher income thresholds are taken into account.

The second eligibility requirement for WIC is the presence of nutritional risk. The ECLS-B does not include data to determine whether a woman is at nutritional risk. However, this should not affect results from the study as nearly all income-eligible individuals are also at nutritional-risk (Ver Ploeg and Betson, 2003).

There are some notable limitations to using the ECLS-B for coding WIC eligibility that may cause us to misclassify women. First, as described above, the income information is bracketed thus some women are classified as income-eligible who are not and some as not

income-eligible who are. Second, respondents' report their household income over the past year. Because of the practice of six-month to one-year certification periods and the use of monthly income to determine eligibility, it is possible that some women who are income-eligible for WIC are not captured. These excluded women are those that report an annual household income above 185 percent of the poverty threshold, but have at least one month of income at or below 185 percent of the poverty threshold. Indeed, 207 women in the sample reported prenatal WIC participation, but are coded as ineligible.

3.4 Analysis Samples

To perform our analysis we construct an analysis sample of 5,780 pregnant women eligible for WIC. To be included in this sample, women had to meet the following five criteria with the number of expecting women excluded for each criterion in parentheses. First, only observations with state identifiers are included (86). Second, only mothers with biological children are included (141). Third, only one record per woman is included (794). Thus, if a woman has a multiple birth, only one child is included in the analysis. Fourth, only observations with missing data for variables with 40 or greater missing values are included (114)[7]. Fifth, only mothers who are determined to be eligible for WIC are included (3,770).[8]

Table 1 illustrates the main characteristics of the analysis sample. We find that 41 percent of U.S. women who gave birth in 2001 participated in WIC while they were pregnant. Not

[7] Indicator variables for missing values are included for variables with 40 or more missing values. Variables with missing value indicators are the following: household invests, household has a checking or savings account, mother received welfare as a child, mother received welfare all or most of the time as a child, and indicator of first order birth. Indicator variables are not generated for variables with less than 40 missing values as these missing value indicators tended to perfectly predict the outcome variable. Observations with missing information for variables with less than 40 missing values are excluded from the analysis sample.

[8] Women who participated in WIC, but are coded as ineligible, are excluded from the analysis sample.

surprisingly, women who were eligible to receive WIC (both participants and nonparticipants) are worse-off on average than all women who gave birth in 2001.

Respondents to household surveys tend to underreport participation in means-tested transfer programs. Although the ECLS-B probably does not capture all prenatal WIC participants, Table 2 shows that the rates of participation and eligibility in the 2001 ECLS-B are similar to those in the 1998 Survey of Income and Program Participation (SIPP*)* as reported in Bitler, Currie, and Scholz (2003). Further, Table 2 illustrates that the demographic characteristics of WIC participants in the ECLS-B are quite similar to those generated using 2002 data from *WIC Participants and Program Characteristics 2002*. The two datasets do not compare as well on the income and poverty variables; however, it is not uncommon to find higher reported incomes among participant households in survey data compared to administrative data (Bitler, Currie, and Scholz, 2003).

4. Methods

We use probit regression analysis to estimate equations explaining any prenatal WIC participation and the timing of WIC participation.[9] We include many of the characteristics displayed in Table 1 as explanatory variables. We include variables that indicate the mother's race and ethnicity (with Non-Hispanic white as the basis), the mother's education (with no high school diploma as the basis), the mother's age (with age less than 20 as the basis), the mother's primary language (with primary language of English as the basis), the mother's relationship status (with married as the basis), the presence of child (other than the interview child or twin) under age 5 in the household, the presence of a child between the ages of 5 and 17 in the

[9] We have information only on the trimester, rather than the month, in which WIC receipt began. Therefore, survival analysis such as that conducted by Swann (2003) is not appropriate.

household, whether the mother has twins, and whether the interview child is the mother's first. We include indicator variables for the region of residence (with residence in the West as the basis), and for living in an urban area.

We capture a women's experience with other assistance programs with an indicator variable for participating in either AFDC/TANF, the Food Stamp Program, or Medicaid since the birth of the child, and two variables for the amount of time—either some of the time or at least most of the time—the household received cash welfare during the mother's childhood (with no cash welfare receipt as the basis). We include variables that capture participation in assistance programs in the period after prenatal WIC participation in order to address selection.

We also include household income, an indicator variable for household income below the poverty line, and an indicator variable for being employed any time during the 12 months prior to the child's birth. We characterize the woman's assets with indicator variables for home ownership, car or truck ownership, for having investments, and for having a savings or checking account.

We include variables to describe characteristics related to a woman's prenatal care and general health. The equation includes variables that indicate whether the woman had prenatal care and how she paid for it (with payment through private insurance but not Medicaid as the basis). We include a variable that indicates that the woman has smoked at least 100 cigarettes during her lifetime, a variable that indicates that the woman smoked during the third trimester of her pregnancy, and a variable for the number weeks into her pregnancy when the mother found out she was pregnant. We also include indicator variables for missing data on selected characteristics, as described above.

Indicators variables are included to capture the state-level WIC policies discussed in the Appendix. It is important to note that WIC eligibility criteria were becoming more standardized during the period of our analysis. Federal guidelines, effective in 2000, required that all WIC applicants provide some form of income documentation. In addition, since 1999, states choose the nutritional risk criteria they use to determine nutritional risk from a uniform national list. Therefore, two of our explanatory variables—the mean hematocrit cutoff values used to establish nutritional risk and an indicator for states that require applicants to provide income documentation to establish eligibility--characterize the state WIC policy environment prior to standardization. Because these specific policies were being phased out during the period of our analysis, we do not provide a strict interpretation of these variables, but view them as a way to characterize the general WIC policy environment in a woman's state of residence. We test the sensitivity of our regression results to the inclusion of the state policy variables by estimating regressions without them.

We first investigate the decision to participate and then examine the timing of WIC participation. To explore the timing of prenatal WIC participation, we estimate equations for the sample of prenatal WIC participants, explaining (1) WIC participation that begins in the first trimester (early participation) and (2) WIC participation that begins in the third trimester (late participation). To further explore the timing of WIC participation, we create two subsamples of WIC participants. The first subsample contains women who begin WIC receipt during either the 1^{st} or 2^{nd} trimester, and the second subsample contains women who begin receipt during either the 2^{nd} or 3^{rd} trimester. We then examine the factors associated with early WIC receipt within each subsample.

All probit regressions are weighted using the weight variable, W1RO, which is provided with the ECLS-B. In addition, marginal effects evaluated at the means of the independent variables are presented. Finally, standard errors are clustered at the state level in the specification that includes state variables since all mothers in the state will be assigned the same value for the state policy.

5. Results

5.1. Any Prenatal WIC Participation

As shown in Table 1, among eligible women, those who choose to participate appear to be worse off than women who do not participate. Households that participate in WIC are more likely to be non-Hispanic Black or Hispanic, have less than a high school education, be younger, have never been married, participate in other assistance programs, and have income that falls below the poverty line than their non-participant counterparts.

The results of the probit regression of any prenatal WIC participation are displayed in Table 3. We report the estimated marginal effects from three different specifications. Column (1) displays results from a probit regression with our main specification, which includes WIC state policy variables. The specification in Column (2) is identical to that in Column (1) except that the WIC state policy variables are omitted. Column (3) contains the regression results from a state-level fixed effects probit regression without WIC state policy variables.

Our findings on the relationship between WIC participation and race, ethnicity, age, education, marital status, urban residence, and state-level WIC policies are largely consistent with the previous literature. The results indicate that WIC participants are generally worse-off than eligible nonparticipants. We find further evidence of negative selection when we examine

the factors that have not been included in most previous studies of prenatal WIC participation. Women whose primary language is Spanish, those who participate in either AFDC/TANF, the Food Stamp Program, or Medicaid since the birth of their child, or who have twins are more likely to participate in WIC. WIC participation decreases with income and is lower among those with a home or other investments. Car ownership is the only asset ownership associated with higher prenatal WIC participation. Women who have their prenatal care paid for by Medicaid are more likely to participate in WIC than those with access to private health insurance to pay for their prenatal care. This is not surprising, since Medicaid participants are automatically income-eligible to receive WIC. However, we also find that women who use neither Medicaid nor private health insurance are more likely to use WIC than those with private health insurance.

Our regression results indicate that WIC participation is higher among women who live in states characterized by the use of less strict eligibility criteria. The only inconsistent result is that WIC participation is higher among women in states where participation in the free or reduced-price School Lunch program confers eligibility for WIC.

As shown in Column (2), the omission of the state policy variables does not greatly affect our other regression results. In addition, the regression results in Column (3) from state-level fixed effects probit regression without WIC state policy variables are similar to those in our main specification. This indicates that within-state differences in the characteristics of eligible pregnant women have a similar association with WIC participation as do between-state differences in these characteristics.

5.2. The Timing of Prenatal WIC Participation

The majority of women who participate during their pregnancy begin during their 1st trimester. However, there is a substantial percentage that begins in the 2nd and 3rd trimesters. According to Table 4, roughly one-third of pregnant WIC participants begin participation during the 2nd trimester, and almost 10 percent begin participation during their 3rd trimester. Our findings on the timing of prenatal WIC participation conditional on any prenatal participation are quite similar to those of Swann (2003) in his descriptive analysis of 1988 NMIHS data. This is particularly striking, considering the changes in the WIC program and WIC participation since 1988.

We now examine the characteristics of prenatal WIC participants, according to the trimester in which participation began. In Table 5, we compare the mean characteristics of women who begin WIC receipt in either the second or third trimester of their pregnancy to those of women who begin WIC receipt in the first trimester, whom we refer to as "early participants."

We find that early participants are different from both 2nd and 3rd trimester participants over a few dimensions. Early participants are less likely to live in an urban area and be having their first child. Further, early participants are more likely to have another child in the household under the age of five and have received cash welfare during most or all of their childhood. On average, early WIC participants find out about their pregnancy over two weeks sooner than participants beginning WIC participation in the 2nd and 3rd trimesters.

Compared to only those who begin receipt in the second trimester, early participants are more likely to be Non-Hispanic White and less likely to be Hispanic or Asian. Early participants are more likely to be older, and married,. They are less likely to live in the Northeast.

Many of the differences between early participants and those who begin participating in the 2nd trimester are also found between early participants and those who begin WIC in the 3rd trimester (whom we refer to as "late participants"). However, there are fewer statistically significant differences between early participants and late participants. Participation in other programs is an important difference between early and late participants. Early participants are more likely to have participated in other assistance programs since the birth of the child, and to have received cash welfare as a child. Early participants also have lower average household income and are less likely to have investments. They are also less likely to have had their prenatal care paid by private health insurance and more likely to have it paid by Medicaid than late participants.

The results of the probit regressions that examine the timing of prenatal WIC participation are displayed in Table 6. The table contains the estimation results for an equation predicting early WIC participation [Column (1)] and late WIC participation [Column (2)] among prenatal WIC participants. Table 6 also displays the probit regression results from the estimation of early WIC participation among the subsample of 1st and 2nd trimester participants (in Column (3)) and among the subsample of 2nd and 3rd trimester participants (Column (4)).

As shown in Column (1) of Table 6, many of the factors that were found to influence any prenatal WIC participation have a similar influence on early WIC participation. For example, among all prenatal WIC participants, early WIC participants are less likely to have a college degree or to live in an urban area. Early WIC participation decreases with household income. Compared to those who have their prenatal care paid by private health insurance, women who use Medicaid are not more likely to begin participating in the 1st trimester, but are more likely to begin participating in the 2nd rather than the 3rd trimester. These findings indicate that, even

among WIC participants, early participants are negatively selected on a number observables. This is an important consideration for studies that examine the effect of early WIC prenatal participation on birth outcomes. If early WIC participants are also worse-off than other participants in unobservable ways, the estimated effect of early WIC participation will suffer from greater selection bias than the estimated effect of any WIC participation.

There are a couple of factors that influence the timing of WIC participation that may inform policy design and outreach efforts. While Hispanic women are more likely to participate in WIC than non-Hispanic white women, they are less likely to begin participation during their 1st trimester. Non-Hispanic black women and women who are American Indians or other races are more likely to participate in WIC than Non-Hispanic white women, but they are not more likely to participate until the 2nd trimester. Teen mothers are more likely to participate in WIC than mothers ages 20 to 29 years, but are not more likely to participate until the 2nd trimester. These findings suggest that there may be a lack of information about the WIC program among Hispanic women, non-Hispanic black women, and teen mothers. In addition, women who have twins are more likely to participate in WIC while they are pregnant, but are more likely to begin late in their pregnancies.

There are a number of factors that do not affect prenatal WIC participation, but do affect the timing of participation. Women who have another young child are not more likely to participate in WIC during their pregnancy, but those that participate are more likely to begin during their first trimester than women without young children. This may indicate either a greater awareness of the program or a greater need for it. Asian participants are less likely than non-Hispanic white participants to begin participation during the 1st trimester, but are more likely than non-Hispanic white participants to begin participation during the 2nd trimester.

Compared to the West, early WIC participation is more likely and late participation is less likely in the Northeast and the South. The mother's receipt of cash welfare as a child encourages early participation among WIC participants. This may indicate a greater awareness of assistance programs, greater need for assistance, or less of a feeling of stigma associated with program participation. The timing of a pregnant woman's WIC participation is influenced by when she finds out she is pregnant and whether she is having her first child. Finding out about the pregnancy later and having a first child are both associated with a lower probability of early WIC receipt and higher probability of late WIC receipt. Regression analysis of the factors that influence when a woman finds out about her pregnancy (not displayed) shows that women who are worse-off find out about their pregnancies later. These findings suggest that policies that promote an earlier awareness of pregnancy may increase early participation in WIC. WIC participants who have smoked at least 100 cigarettes in their lifetime are more likely to begin participating later in their pregnancy.

While state-level policies have an influence on any prenatal WIC participation, they do not have as much effect on the timing of WIC participation. The application of stricter nutritional risk criteria in the period before standardization is associated with lower early WIC participation. On the other hand, early WIC participation is higher among women in states that require dietary intake information from applicants. This is surprising, since the requirement would be expected to increase the transactions cost of WIC participation. However, it may be that the collection of dietary intake information is a relatively less burdensome way of confirming nutritional risk than other methods.

6. Conclusions and Policy Implications

We examine a number of factors associated with the timing of prenatal WIC participation. We find evidence of negative selection on observables in the prenatal WIC participation decision as well as the early prenatal WIC participation decision. Our key findings suggest that there may be a lack of information that delays WIC participation among Hispanic women, non-Hispanic black women, and teen mothers. In addition, we find that past cash welfare receipt has a positive effect on early prenatal WIC participation, either through its effect on program awareness or as a proxy for greater need for or less stigma related to program participation. We also find evidence that early WIC participation is delayed by a lack of knowledge of pregnancy status, as evidenced by the lower early WIC participation among women who are having their first child and those who report that they found out about their pregnancy later. Since a later awareness of pregnancy status is associated with greater disadvantage, it is important to figure out a way to increase this awareness among vulnerable populations.

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TABLES

Table 1. Characteristics of pregnant women by WIC eligibility and participation

		Eligible Women		
	All Women	All	Participants	Non-Participants
WIC participation	41.1	67.0	100.0	0.0
Mother's Race				
Non-Hispanic White	57.4	42.5	38.7*	50.4
Non-Hispanic Black	13.9	19.5	22.0*	14.6
Hispanic	22.9	32.6	34.8*	28.2
Asian	3.3	2.4	1.5*	4.3
Other	2.5	2.9	3.1	2.5
Mother's Education				
Less than high school	27.4	43.2	48.4*	32.8
High school graduate	21.9	27.6	28.6	25.6
Some college or voc/tech degree	26.3	23.3	20.3*	29.5
College degree	24.4	5.8	2.8*	12.0
Mother's Age				
Less than 20 years	7.5	12.3	14.2*	8.3
Age 20–24	24.2	35.5	39.5*	27.5
Age 25-29	26.2	26.3	25.1*	28.6
Age 30-34	25.0	16.1	13.6*	21.3
Age 35-39	13.7	8.0	6.1*	11.8
Age 40 or more	3.4	1.8	1.4*	2.6
Primary Language				
English	87.0	83.2	82.9	83.8
Spanish	9.0	13.3	14.4*	11.1
Other	4.0	3.5	2.7*	5.0
Relationship Status				
Married	66.6	47.8	41.2*	61.3
Never married, no partner present	14.5	23.7	27.5*	16.0
Never married, partner present	12.0	18.4	21.1*	12.9
Other marital status	6.9	10.0	10.3	9.9
At least one other child under 5 in household	38.6	38.9	38.5	40.0
At least one child age 5 to 17 in household	39.6	46.9	45. 8	49.2
Child is a twin	1.5	1.3	1.3	1.3
Child is mother's first	36.4	34.4	36.5*	30.1
Region and Urban Area				
Northeast	16.9	14.2	13.0*	16.9
Midwest	22.3	19.8	19.7	20.1
South	36.8	39.4	40.9*	36.5
West	24.0	26.5	26.4	26.5
Lives in urban area	85.6	83.2	82.1*	85.3

Table 1. Characteristics of pregnant women by WIC eligibility and participation (continued)

		Eligible Women		
Program Participation	All Women	All	Participants	Non-Participants
Participated in other programs since birth of child	40.2	69.2	78.1*	50.1
Mother received cash welfare as a child	10.8	14.6	16.7*	10.5
Mother received cash welfare all or most of the time as a child	4.0	6.1	7.2*	4.1
Income/Employment/Assets				
Mean household income (thousands)	49.8	24.2	21.8*	28.9
Below poverty line	24.8	42.6	48.5*	30.7
Mother employed during year before birth	71.4	64.3	63.0*	66.9
Owns home	47.8	25.7	20.7*	35.8
Adult owns car	89.2	82.5	80.3*	86.9
Household invests	40.3	15.4	10.4*	25.5
Adult has checking/savings account	73.8	57.3	51.8*	68.6
Prenatal Care/ Health				
Prenatal care paid by private health insurance (no Medicaid)	58.5	31.7	21.1*	53.3
Prenatal care paid by Medicaid	33.2	57.0	67.5*	35.6
Prenatal care paid by neither Medicaid nor private health insurance	7.1	9.7	10.0	8.9
No prenatal care received	1.3	1.7	1.3	2.3
Mean number of weeks pregnant before knowing	5.4	6.0	6.2*	5.6
Mother smoked at least 100 cigarettes during her lifetime	33.5	37.1	37.9	35.3
Mother smoked during her third trimester	11.0	15.4	17.0*	12.1
State-Level WIC Policies and Practices				
SSI confers WIC eligibility	8.8	8.3	8.2	8.5
School lunch program confers WIC eligibility	17.3	15.1	13.2*	18.8
Food packages allow tailoring for milk	85.6	86.1	86.5	85.3
Food packages allow tailoring for sucrose content	7.8	9.1	9.3	8.7
Mean frequency of WIC food instrument issuance (months)	2.3	2.2	2.2	2.2
Mean hematocrit cutoff values	34.2	34.1	34.1*	34.2
Mean cost of food package (dollars)	49.3	49.4	49.5	49.2
Income documentation is required	46.2	41.6	38.9*	47.3
Dietary intake information required	84.4	85.2	85.8	84.0
Observations	9550	5780	3783	1997

Notes: All means are weighted. Participation in other programs includes participation in Medicaid, TANF, or the Food Stamp Program.

* indicates that the value is significantly different from that of non-participants at the 5% level using a two-tailed test.

Table 2. Comparison of estimates from the ECLS-B, SIPP, and WIC PC data

	ECLS-B	1998 SIPP	2002 WIC PC
Participation rates			
% of women eligible	58.2	54.0	*
% of women participating	41.1	38.0	*
% of eligibles participating	67.0	67.0	*
Age of participants			
Less than 35 years old	92.5	*	94.0
35 years or older	7.5	*	5.8
Race of participants			
Non-Hispanic White	39.3	24.0	39.3
Non-Hispanic Black	21.8	48.0	18.8
Hispanic	33.6	24.0	36.4
Other	5.3		4.7
Income of participants			
Average family income	23,434	*	13,859
Percent below poverty line	46.0	*	51.3
Percent below 185% poverty line	81.5	*	81.8

Notes: ECLS-B estimates are weighted. The 1998 SIPP estimates are based on both pregnant women and women in the postnatal period. 2002 WIC PC data from *WIC Participants and Program Characteristics 2002*. 1998 SIPP data are from Bitler, Currie, and Scholz (2003). Estimates in Table 2 may be different than those in Table 1 as Table 2 includes non-eligible participants whereas Table 1 does not.
* indicates the information is not available.

Table 3. Marginal effects from probit regressions: Any prenatal WIC participation among eligible pregnant women

	Probit with State Policy Variables (1)	Probit without State Policy Variables (2)	State-level Fixed Effects Probit (3)
Mother's Race			
Non-Hispanic Black	0.071**	0.072**	0.084**
	(0.027)	(0.025)	(0.026)
Hispanic	0.093*	0.068*	0.112**
	(0.038)	(0.027)	(0.027)
Asian	-0.060	-0.058	-0.050
	(0.044)	(0.045)	(0.046)
Other	0.070*	0.064+	0.069*
	(0.033)	(0.033)	(0.033)
Mother's Education			
High school graduate	0.000	-0.003	0.003
	(0.021)	(0.022)	(0.022)
Some college or voc/tech degree	-0.038	-0.041+	-0.032
	(0.024)	(0.025)	(0.025)
College degree	-0.216**	-0.229**	-0.218**
	(0.039)	(0.044)	(0.045)
Mother's Age			
Age 20-24	0.010	0.009	0.014
	(0.037)	(0.030)	(0.030)
Age 25-29	-0.029	-0.026	-0.032
	(0.038)	(0.034)	(0.034)
Age 30-34	-0.038	-0.032	-0.042
	(0.042)	(0.039)	(0.039)
Age 35-39	-0.095+	-0.092+	-0.094*
	(0.057)	(0.047)	(0.048)
Age 40 and up	-0.039	-0.036	-0.044
	(0.052)	(0.068)	(0.067)
Primary Language			
Spanish	0.056+	0.062*	0.053+
	(0.031)	(0.03)	(0.031)
Other	0.032	0.024	0.023
	(0.053)	(0.046)	(0.047)
Relationship Status			
Never married, no partner present	0.047	0.048+	0.045+
	(0.03)	(0.025)	(0.026)
Never married, partner present	0.056	0.058*	0.055*
	(0.037)	(0.025)	(0.025)
Other marital status	0.020	0.020	0.013
	(0.029)	(0.031)	(0.031)
At least one other child under 5 in household	0.003	-0.002	0.006
	(0.019)	(0.021)	(0.021)
At least one child age 5 to 17 in household	-0.012	-0.014	-0.007
	(0.016)	(0.020)	(0.020)
Child is a twin	0.073**	0.076**	0.073**
	(0.024)	(0.025)	(0.026)

Table 3. Marginal effects from probit regressions: Any WIC participation among eligible pregnant women (continued)

	Probit with State Policy Variables (1)	Probit without State Policy Variables (2)	State-level Fixed Effects Probit (3)
Child is mother's first	0.024	0.025	0.027
	(0.024)	(0.024)	(0.024)
Region and Urban Area			
Northeast	-0.014	-0.147**	-0.330+
	(0.036)	(0.033)	(0.180)
Midwest	0.020	-0.073**	0.041
	(0.035)	(0.028)	(0.148)
South	-0.031	-0.076**	-0.091
	(0.027)	(0.025)	(0.128)
Lives in urban area	-0.077**	-0.093**	-0.060*
	(0.022)	(0.023)	(0.025)
Program Participation			
Participated in other program since birth of child	0.156**	0.145**	0.157**
	(0.020)	(0.022)	(0.023)
Mother received cash welfare as a child	0.019	0.022	0.014
	(0.042)	(0.032)	(0.033)
Mother received cash welfare all or most of the time as a child	0.012	0.010	0.006
	(0.067)	(0.046)	(0.047)
Income/Assets/Employment			
Household income (thousands)	-0.002**	-0.002**	-0.002**
	(0.001)	(0.001)	(0.001)
Below poverty line	-0.006	-0.011	-0.005
	(0.024)	(0.023)	(0.023)
Mother employed during year before birth	0.007	-0.003	0.006
	(0.025)	(0.019)	(0.019)
Owns home	-0.042*	-0.041+	-0.039+
	(0.021)	(0.022)	(0.022)
Adult owns car	0.055	0.054*	0.060*
	(0.034)	(0.027)	(0.027)
Household invests	-0.085**	-0.090**	-0.088**
	(0.025)	(0.027)	(0.028)
Adult has checking/savings account	-0.004	-0.005	-0.005
	(0.020)	(0.020)	(0.021)
Prenatal Care/Health			
Prenatal care paid by Medicaid	0.201**	0.198**	0.214**
	(0.028)	(0.022)	(0.023)
Prenatal care paid by neither Medicaid nor private health insurance	0.117**	0.111**	0.122**
	(0.028)	(0.027)	(0.026)
No prenatal care received	-0.051	-0.049	-0.063
	(0.071)	(0.069)	(0.068)

Table 3. Marginal effects from probit regressions: Any WIC participation among eligible pregnant women (continued)

	Probit with State Policy Variables (1)	Probit without State Policy Variables (2)	State-level Fixed Effects Probit (3)
Number of weeks pregnant before knowing	0.000	0.001	0.001
	(0.002)	(0.002)	(0.002)
Mother smoked at least 100 cigarettes during her lifetime	-0.015	-0.009	-0.021
	(0.020)	(0.023)	(0.023)
Mother smoked during her third trimester	0.04	0.043	0.042
	(0.029)	(0.028)	(0.028)
State-Level WIC Policies and Practices			
SSI confers WIC eligibility	0.067*		
	(0.031)		
School lunch program confers WIC eligibility	-0.112**		
	(0.028)		
Food packages allow tailoring for milk	0.030		
	(0.023)		
Food packages allow tailoring for sucrose content	-0.035		
	(0.029)		
Mean frequency of WIC food instrument issuance (months)	0.003		
	(0.018)		
Mean hematocrit cutoff values	-0.013		
	(0.008)		
Mean cost of food package	0.004		
	(0.003)		
Income documentation is required	-0.119**		
	(0.028)		
Dietary intake information required	0.009		
	(0.033)		
Includes state policy variables	Yes	No	No
Includes state fixed effects	No	No	Yes
Observations	5780	5780	5778

Notes: All estimates are weighted. Standard errors are in parentheses and adjusted to account for multiple mothers in the same state. Marginal effects are calculated at the means of the independent variables. Missing value indicator variables are included for the following variables: household invests, household has a checking or savings account, mother received welfare as a child, mother received welfare all or most of the time as a child, and indicator of first order birth. Excluded groups are the following: Non-Hispanic White, less than high school, less than 20 years, English, married, West, prenatal care paid by private health insurance. The inclusion of state fixed effects causes two observations to be dropped from the analysis in Column 3.

+ significant at 10%.

* significant at 5%.

** significant at 1%.

Table 4. Timing of WIC participation by trimester WIC receipt began

	All Eligible Women	WIC Participants
WIC Participation	67.0	100.0
Began 1st trimester	38.6	57.6
Began 2nd trimester	22.1	32.9
Began 3rd trimester	6.4	9.5
Observations	5780	3783

Notes: All means are weighted.

Table 5. Characteristics of eligible prenatal WIC participants, by timing of their participation

		Trimester WIC Receipt Began		
	Participants	1st	2nd	3rd
Mother's Race				
Non-Hispanic White	38.7	41.4	33.7*	39.7
Non-Hispanic Black	22.0	21.4	23.8	19.5
Hispanic	34.8	32.9	37.4*	37.4
Asian	1.5	1.2	1.9*	1.7
Other	3.1	3.1	3.3	2.2
Mother's Education				
Less than high school	48.3	49.2	47.2	47.3
High school graduate	28.6	29.0	28.4	27.2
Some college or voc/tech degree	20.3	19.6	20.7	22.5
College degree	2.8	2.2	3.7	29.9
Mother's Age				
Less than 20 years	14.3	12.0	17.9*	14.9
Age 20–24	39.5	40.8	38.0	37.1
Age 25-29	25.1	26.3	21.6*	30.6
Age 30-34	13.6	13.7	14.4	10.7
Age 35-39	6.1	5.8	6.7	5.4
Age 40 or more	1.4	1.4	1.5	1.3
Primary Language				
English	82.9	83.6	81.0	85.3
Spanish	14.4	14.1	15.9	11.1
Other	2.7	2.3	3.1	3.7
Relationship Status				
Married	41.2	43.2	37.2*	42.4
Never married, no partner present	27.5	25.7	29.9*	29.9
Never married, partner present	21.1	20.7	22.5	18.5
Other marital status	10.3	10.4	10.3	9.3
At least one other child under 5 in household	38.5	42.5	33.0*	32.3*
At least one child age 5 to 17 in household	45.8	46.2	46.7	39.7
Child is a twin	1.3	1.2	1.3	1.8
Child is mother's first	36.5	32.2	42.4*	42.7*
Region and Urban Area				
Northeast	12.9	12.0	15.6*	10.0
Midwest	19.7	19.9	19.2	20.5
South	40.9	42.3	39.3	38.1
West	26.4	25.9	25.9	31.5
Lives in urban area	82.1	80.1	84.5*	86.5*

Table 5. Characteristics of eligible prenatal WIC participants, by timing of their participation (continued)

		Trimester WIC Receipt Began		
	Participants	1st	2nd	3rd
Program Participation				
Participated in other programs since birth of child	78.1	78.8	78.6	72.3*
Mother received cash welfare as a child	16.7	17.5	16.8	11.7*
Mother received cash welfare all or most of the time as a child	7.2	8.7	5.2*	4.5*
Income/Assets/Employment				
Mean household income (thousands)	21.8	21.2	22.1	24.9*
Below poverty line	48.5	48.6	49.6	44.2
Mother employed during year before birth	63.0	62.4	63.8	63.9
Owns home	20.7	22.1	19.2	17.1
Adult owns car	80.3	80.7	79.8	79.7
Household invests	10.4	9.2	11.0	15.6*
Adult has checking/savings account	51.8	51.6	50.8	56.2
Prenatal Care/Health				
Prenatal care paid by private health insurance (no Medicaid)	21.0	20.4	20.4	27.6*
Prenatal care paid by Medicaid	57.5	68.6	68.5	57.6*
Prenatal care paid by neither Medicaid nor private health insurance	10.0	9.7	10.3	11.1
No prenatal care received	1.3	1.3	0.8	3.7*
Mean number of weeks pregnant before knowing	6.2	5.3	7.4*	7.3*
Mother smoked at least 100 cigarettes during her lifetime	37.9	38.7	35.6	41.3
Mother smoked during her third trimester	17.0	18.1	15.6	15.0
State-Level WIC Policies and Practices				
SSI confers WIC eligibility	8.2	8.7	7.5	7.7
School lunch program confers WIC eligibility	13.3	11.9	15.5*	13.8
Food packages allow tailoring for milk	86.5	86.1	87.6	85.4
Food packages allow tailoring for sucrose content	9.3	10.2	7.9	8.4
Mean frequency of WIC food instrument issuance (months)	2.21	2.19	2.25	2.19
Mean hematocrit cutoff values	34.06	34.01	34.18*	34.0
Mean cost of food package (dollars)	49.47	49.38	49.57	49.70
Income documentation is required	38.9	37.2	42.4*	36.7
Dietary intake information required	85.8	87.5	83.3*	83.5
Observations	3783	2219	1219	345

Notes: All means are weighted. Participation in other programs includes participation in Medicaid, TANF, or the Food Stamp Program.

* indicates that the value is significantly different from the first trimester value at the 5% level using a two-tailed test.

Table 6. Marginal effects from probit regressions among eligible WIC participants: A comparison of participation by trimester

Analysis Sample	All Participants		1st or 2nd Trimester	2nd or 3rd Trimester
Trimester Began WIC Receipt	1st (1)	3rd (2)	1st Trimester (3)	2nd Trimester (4)
Mother's Race				
Non-Hispanic Black	-0.037	-0.013	-0.045	0.060+
	(0.033)	(0.014)	(0.036)	(0.033)
Hispanic	-0.105**	0.022	-0.099**	0.000
	(0.035)	(0.015)	(0.038)	(0.042)
Asian	-0.102	-0.024	-0.136*	0.095+
	(0.063)	(0.025)	(0.063)	(0.05)
Other	-0.036	-0.022	-0.058	0.082*
	(0.058)	(0.016)	(0.057)	(0.034)
Mother's Education				
High school graduate	-0.037	0.001	-0.044	0.007
	(0.030)	(0.014)	(0.032)	(0.032)
Some college or voc/tech degree	-0.051	-0.003	-0.068	0.029
	(0.043)	(0.013)	(0.046)	(0.028)
College degree	-0.134**	-0.014	-0.166**	0.072
	(0.047)	(0.023)	(0.054)	(0.048)
Mother's Age				
Age 20-24	0.057	0.001	0.068+	-0.027
	(0.037)	(0.016)	(0.040)	(0.043)
Age 25-29	0.051	0.039	0.092+	-0.128+
	(0.041)	(0.025)	(0.047)	(0.067)
Age 30-34	0.052	-0.002	0.066	-0.003
	(0.034)	(0.020)	(0.040)	(0.056)
Age 35-39	0.033	0.008	0.051	-0.024
	(0.044)	(0.032)	(0.046)	(0.074)
Age 40 and up	0.023	0.015	0.037	-0.058
	(0.077)	(0.038)	(0.089)	(0.123)
Primary Language				
Spanish	0.034	-0.034	0.013	0.079
	(0.029)	(0.023)	(0.037)	(0.072)
Other	-0.082	0.035	-0.074	-0.053
	(0.061)	(0.043)	(0.066)	(0.087)
Relationship Status				
Never married, no partner present	-0.019	-0.002	-0.028	0.011
	(0.033)	(0.016)	(0.033)	(0.035)
Never married, partner present	-0.002	-0.020	-0.021	0.049
	(0.031)	(0.016)	(0.037)	(0.038)
Other marital status	-0.034	-0.009	-0.044	0.052
	(0.038)	(0.022)	(0.045)	(0.054)
At least one other child under 5 in household	0.072**	-0.019+	0.062*	0.004
	(0.025)	(0.011)	(0.029)	(0.030)
At least one child age 5 to 17 in household	0.010	-0.025+	-0.009	0.044
	(0.022)	(0.014)	(0.024)	(0.033)

Table 6. Marginal effects from probit regressions among eligible WIC participants: A comparison of participation by trimester (continued)

Analysis Sample	All Participants		1st or 2nd Trimester	2nd or 3rd Trimester
Trimester Began WIC Receipt	1st (1)	3rd (2)	1st Trimester (3)	2nd Trimester (4)
Child is a twin	-0.049	0.034+	-0.028	-0.054
	(0.036)	(0.019)	(0.044)	(0.050)
Child is mother's first	-0.061+	0.008	-0.055	0.01
	(0.034)	(0.014)	(0.037)	(0.027)
Region and Urban Area				
Northeast	0.103*	-0.059**	0.060	0.111**
	(0.047)	(0.013)	(0.049)	(0.042)
Midwest	0.049	-0.010	0.043	-0.015
	(0.038)	(0.016)	(0.039)	(0.041)
South	0.102**	-0.033*	0.084*	0.035
	(0.037)	(0.015)	(0.038)	(0.033)
Lives in urban area	-0.052*	0.023+	-0.039	-0.025
	(0.023)	(0.013)	(0.024)	(0.036)
Program Participation				
Participated in other program since birth of child	0.013	-0.019	-0.006	0.044
	(0.032)	(0.014)	(0.040)	(0.040)
Mother received cash welfare as a child	-0.057	-0.024+	-0.081*	0.081*
	(0.037)	(0.015)	(0.040)	(0.034)
Mother received cash welfare all or most of the time as a child	0.179**	-0.014	0.178**	-0.064
	(0.040)	(0.027)	(0.033)	(0.077)
Income/Assets/Employment				
Household income (thousands)	-0.002*	0.001**	-0.002+	-0.001
	(0.001)	(0.000)	(0.001)	(0.001)
Below poverty line	-0.045	0.014	-0.042	-0.020
	(0.028)	(0.015)	(0.028)	(0.037)
Mother employed during year before birth	-0.011	-0.001	-0.014	0.016
	(0.021)	(0.014)	(0.021)	(0.033)
Owns home	0.011	-0.016	-0.005	0.039
	(0.029)	(0.013)	(0.026)	(0.029)
Adult owns car	0.002	-0.024+	-0.013	0.056*
	(0.027)	(0.013)	(0.025)	(0.025)
Household invests	-0.052	0.030	-0.033	-0.035
	(0.044)	(0.022)	(0.046)	(0.045)
Adult has checking/savings account	0.006	0.011	0.017	-0.032
	(0.020)	(0.014)	(0.020)	(0.032)
Prenatal Care/Health				
Prenatal care paid by Medicaid	0.041	-0.029	0.024	0.061+
	(0.038)	(0.02)	(0.033)	(0.033)
Prenatal care paid by neither Medicaid nor private health insurance	0.025	-0.008	0.014	0.018
	(0.044)	(0.016)	(0.046)	(0.050)

Table 6. Marginal effects from probit regressions among eligible WIC participants: A comparison of participation by trimester (continued)

Analysis Sample	All Participants		1st or 2nd Trimester	2nd or 3rd Trimester
Trimester Began WIC Receipt	1st (1)	3rd (2)	1st Trimester (3)	2nd Trimester (4)
No prenatal care received	0.020	0.132*	0.124	-0.345*
	(0.113)	(0.066)	(0.131)	(0.158)
Number of weeks pregnant before knowing	-0.033**	0.005**	-0.033**	-0.001
	(0.003)	(0.001)	(0.003)	(0.003)
Mother smoked at least 100 cigarettes during her lifetime	-0.017	0.031*	0.014	-0.061+
	(0.028)	(0.013)	(0.028)	(0.032)
Mother smoked during her third trimester	0.010	-0.019	-0.007	0.049
	(0.030)	(0.015)	(0.033)	(0.038)
State-Level WIC Policies and Practices				
SSI confers WIC eligibility	0.045	-0.014	0.043	0.005
	(0.049)	(0.010)	(0.051)	(0.038)
School lunch program confers WIC eligibility	-0.023	-0.008	-0.033	0.033
	(0.033)	(0.008)	(0.036)	(0.024)
Food packages allow tailoring for milk	0.035	-0.031*	0.009	0.043
	(0.032)	(0.014)	(0.036)	(0.031)
Food packages allow tailoring for sucrose content	0.046	-0.009	0.046	0.017
	(0.031)	(0.010)	(0.032)	(0.024)
Mean frequency of WIC food instrument issuance (months)	-0.027	0.009	-0.023	-0.010
	(0.019)	(0.006)	(0.020)	(0.015)
Mean hematocrit cutoff values	-0.027**	0.008+	-0.024**	-0.006
	(0.007)	(0.004)	(0.007)	(0.010)
Mean cost of food package	-0.003	0.002+	-0.002	-0.003
	(0.003)	(0.001)	(0.003)	(0.003)
Income documentation is required	-0.035	0.007	-0.027	0.010
	(0.029)	(0.013)	(0.034)	(0.032)
Dietary intake information required	0.083*	-0.017	0.075+	0.009
	(0.037)	(0.016)	(0.041)	(0.036)
Observations	3783	3783	3438	1564

Notes: All estimates are weighted. Standard errors are in parentheses and adjusted to account for multiple mothers in the same state. Marginal effects are calculated at the means of the independent variables. Missing value indicator variables are included for the following: household invests, household has a checking or savings account, mother received welfare as a child, mother received welfare all or most of the time as a child, and indicator of first order birth. Excluded groups are the following: Non-Hispanic White, less than high school, less than 20 years, English, married, West, prenatal care paid by private health insurance

+ significant at 10%.

* significant at 5%.

** significant at 1%.

Appendix: State-level WIC Policies and Practices

1. WIC Eligibility Variables

States may offer automatic WIC income eligibility to individuals who participate in the Supplemental Security Income (SSI), Free or Reduced Price National School Lunch Program, or other state-selected programs.

Prior to 2000, some states required that applicants provide documentation of income (such as pay stubs, W-2 forms and letters from employers), while other states allowed applicants to self-declare their income. Federal guidelines, effective in 2000, now require that all applicants provide income documentation, unless they are adjunctively eligible for WIC.

- *SSI confers WIC eligibility* indicates whether participation in the Supplemental Security Income program confers automatic WIC income eligibility.

- *School lunch program confers WIC eligibility* indicates whether participation in the free or reduced price lunch or breakfast program confers automatic WIC income eligibility.

- *Income documentation is required* indicates whether a state requires applicants to provide documentation of income to determine WIC income eligibility.

2. WIC Food Package and Instrument Distribution Variables

The USDA Food and Nutrition Service limits the maximum amount of food states can distribute in each food package. Within this limit, state and local agencies may allow for food packages to be tailored to better meet the nutritional needs of individual WIC participants. For example, some states offer various types of milk (low fat, soy, etc.) or cereal of varying sucrose content. States also have discretion over the frequency with which the food instruments (vouchers) are distributed to WIC participants, with distribution periods ranging from one month to three months. Food package costs within states differ between infants, children and pregnant, breastfeeding and postpartum women. The pre-rebate average cost of the food packages for all WIC participants tends to vary by region and state (from $33.38 to $61.84), dependent partly on differences in local food costs and tailoring allowances.

- *Food packages allow tailoring for milk* indicates whether states allow for tailoring of the type of milk in food packages.

- *Food packages allow tailoring for sucrose content* indicates whether states allow for tailoring of the type of cereal in food packages to reduce sucrose content.

- *Mean frequency of WIC food instrument issuance (months)* represents the frequency of WIC food instrument issuance in months.

- *Mean cost of food package* is the pre-rebate real average cost of food packages for all WIC participants in 2000 dollars.

3. WIC Nutritional Risk Variables

Prior to 1999, states selected criteria for establishing nutritional risk under broad federal guidelines. All applicants except infants take a blood test as part of the nutritional risk determination process. Low levels of hemoglobin or hematocrit may indicate anemia or other nutritional abnormalities. Because states set the lower and upper limits for nutritional risk eligibility, there is variation across states in the criteria for determining nutritional risk. Some states also require dietary intake information be provided in order to assess nutritional risk. We include hematocrit cutoff values and an indicator for the dietary information requirement as proxies for the state's nutritional risk stringency.

- *Mean hematocrit cutoff values* refers to the state's WIC nutritional risk eligibility cutoff for hematocrit values among pregnant women.

- *Dietary intake information required* indicates whether states require that dietary intake information be provided to determine WIC nutritional risk eligibility.