

United States
Department of
Agriculture



Economic
Research
Service

Economic
Research
Report
Number 109
December 2010

WIC Participation Patterns

An Investigation of Delayed Entry and Early Exit

Alison Jacknowitz
Laura Tiehen



www.ers.usda.gov

Visit Our Website To Learn More!

For more information
<http://www.ers.usda.gov/Briefing/WIC>

Recommended citation format for this publication:

Jackowitz, Alison, and Laura Tiehen. *WIC Participation Patterns: An Investigation of Delayed Entry and Early Exit*, ERR-109, U.S. Department of Agriculture, Economic Research Service, December 2010.

Cover photo: Thinkstock®

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and, where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.



United States
Department
of Agriculture

Economic
Research
Report
Number 109

December 2010



A Report from the Economic Research Service

www.ers.usda.gov

WIC Participation Patterns An Investigation of Delayed Entry and Early Exit

Alison Jacknowitz

Laura Tiehen, ltiehen@ers.usda.gov

Abstract

USDA's 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/children up to age 5. Despite the health benefits of WIC participation, many eligible women do not participate during pregnancy, and many households exit WIC when a participating child turns 1 year old. The authors of this report use the first two waves of the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B) to understand these transitions into and out of WIC. Findings show that households that are more economically advantaged are more likely to delay entry into the program or exit after a child turns 1 year old. Some of the mothers exiting the program reported that WIC requires too much effort and that its benefits are not worth the time (26.2 percent of those exiting) or that they have scheduling and transportation problems (almost 10 percent of those exiting), suggesting that the costs of participation may be a barrier to continued WIC participation.

Keywords: Special Supplemental Nutrition Program for Women, Infants, and Children, WIC, participation dynamics

Acknowledgments

The authors thank Tracy Fox Salmons and Steven Putansu of American University for research assistance. Nancy Burstein from Abt Associates; Philip Gleason from Mathematica Policy Research; Jay Hirschman and Janis Johnston from USDA's Food and Nutrition Service; Ephraim Leibtag, Victor Oliveira, and Mark Prell from USDA's Economic Research Service; and participants at the 2006 and 2007 Association for Public Policy Analysis and Management Conference, the 2007 National Association for Welfare and Research Statistics Conference, the 2006 University of Kentucky Center for Poverty Research (UKCPR) Small Grants Conference, a 2007 National Poverty Center

seminar, a 2008 UKCPR seminar, and a 2007 U.S. Department of Health and Human Services, Administration for Children and Families seminar provided valuable comments on an earlier version of the paper. Alison Jacknowitz thanks the following organizations for funding: UKCPR through the U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, grant number 2U01PE000002-04; and USDA, Economic Research Service. Thanks also go to our editor, Angela Anderson, and to Wynnice Pointer-Napper for graphic design and layout.

About the Authors

Alison Jacknowitz is an associate professor of public administration and policy in the School of Public Affairs at American University. Laura Tiehen is an economist with USDA's Economic Research Service (ERS).

Contents

- Summary iv
- Introduction 1
- How WIC Works: Program Administration and Outcomes 3
 - Services Provided by WIC 3
 - WIC Eligibility Requirements 3
 - Research on WIC Participation and the Outcomes Associated With Participation 4
- Data 7
 - The ECLS-B Provides Unique Data 7
 - Additional Data Sources 7
 - Coding WIC Eligibility and Participation. 8
 - Constructing the Analysis Sample 10
- Methods 13
 - A Conceptual Model of Household Program Participation. 13
 - Regression Analysis 13
- Results on Dynamic WIC Participation Patterns 17
 - Descriptive Analysis of Dynamic Participation Patterns 17
 - Comparability of ECLS-B Coverage Rates and Official Coverage Rates. 18
 - Dynamic WIC Participation Rates 18
 - Results for Postnatal-Infant WIC Entrants 19
 - Results for Participants Exiting WIC 20
 - Self-Reported Explanations for Early Exits 25
- Discussion 32
- References 33
- Appendix: State-Level WIC Policies and Practices 37

Summary

What Is the Issue?

Despite the health benefits of participation, many eligible households do not participate in USDA's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). While roughly half of infants born in the United States receive WIC benefits, USDA statistics indicate that eligible pregnant women and children 1-5 years of age are far less likely to participate in WIC than eligible infants and postpartum women. This implies that a number of pregnant women delay enrollment until after having a child, and that many households leave the program when a participating child turns 1 year old. Research on the factors that influence the dynamics of WIC participation can inform outreach and targeting efforts, so that vulnerable populations receive adequate exposure to the benefits of WIC participation.

What Did the Study Find?

There are notable differences in the timing of household participation in the WIC program.

- Among the mother-child pairs (referred to as households) eligible for WIC, 79.1 percent participated in the program at some time during the period between the child's birth and when the child turned 1 year old (the "postnatal-infant period").
- Of those who participated in the WIC program during the postnatal-infant period, 17.6 percent did not enroll in the program until after the child was born and 22.9 percent exited the program when the child turned 1 year old.

Postnatal Enrollment in WIC

The following types of households were more likely than others to delay participating in WIC until after their child was born:

- Households with higher income and those with private insurance.
- Households in which the mother has a college degree and was employed the year before giving birth.
- Households in the Northeast and those in urban areas with a population of at least 50,000.

By contrast, prenatal Medicaid recipients were much less likely to delay WIC enrollment until after having a child.

Exits From WIC

When a child turns 1 year old, the WIC household must recertify its eligibility for benefits. Roughly 90 percent of postnatal-infant participants retained eligibility after the child turned 1 year old. The following types of households were more likely than others to exit WIC after their child turns 1 year old:

- Households with higher income.
- Households in which mothers are more educated and were employed after the child's birth.
- Mothers who did not breastfeed and those who breastfed for less than 6 months.

By contrast, households with income below the poverty line and those that participated in prenatal Medicaid were less likely to exit WIC after their child turned 1 year old. Approximately 33 percent of households that left the WIC program reported that they believed they were no longer eligible once the child turned 1 year old, and 27.8 percent reported that they no longer needed food benefits.

When a child turns 1 year old, the eligible WIC household no longer receives the infant food package, which contains infant formula for those who are not being breastfed exclusively, and transitions to the child food package, which has a significantly lower retail value. This change in WIC food benefits may play a role in a household's decision to exit WIC.

Although WIC is not an entitlement program, few households reported that they were denied benefits due to lack of program funds. Some households reported, however, that the program requires too much effort and the benefits are not worth the time (26.2 percent of those exiting) or that they have scheduling and transportation problems (almost 10 percent of those exiting), suggesting that such transaction costs of participation may be a barrier to continued participation in WIC.

How Was the Study Conducted?

Researchers used data from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), a nationally representative longitudinal dataset of children born in 2001. The dataset provides demographic and economic information collected from the child's biological mother when the child is 9 months and 24 months old, as well as information from the child's birth certificate. The ECLS-B collects extensive information about the WIC participation of the mother and children in the household, and the timing of that participation. In addition, a subset of mothers who left the WIC program was asked to report why they stopped receiving WIC benefits for their child.

The researchers used probit regression analysis to examine the factors that influence postnatal, rather than prenatal, enrollment in WIC and the factors that influence a household's exit from WIC once the child turns 1 year old. The researchers' analysis focused on the factors that influence a household's participation: perceived benefits, the stigma or transaction costs associated with participation, and the availability of information on the program and its eligibility requirements. The researchers also used multinomial logit regression to examine WIC household characteristics that may have influenced WIC participants' self-reported explanation for leaving the program.

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 for low-income pregnant and postpartum women and their infants and children up to age 5. WIC has grown from serving 88,000 participants in fiscal year 1974 to approximately 8.7 million in fiscal year 2008 (U.S. Department of Agriculture (USDA), 2010a). In fiscal year 2006, approximately a quarter of participants were women (categorized as either pregnant, breastfeeding, or nonbreastfeeding post-partum), approximately a quarter were infants, and approximately half were children 1-5 years of age (Oliveira and Frazão, 2009).

To be eligible for WIC, in addition to belonging to 1 of the 5 demographically targeted groups discussed above, an individual must have low income and be at nutritional risk. Not everyone who is eligible for WIC chooses to participate. The percent of the eligible population receiving WIC benefits is referred to as the “coverage rate.” The official WIC coverage rate is calculated as the number of WIC participants (derived from administrative data) divided by the number of individuals eligible for WIC (estimated using survey data). WIC’s official coverage rate in 2007 was 55.9 percent (USDA, 2009).

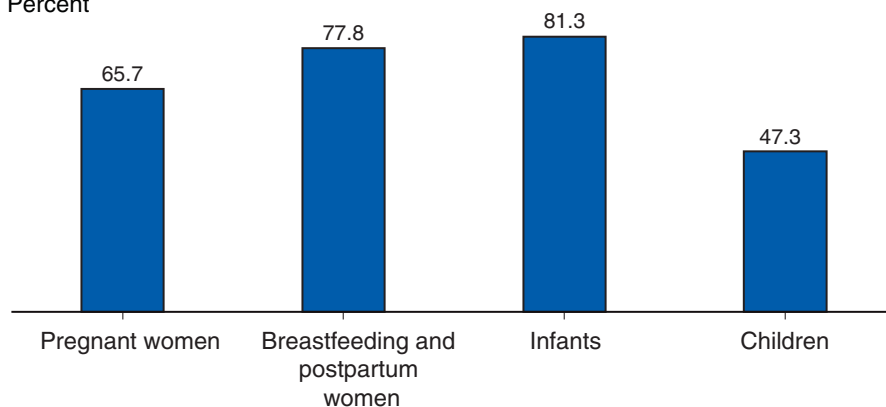
Participation in WIC varies across categories. As shown in figure 1, coverage rates for 2007 were higher among women in the year after giving birth (77.8 percent) than for pregnant women (65.7 percent).¹ The coverage rate for infants (81.3 percent) was higher than that for children 1-5 years old (47.3 percent) (USDA, 2009). Among the five participant categories, infants had the highest coverage rate. Arranging coverage rates in time sequence shows a hump-shaped pattern, with a peak in WIC coverage during the year after a woman gives birth. This pattern is also evident in the official coverage rates from 1994 to 2007 reported by USDA (2009).

¹Women who participate in WIC after giving birth are divided into two groups: those who breastfeed (participation rate of 68.1 percent) and those who do not breastfeed (participation rate of 78.8 percent).

Figure 1

WIC coverage rates, 2007

Percent



Note: Coverage rate equals the number of WIC participants as a percent of the number of persons estimated to be eligible for WIC.

Source: U.S. Department of Agriculture, 2009.

While pregnant women and children 1-5 years old have relatively low participation rates, previous research suggests that participation in WIC does confer health benefits to these groups. In addition, studies demonstrate that eligible pregnant women and children who do not participate exhibit need across a variety of dimensions (Bitler, Gundersen, and Marquis, 2005; Gundersen, 2005; Tiehen and Jacknowitz, 2008). For example, Bitler, Gundersen, and Marquis (2005) found that among eligible children who did not participate in WIC, 5.5 percent lived in households that are food insufficient (sometimes or often do not get enough to eat) and 19.5 percent lived in households that could not afford to eat balanced meals. Focusing on pregnant women, Tiehen and Jacknowitz (2008) found that 32.7 percent of eligible nonparticipants had household income below the poverty line.

In this study, we examined why eligible participant households are less likely to participate during the prenatal period and after a child turns 1 year old than in the year after birth.² Specifically, we examined factors associated with the decision of households that participate in WIC during the year after the birth of a child (the postnatal-infant period) to (1) delay their entry into the WIC program until after the child's birth and (2) exit the program when a child turns 1 year old. We considered three sets of factors:

1. Household demographic and socio-economic characteristics;
2. WIC policies; and
3. Self-reported reasons for exiting the program after the child turns 1 year old.

We used the first two waves of the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B) data to document and analyze the participation patterns of mother-child pairs from the time of the mother's pregnancy until the child's second birthday. While the relatively low coverage rates for children pertain to children up to their fifth birthday, the ECLS-B data used for this study provided information up to the child's second birthday. We were able to estimate WIC participation in each of three periods for the same set of households. In contrast to the cross-sectional program data and survey data on which most analysis of WIC is based, the longitudinal nature of the ECLS-B permits analysis of the dynamic participation patterns of WIC-eligible mother-child pairs.

From a program perspective, if those who delay entry into WIC or those who exit early are more advantaged economically and less in need of program benefits, then the program is well-targeted. If eligible nonparticipants exhibit need, research results can be used to facilitate outreach efforts and to guide program reforms to prolong the participation of underserved groups. Given that households that participated during the year after the birth of a child demonstrated program awareness and the willingness to participate, outreach activities and program changes could be effective for these groups. Program awareness, however, may be delayed for those who enroll after giving birth.

²This work is an extension of Jacknowitz and Tiehen (2009).

How WIC Works

Program Administration and Outcomes

Services Provided by WIC

The overarching objective of the WIC program is to counteract the negative effects of poverty on prenatal and child health. WIC participants typically receive vouchers to purchase specific supplemental foods from authorized retailers. These foods are good sources of nutrients, such as protein, iron, calcium, and vitamins A and C.

WIC food packages do not vary by household income, but they do vary by low-income target group. The contents of WIC food packages were revised in 2009 to reflect changes in dietary recommendations.³ During the period of this study, WIC food packages for most participant categories, other than infants, included milk, eggs, cheese, dried beans, peanut butter, and breakfast cereals that are high in iron and low in sugar. Infants who were not exclusively breastfed received iron-fortified infant formula from 0-12 months of age as well as infant cereal and fruit or vegetable juice from 4-12 months of age. The price of infant formula creates most of the variation in the value of food packages across participant categories. In fiscal year 2005, the average retail value of the WIC food package for infants was \$97.86 per month, while the average retail value of the child package was \$39.97 per month (USDA, 2007).⁴ In addition, while Federal guidelines limit the maximum amount of food in each food package, States have some discretion over the content of food packages. For example, some States allow WIC agencies to tailor the food packages of some participants for sucrose content or the type of milk.⁵

In addition to the supplemental foods, WIC also provides nutrition education to its participants. Nutrition education includes lessons on recommended food patterns, but can also cover topics like breastfeeding and health behaviors, such as avoiding alcohol, smoking, and drugs. States must offer participants two nutritional education sessions every 6 months, though participants are not required to attend them. WIC also provides referrals to health and social services, such as preventative medicine and other assistance programs, particularly Medicaid (Oliveira and Frazão, 2009).

WIC Eligibility Requirements

In addition to being categorically eligible (i.e., belonging to 1 of the 5 groups discussed earlier), an individual must meet two other criteria to be WIC eligible.

1. The individual must reside in a household with income at or below 185 percent of the Federal poverty threshold (i.e., income eligible) or be enrolled in another assistance program, such as the Food Stamp Program,⁶ Temporary Assistance for Needy Families (TANF), or Medicaid (i.e., adjunctively eligible). Some States allow participants in the National School Lunch Program or the Supplemental Security Income (SSI) Program to be adjunctively eligible for WIC.

³For more information, see Oliveira and Frazão (2009).

⁴Manufacturer rebates to the WIC program lower the cost to USDA of certain WIC foods, especially infant formula, below the retail value (Oliveira and Frazão, 2009).

⁵Davis and Leibtag (2005) studied the sources of State variation in the retail value of WIC food packages.

⁶The Food Stamp Program was renamed the Supplemental Nutrition Assistance Program (SNAP) in October 2008. We refer to it as the Food Stamp Program, since the name change occurred after the period of our study.

2. The individual must be assessed as nutritionally at risk:⁷

- Medically based risks, such as anemia, underweight, overweight, or history of pregnancy complications or poor outcomes; and
- Diet-based risks, such as failure to meet dietary guidelines. During the period of our study, States varied on how they collected information about nutritional risk. For example, some States required individuals to recall food intake over a 24-hour period and others just required that individuals complete a food frequency checklist (USDA, 2002).⁸

Participants are certified as WIC eligible for a specified period of time, which varies by participant category. A pregnant participant is certified for the duration of her pregnancy and does not have to recertify her eligibility until 6 weeks after the birth of her infant. Postpartum women who do not breast-feed are eligible for WIC for up to 6 months after delivery, while mothers who breastfeed are certified for 6 months at a time up to 1 year after delivery as long as they continue to breastfeed. Infants are generally certified until they turn 1 year old, while children 1-5 years old are certified for a 6-month period. WIC is not an entitlement program, which means that eligible applicants are not guaranteed to receive services. When an agency does not have sufficient funds to serve all eligible applicants, it creates a waiting list and allocates available resources based on a system that ensures that those with the greatest nutritional needs are served first.⁹ As noted by Oliveira and Frazão (2009), anecdotal evidence suggests that in recent years States have received sufficient funding to provide benefits to all eligible WIC applicants.

Research on WIC Participation and the Outcomes Associated With Participation

Most national-level studies of WIC participation have used a cross-sectional design to examine factors associated with participation (Ku, 1989; Brien and Swann, 1997; Kowaleski-Jones and Duncan, 2000; Chatterji et al., 2002; Bitler et al., 2003; Bitler and Currie, 2005a), while others used a dynamic design (Burstein et al., 2000; Gundersen, 2005; Swann, 2007; Tiehen and Jacknowitz, 2008). Most studies examined prenatal participation, while relatively few examined children's participation (Burstein et al., 2000; Gundersen, 2005; Castner et al., 2009). Two studies examined the correlates of WIC participation around the birth of a child, though they did not distinguish prenatal from postnatal participation (Bitler et al., 2003; Chatterji et al., 2002).¹⁰

Among the studies that focused on prenatal participation, some concentrated on what factors influenced prenatal participation (Ku, 1989; Swann, 2007; Tiehen and Jacknowitz, 2008), while others focused on understanding prenatal participation to estimate the effect of WIC on birth outcomes (Bitler and Currie, 2005a; Brien and Swann, 1997; Kowaleski-Jones and Duncan, 2000). The primary interest of Ku (1989), Swann (2007), and Tiehen and Jacknowitz (2008) was to understand factors associated with the timing of prenatal participation.

⁷All WIC applicants, except infants under 9 months, must undergo a blood test for anemia (Oliveira and Frazão, 2009).

⁸The 24-hour food intake recall is no longer used to determine nutritional risk.

⁹For additional information on WIC eligibility, see the USDA, Food and Nutrition Service website at <http://www.fns.usda.gov/wic/howtoapply/eligibilityrequirements.htm>.

¹⁰Chatterji et al. (2002) examined WIC participation during the year of a child's birth (i.e., end of pregnancy and immediately after birth) as part of a study that examined the effect of WIC on breastfeeding.

Three studies focused on the dynamics of WIC participation among infants and children, using the Survey of Income and Program Participation (SIPP) (Burstein et al., 2000; Gundersen, 2005; Castner et al., 2009). Gundersen (2005) used the 1996 SIPP to compare the economic health of three groups of infants and children who were found to be eligible during a single month in late 1996 or early 1997. The three groups were based on their WIC participation patterns over a 48-month period: nonparticipants, participants who left WIC at any time during the 48-month period, and participants who remained in the program for the entire 48-month period. Gundersen (2005) found that infants and children who never participated were, on average, more economically advantaged than infants and children who did participate. In addition, those who participated for only a portion of the 48-month period were generally more economically advantaged than those who remained in the program for the 48-month period. Burstein et al. (2000) and Castner et al. (2009) both used the SIPP to track the participation patterns of infant participants as they aged and examined the factors associated with their exit from the program. Both studies found that exits were strongly associated with increases in household income and exits from other public assistance programs.

Recent reviews of the literature by Currie (2003); Fox, Hamilton, and Lin (2004); and Oliveira and Frazão (2009) concluded that the research, taken as a whole, suggests that WIC has a beneficial impact on the intake of food energy and nutrients during pregnancy and on birth outcomes, such as mean birthweight, gestational age, and the likelihood of low birthweight. While some recent studies (e.g., Bitler and Currie, 2005a; Figlio et al., 2009) found that WIC participation was associated with improved birth outcomes, debate has emerged over the role that WIC participation plays in the improvement of birth outcomes (Besharov and Germanis, 2001; Bitler and Currie, 2005b; Joyce et al., 2005; Joyce et al., 2008; Ludwig and Miller, 2005). One of the underlying issues 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.¹¹ A more thorough understanding of the factors associated with WIC participation, as well as the timing of participation, can contribute to the debate over WIC effectiveness.

Evidence also shows that children benefit from participation in WIC, though it was not as strong or consistent as the evidence relating to prenatal WIC participation. Many studies of WIC's effect on children were not consistent with current methods for assessing dietary intake (Oliveira and Frazão, 2009). Fox, Hamilton, and Lin (2004), however, noted that there was credible evidence that WIC reduces the prevalence of iron-deficiency anemia. Some evidence also indicated that WIC participation may improve children's growth, health care use, immunization status, and overall health (Fox, Hamilton, and Lin, 2004).

This report advances the literature on WIC participation in several ways:

- We examined the dynamics of mother-child pair WIC participation from the time of a woman's pregnancy until her child reaches 2 years old. Previous studies focused on either pregnant women participants (Swann, 2007; Tiehen and Jackowitz, 2008) or infant and/or child participants (Burstein et al., 2000; Gundersen, 2005; Castner et al., 2009). While Burstein et al. (2000) and Castner et al. (2009) tracked WIC participation

¹¹Another underlying issue in this debate, less relevant for this study, is the role of gestational age bias in assessing the effectiveness of WIC. Gestational age bias can lead to a spurious positive association between prenatal WIC participation and birth outcomes that depends on length of gestation, since women whose pregnancies last longer have more opportunity to enroll in WIC.

of infants as they aged, no previous study identified mother-child pairs and tracked the dynamics of their participation over this timeframe.

- We examined why women who enter WIC in the postnatal-infant period did not enter the program earlier. To our knowledge, this issue has not been examined.
- We examined the characteristics associated with the decision to leave WIC when an infant turns 1 year old, and the mother's reasons for exiting the program at that time. Such information has not previously been available in a nationally representative survey.
- Our dataset captured the period after recent policy changes, which standardized WIC eligibility requirements and expanded Medicaid eligibility.

Data

The ECLS-B Provides Unique Data

The primary data source for this study was the Early Childhood Longitudinal Study-Birth Cohort. The ECLS-B is a longitudinal dataset collected by the National Center for Education Statistics (NCES). The sample of 10,700 children was designed to be nationally representative of children born in 2001 and oversampled children who are American Indian, Chinese, a member of another Asian and Pacific Islander group, a twin, or low and very low birth-weight children.¹² The ECLS-B follows these children from birth through kindergarten, collecting data when the child is approximately 9 months, 2 years, 4 years old (at pre-school), and at kindergarten entry.¹³ This study used data from the first two waves (sample at 9 months and at 2 years old). Of the 10,700 children with a parent who participated in the first wave of the survey, 9,850 of their parents participated in the second wave.¹⁴

In the first two waves of the data, information was collected from children and both parents, including nonresidential fathers, birth certificates, and child care providers. The ECLS-B contains information on the timing of WIC participation, explanations for exiting the WIC program, demographic characteristics, income and assets, participation in other assistance programs, and health status and behaviors.

While program administrative data are often utilized for studies of entry into and exit out of participation in many programs, the ECLS-B was a more appropriate dataset for this analysis than available WIC administrative data. The national-level WIC administrative data come from a biennial census of WIC participants in the month of April collected since 1992. WIC administrative data provide valuable information on WIC participation and program characteristics, which are published in a series of USDA reports (see, for example, USDA (2010b)). Although administrative data provide the most accurate count of program participants, there is not sufficient information to link members of a single household that receives WIC or to follow changes in a household's WIC participation over time.

Additional Data Sources

Because some WIC policies vary at the State level, we used a variety of State-level data:

- 2000 data on State policies from *WIC Participants and Program Characteristics 2000*, including the benefits of WIC food packages (e.g., the value of the food package) and the transaction costs of enrolling in WIC and receiving the food packages (e.g., whether WIC vouchers are issued monthly or less frequently). For more information on these policies, see “Appendix A: State-Level WIC Policies and Practices.”
- Information on the number of WIC-only stores (stock only or predominantly WIC food items and serve only or predominantly WIC customers) in the State from *The Integrity Profile Report for Fiscal Year 2000*.

¹²All unweighted sample sizes were rounded to the nearest 50 per NCES rules governing use of restricted data.

¹³There was variation in the age of the survey child at the time of the 9-month survey. For example, over half of the ECLS-B survey children were over 9 months old at the first wave. However, very few (about 10 percent) were 12 months of age or older.

¹⁴Nonresponse rates for the second wave of the survey were fairly similar across maternal education, region of residence, and child's race ethnicity (Nord et al., 2006). Survey instruments are available from NCES at <http://nces.ed.gov/ecls/Birth.asp>.

- 2000 State Medicaid income-eligibility thresholds for pregnant women (National Governors Association, 2001) in our determination of respondents' eligibility for WIC.

We relied on 2000 data, the most recent information available on WIC State policies and the year during which many mothers in the sample were pregnant. It is unlikely that WIC State policies changed between 2000 and 2002 (the period of our study), as Bitler and Currie (2005a) and USDA (2002) noted that these policies changed little during the 90s. Therefore, households that were deciding whether to enter WIC in the postnatal period or exit WIC in the child period most likely faced the same policies that were in place in 2000.

Coding WIC Eligibility and Participation

To be eligible to receive WIC services, an individual must meet categorical, income, and nutritional risk requirements. To meet the income requirement, a household must have income at or below 185 percent of the poverty line or participate in the Food Stamp Program, TANF, or Medicaid. We calculated the household income-to-poverty ratio using household income over the year before the 9-month survey, household size from the 9-month survey, and U.S. Department of Health and Human Services poverty guidelines. Because income information is bracketed in the ECLS-B, the midpoint of each bracket was used to calculate the income-to-poverty ratio.

Because Medicaid participants are deemed adjunctively eligible for WIC, we considered all women who reported prenatal Medicaid participation as eligible for WIC. In addition, the income threshold for Medicaid eligibility varies by State and can be higher than the income threshold for WIC eligibility. If the State's income threshold for Medicaid eligibility was higher than 185 percent of the income-to-poverty ratio, we used the Medicaid threshold to estimate eligibility.¹⁵

There were some notable limitations to using the ECLS-B for coding WIC eligibility that may influence our results. First, adequate information was not available to precisely model changes in eligibility over the three periods of our study. Household incomes vary over time, affecting whether any one household would be determined to be eligible at an actual WIC office at a given time. Ideally, adequate information would be available to estimate eligibility for the prenatal, postnatal-infant, and child periods separately. Instead, we focused on a fixed sample of households where the mother was eligible based on her annual income during the year before the 9-month survey and based on her receipt of prenatal Medicaid. Therefore, the income measure used to estimate WIC eligibility captured income during the prenatal and postnatal period.¹⁶ We examined the role of estimated changes in eligibility status in our analysis of WIC exits when the survey child reached 1 year old.

Another issue related to the use of annual household income to estimate eligibility was that WIC agencies do not necessarily use annual income to determine eligibility, since they have wide discretion over the period used to determine a household's income (Ver Ploeg and Betson, 2003). Ver Ploeg and Betson (2003) noted that, given WIC certification periods, a researcher's use of annual income to estimate eligibility will underestimate the number

¹⁵This is an upper bound estimate of the number of WIC-eligible households, since a number of States have Medicaid income eligibility thresholds above 185 percent of the poverty line. We created a lower bound estimate of WIC-eligible households that included those with income above 185 percent of the poverty line only if the mother participated in Medicaid in the prenatal period, and the estimation results were quite similar.

¹⁶There was variation in the age of the survey child at the time of the 9-month survey, so the period of the annual income measure will also vary. For example, 9 percent of the analysis sample was between 12 and 17 months old at the time of the 9-month survey.

of eligible households, because households with annual income above 185 percent of the poverty guideline but with at least 1 month of income eligibility will be misclassified as ineligible. We found that 250 households in the sample reported prenatal WIC participation, but were coded as ineligible.¹⁷

Based on the midpoint of the income brackets, a household whose income falls within an income bracket that contains the relevant eligibility threshold may be assigned the wrong eligibility status. We tested other methods of coding eligibility, including a more restrictive measure that considered only households with income below the bracket that contained the WIC eligibility threshold. We found that the primary regression results were not sensitive to our eligibility definition.

The ECLS-B does not include data to determine whether a woman is at nutritional risk. However, research that used nationally representative data with information on medical and dietary risk characteristics estimated that at least 97 percent of women, infants, and children ages 2-5 years who are income-eligible for WIC also met the program's criteria for nutritional risk (Ver Ploeg and Betson, 2003). The study also concluded that the prevalence of nutritional risk among children ages 1-2 years was likely as high as for the other groups of WIC participants (Ver Ploeg and Betson, 2003).

Finally, the ECLS-B does not have information on prenatal participation in the Food Stamp Program or TANF, so we cannot account for households who would be income-eligible for WIC through participation in these programs. This will lead us to misclassify as ineligible households with annual income above 185 percent of the poverty line, but that participated in either the Food Stamp Program or TANF in the prenatal period. Given the stricter eligibility criteria for these two programs, however, this type of misclassification was likely minimal.

WIC participation was estimated for three distinct periods: a prenatal period, a postnatal-infant period from birth until the child's first birthday, and a child period. In this study, the child period extends from the child's first to second birthday. While children may participate in WIC until their fifth birthday, the ECLS-B data used for this study did not extend for that length of time. We estimated WIC participation based on responses to a series of questions about WIC participation in the first two waves of the survey. We tracked only the WIC participation of the mother-child survey pair and did not account for the participation of older children in the household.

A household was coded as a prenatal participant if the mother indicated that she participated in WIC prior to giving birth. Due to the timeframe and wording of the WIC questions, it was difficult to fully capture the WIC participation of each individual in the household during the postnatal-infant period (i.e., the year after the child's birth). Therefore, we coded WIC participation in the postnatal-infant period at the household level, capturing participation by the mother, the infant, or both. A household was considered a participant in the postnatal-infant period if the mother responded that she used WIC vouchers to buy food for herself during the 6 months after giving birth, or if the mother used WIC vouchers to buy food for herself, the survey child, or twin during the 30 days before the 9-month survey and the child or twin was less than 12 months old at the time. Finally, a household was

¹⁷There are other explanations for the presence of 250 ineligible WIC participants in the ECLS-B (approximately 5.3 percent of the analysis sample), such as misreporting income to the WIC agency or misreporting income or WIC participation in the ECLS-B.

considered a participant in the child period if the mother responded that the survey child or the twin of the survey child received WIC benefits in the last 30 days and the survey child was over 12 months old at the time.

Our measures of participation did not capture the duration of participation in a given period. It was easier to discuss transitions into and out of the prenatal, postnatal-infant, and child periods as if the transitions all occurred at the thresholds of “birth” and “first birthday.” Strictly speaking, not all transitions occurred at those thresholds. Nevertheless, our measures of participation still provided an informative analysis sample to examine the factors that influenced whether a household delays entry into WIC or exits from the program.

Constructing the Analysis Sample

We constructed a sample of 8,250 mother-child pairs from the 10,700 children in the ECLS-B, of which 4,650 were estimated to be eligible for WIC based on information from the 9-month dataset. We used the following criteria to restrict the sample (the number of observations excluded for each criterion in parentheses) to:

- Observations with State identifiers (100);
- Households with parents who participated in the second wave of data collection (850);¹⁸
- Households with the biological mother of the survey child (150);
- One mother-child pair per household, even if the woman had a multiple birth (750);¹⁹
- Households with a survey child 18 months of age or younger in the first wave of data (50). We excluded mothers of infants older than 18 months at the 9-month data collection because, due to the structure of the survey, we cannot ascertain their prenatal WIC participation status;
- Households that provided information on WIC participation in all periods (100); and²⁰
- Observations with complete information for all relevant variables, with the exception of maternal welfare use as a child (500).²¹ Due to the relatively high number of missing values on the mother’s use of welfare as a child, we assigned the mode to each of the approximately 100 missing value data points, and included a variable in the regression analysis that indicated whether the observation was missing data on mother’s use of welfare as a child.

Table 1 compares the analysis sample of postnatal-infant participants with eligible nonparticipants. Among eligible households, those that chose to participate in WIC during at least the postnatal-infant period were more disadvantaged than those who never participated. For example, postnatal-infant participants were more likely to have less than a high school education, to be younger, to be unmarried, to have income that falls below the poverty line, and to participate in other assistance programs than their nonparticipant counterparts.

¹⁸We estimated equations that explained panel attrition among all households as a function of WIC eligibility and among WIC-eligibles as a function of WIC participation (results available from authors). Controlling for a number of demographic variables, we found that households eligible for WIC were slightly more likely (1.4 percentage points) to exit between the first and second waves of the survey. WIC participation was not associated with the probability of attrition between the first and second waves of the survey.

¹⁹In less than 1 percent of households with twins, the household reported that only one of the twins participated in WIC. In those cases, we counted the mother-child pair as a participant if either the child or the twin participated.

²⁰Households that participated in WIC during the prenatal period, but were coded as ineligible, were excluded from the analysis sample (250). Because these ineligible participants were significantly more advantaged, on average, than eligible households, and we could not determine why they were misclassified, we excluded them from the analysis. We found that our results were largely robust to the inclusion of the ineligibles in the analysis sample.

²¹The observations excluded for missing data had very similar socio-economic characteristics to those included in the analysis sample. Probit regression analysis indicated that Hispanics (relative to non-Hispanic Whites), high school and college graduates (relative to high school dropouts), mothers age 20 and older (relative to teens), those in the Midwest or South (relative to the West), and those in areas with a population of 2,500 to 49,999 (relative to those in cities with a population of 50,000 or more) were slightly less likely to be excluded from the analysis sample due to missing data (results available from authors).

Table 1

Characteristics of WIC participants and eligible nonparticipants

	Proportion of eligible nonparticipants	Proportion of participants in postnatal- infant period
<i>Mother's characteristics:</i>		
Non-Hispanic White	0.613*	0.391
Non-Hispanic Black	0.074*	0.226
Hispanic	0.242*	0.332
Other	0.071*	0.050
Did not graduate high school	0.236*	0.474
High school graduate	0.249	0.281
Some college or vocational/technical degree	0.343*	0.218
College degree	0.172*	0.027
Younger than 20 years old	0.059*	0.136
Age 20-34	0.770	0.776
Age 35 or older	0.171*	0.087
Mother is a U.S. citizen	0.846*	0.787
<i>Mother's relationship status:</i>		
Married	0.747*	0.420
At least one other child under age 5 in household	0.455*	0.393
At least one child 5-17 years old in household	0.471	0.458
Child is twin or higher-order birth	0.011*	0.017
<i>Income, employment, and assets:</i>		
Household income below poverty level	0.210*	0.483
Household income between poverty level and 185 percent poverty	0.541*	0.394
Household income above 185 percent poverty level	0.249*	0.123
Household income increased between surveys	0.611*	0.461
Owns home	0.477*	0.214
Mother employed during year before birth	0.660	0.650
Mother did not work anytime after birth	0.353	0.321
<i>Program participation:</i>		
Participated in other programs since birth of child	0.308*	0.761
Mother received cash welfare most/all of childhood	0.022*	0.065
Mother received cash welfare some/half of childhood	0.040*	0.090
Mother did not receive cash welfare as a child	0.938*	0.844
<i>Prenatal care and infant health:</i>		
Prenatal care paid by private insurance	0.644*	0.227
Prenatal care paid by Medicaid	0.247*	0.664
Prenatal care paid by neither Medicaid nor private health insurance	0.099	0.091
No prenatal care received	0.010	0.019
Mother smoked at least 100 cigarettes during her lifetime	0.359	0.381
Child never breastfed	0.265*	0.411
Child breastfed for less than 6 months	0.358	0.383
Child breastfed 6 months or more	0.378*	0.206
Child had low birthweight	0.065*	0.082

—continued

Table 1

Characteristics of WIC participants and eligible nonparticipants—continued

	Proportion of eligible nonparticipants	Proportion of participants in postnatal-infant period
Region and urbanicity:		
Northeast	0.128	0.141
Midwest	0.225	0.201
South	0.309*	0.413
West	0.338*	0.246
Population of 50,000 and over	0.729*	0.681
Population of 2,500 to 49,999	0.121	0.148
Population less than 2,500	0.150	0.171
State-level WIC policies and practices in 2000:		
SSI confers WIC eligibility	0.093	0.085
School lunch confers WIC eligibility	0.164	0.141
Food packages tailored for type of milk	0.837	0.864
Food packages tailored to reduce sucrose	0.093	0.095
WIC voucher issued monthly	0.283*	0.229
Average retail value of WIC food packages (\$)	49.258	49.385
WIC offices per 1,000 below the poverty level	0.072	0.071
WIC-only stores per 1,000 below the poverty level	0.019	0.016
All nutritional risk criteria documented	0.804*	0.721
Dietary intake information required of all participants	0.854	0.863
Twenty-four hour recall used to obtain dietary intake information	0.841*	0.794
Observations	700	3,700

SSI=Supplemental Security Income.

* Indicates that the value is significantly different from that of eligible postnatal-infant participants at the 5 percent level using a two-tailed test.

Notes: "Eligible nonparticipants" are mother-infant pairs who were eligible for WIC, but did not participate between the mother's pregnancy and the child's second birthday. "Participants in the postnatal-infant period" are eligible households that participated between the birth of the child and the child's first birthday. Statistics are weighted. Sample sizes are rounded to the nearest 50, per National Center for Education Statistics' regulations.

Source: Authors' calculations using the Early Childhood Longitudinal Study-Birth Cohort.

Methods

A Conceptual Model of Household Program Participation

Individuals who are eligible for benefits from means-tested transfer programs do not always receive them, prompting research on nonparticipation among potentially needy households. Most economic research uses a cost-benefit framework to explain the participation decision of eligible individuals. A utility-maximizing individual will participate if the benefits outweigh the costs associated with participation. This model may also explain the timing of participation, with an individual re-evaluating her decision to participate in the program at certain intervals.

As described by Currie (2006), economic research has focused on two primary costs of participation—stigma and transaction costs—to explain nonparticipation among eligible individuals. Stigma was first incorporated into the cost-benefit framework by Moffitt (1983), who describes stigma as the “disutility arising from participation in a welfare program per se” (p. 1023). A utility-maximizing individual may feel embarrassed or ashamed of receiving assistance from the Government, particularly if others know about this assistance. Transaction costs are the costs (both money and time) associated with applying for a program, documenting eligibility, complying with program rules, and redeeming benefits.

The cost-benefit framework assumes that participants have complete information about the costs and benefits of participation. Currie (2006) noted that research also considered whether a lack of information about the program and its eligibility criteria influenced program participation.²²

Regression Analysis

We used probit regression analysis to estimate equations explaining:

1. Delayed entry into the WIC program in the postnatal-infant period; and
2. Exit from the program when a child reaches 1 year old.

In the delayed entry equation, the dependent variable is a binary variable with a value of 1 if the household entered the WIC program in the postnatal-infant period, and 0 if the household participated in both the prenatal and postnatal-infant periods. In the early exit equation, the dependent variable is a binary variable with the value of 1 if the household exited the program after the child turns 1 year old, and 0 if the household participated in both the postnatal-infant and the child periods. As noted previously, the unit of analysis was the mother-child survey pair, which we also refer to as the household.

This empirical strategy allowed us to focus on the factors that explain delayed entry and early exit among participants. This sample restriction means, however, that our regression results must be interpreted as conditional on WIC participation during the postnatal-infant period. Thus, it should be noted

²²Most notably, Daponte, Sanders, and Taylor (1999) found evidence that providing nonparticipating households with information about their potential food stamp benefits increased participation, primarily among those who were eligible for large benefits.

that the study results cannot be generalized to explain the behavior of those who do not participate in the postnatal-infant period and, in particular, households that never participate in WIC during any of the three study periods.

The equations include independent variables that may influence the transition into and out of WIC through their influence on the size of the benefits, the transaction costs associated with participation, stigma, or the availability of program information. Many of the included variables could be attributable to more than one of these explanations; therefore, we did not assign each variable to a specific factor. We focused on households that participated in the program in an attempt to reduce the role of stigma as a possible explanation for periods of nonparticipation. In addition, we eliminated lack of program awareness as an explanation for households exiting after the child turned 1 year old since they had participated previously in WIC.²³ The equations also included independent variables to control for socio-economic characteristics.²⁴

The characteristics displayed in table 1 are included as explanatory variables in at least one of the regression equations. We included variables for the mother's race and ethnicity (with non-Hispanic White as the basis), the mother's education (with did not graduate from high school as the basis), the mother's age (with age younger than 20 years as the basis), the mother's citizenship status, the mother's marital status, the presence of a 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 household, and whether the survey child is a twin or higher-order birth.

We included an indicator variable for household income below the poverty line and an indicator for household income between the poverty line and 185 percent of the poverty line (with household income above 185 percent of the poverty line as the basis). In the early exit equation, we also included a variable that indicates whether household income increased between the 9-month and the 2-year survey. The income variables were included to reflect varying degrees of need for WIC benefits within the WIC-eligible population. We characterized the household's assets with an indicator variable for home ownership. We included an indicator variable for being employed any time during the 12 months prior to the child's birth and, in the early exit equation, a variable to capture the mother's return to work after giving birth.

We captured the mother's experience with other assistance programs in the early exit equation with an indicator variable for participation in TANF, the Food Stamp Program, or Medicaid since the birth of the child. We also included variables to capture the mother's use of welfare as a child (with no cash welfare receipt as the basis).

We included variables to describe characteristics related to a woman's prenatal care and her smoking history. The equations included variables that indicated whether the woman had prenatal care other than her WIC visits and how she paid for it (with payment through private insurance as the basis) and a variable that indicated whether the mother had smoked at least 100 cigarettes during her lifetime.

²³A lack of program awareness could still play a role in the delay of WIC enrollment until after the birth of a child.

²⁴It should be noted that some of the variables included as explanatory variables, such as other program participation, may be jointly determined with WIC participation.

Two variables in the early exit equation captured the initiation and duration of breastfeeding. One variable indicated that the child was never breastfed and the other variable indicated that the child was breastfed for less than 6 months (with the child breastfed 6 months or more as the basis). An additional variable in the early exit equation indicated whether the child was low birthweight.

We included indicator variables for the region of residence (with residence in the West as the basis) and for the population size of the locality for the household (with population of 50,000 and above as the basis).

We included variables to capture State-level WIC policies that may affect WIC participation. Understanding the relationship between State-level WIC policies and WIC participation can help inform decisions regarding policy design. However, these policies are likely to be correlated with other unobserved characteristics of the State, and therefore the coefficient estimates on these variables should be interpreted with caution. A number of these policies are expected to decrease the transaction costs of WIC participation, thus decreasing the likelihood of delayed entry or early exit. In some States, household receipt of Supplemental Security Income or certification for free or reduced-price meals in the National School Lunch Program confers income eligibility for WIC, so participants in these programs do not have to document income to establish income eligibility for WIC. The number of WIC offices per 1,000 people living in poverty per State is included as a measure of access to the program. WIC-only stores are designed to facilitate the redemption of WIC vouchers and reduce the stigma of doing so. Therefore, we also included the number of WIC-only stores per 1,000 people living in poverty in the State.

Another set of State policy variables may increase the transaction costs of WIC participation, thus increasing the likelihood that households will delay entry or exit early. One variable indicated whether States require prenatal WIC participants to pick up WIC vouchers every month, rather than every 2 or 3 months. A variable was included to indicate that the State documents all identified nutritional risks of participants, rather than just the primary nutritional risks. We included an indicator variable for whether WIC offices in the State collected dietary intake information from all, rather than just high-risk, participants and an indicator variable for whether dietary intake information was collected through 24-hour recall, which is estimated to be more time consuming than a food frequency checklist, the other primary method for collecting dietary intake information (Institute of Medicine, 2002).

Finally, three variables were included to represent State-level differences in WIC benefit packages. As mentioned earlier, larger perceived benefits were expected to increase the likelihood of entering early or exiting late. Two of the variables indicated whether a certified WIC staff person was allowed by the State to tailor an individual's food package according to their nutritional needs or preferences. One variable indicated whether the State allowed case-workers to specify the type of milk to reduce fat, lactose, or calories, while another variable indicated whether the State allowed the sucrose content of cereal to be reduced. It is not clear how these tailoring practices will influence WIC participation. The average retail value of the WIC food package,

which can vary across States as a result of food package tailoring practices and differences in food prices, was also included.

All descriptive and regression analyses were weighted using a weight constructed to reflect population totals and to adjust for survey nonresponse.²⁵ The standard errors of all regression models were adjusted to account for heteroskedasticity and for clustering at the State level since all mothers in a State face the same WIC policies. The results from the probit analyses are presented as marginal effects evaluated at the means of the independent variables. The results from the multinomial logit regression analysis are presented as odds ratios.

²⁵For more information on the construction of the weights in the ECLS-B, see Nord et al. (2006).

Results on Dynamic WIC Participation Patterns

We conducted two types of analysis of WIC participation dynamics for WIC-eligible households.

1. A descriptive analysis of the estimated prevalence of WIC dynamic participation patterns.
2. A multivariate regression analysis of the factors that may explain the WIC dynamic participation patterns.

Descriptive Analysis of Dynamic Participation Patterns

Table 2 shows the eight possible transitions into and out of WIC participation between the prenatal period, the postnatal-infant period, and the child period among eligible households. For example, pattern 1 describes a household that participates in all three study periods, while pattern 2 describes a household that participates in the first two periods and exits the program at the child period. Patterns 1 through 8 describe all possible transitions over the three study periods.

The estimated prevalence of each of the eight dynamic participation patterns shows that about half (51.2 percent) of eligible households participated in WIC during all three periods of the study (pattern 1), while 15.6 percent never participated (pattern 8). The remaining 33.2 percent of eligible households participated in either one or two, but not all, of the three study periods (patterns 2 through 7).

Table 2 also shows the distribution of participation patterns within the subgroup of participants in each time period. For example, while households that participated in all three study periods comprised 51.2 percent of all eligible households, they comprised 74.9 percent of prenatal participants.

Table 2

WIC participation patterns of mother/child pairs from prenatal period to child period, among U.S. children born in 2001

Participation pattern	Participate in period?			Percent with each participation pattern			
	Prenatal period	Postnatal-infant period	Child period	All eligible households	Prenatal participants	Postnatal-infant participants	Child participants
1	Yes	Yes	Yes	51.2	74.9	64.7	78.7
2	Yes	Yes	No	14.0	20.5	17.7	
3	Yes	No	Yes	1.7	2.5		2.7
4	Yes	No	No	1.4	2.0		
5	No	Yes	Yes	9.8		12.4	15.1
6	No	Yes	No	4.1		5.2	
7	No	No	Yes	2.3			3.5
8	No	No	No	15.6			

Notes: Percentages are weighted. A blank cell indicates that the participation pattern is not exhibited by participant subgroup.
Source: Authors' calculations using the Early Childhood Longitudinal Study-Birth Cohort.

Comparability of ECLS-B Coverage Rates and Official Coverage Rates

The information in table 2 can be used to estimate WIC coverage rates within the longitudinal framework of the ECLS-B, which we refer to as ECLS-B coverage rates. As noted previously, the ECLS-B does not have adequate information to estimate eligibility separately for the prenatal, postnatal-infant, and child periods. We created an eligible sample using data from the 9-month survey, which most closely matched the prenatal and postnatal-infant periods. Therefore, our ECLS-B coverage rates were derived by dividing the number of eligible households that participated in WIC in each period by a fixed number of eligible households. In contrast, the official WIC coverage rates were calculated using cross-sectional data on the number of WIC participants (either in total or by category) relative to the estimated number of eligible individuals in that category. The ECLS-B coverage rates are not intended to replace the official methodology for computing coverage rates. Instead, we estimated the ECLS-B coverage rates to assess their comparability with official coverage rates.

We found that the ECLS-B coverage rates, created by tracking the same set of eligible mother-child pairs over time, followed the same hump-shaped pattern observed in the official 2007 WIC coverage rates in figure 1. The ECLS-B coverage rate among prenatal households was 68.3 percent (the sum of rates for participation patterns 1, 2, 3, and 4 in table 2). The ECLS-B coverage rate increased to 79.1 percent in the postnatal-infant period (the sum of rates for participation patterns 1, 2, 5, and 6), and fell to 65.0 percent in the child period (the sum of rates for participation patterns 1, 3, 5, and 7). The most notable disparity was seen in the child period, where the ECLS-B coverage rate of 65.0 was higher than the official WIC coverage rate for children, which has ranged from 45.0 to 47.3 percent in recent years (USDA, 2009). This disparity is likely a result of two major differences in the measures. First, the ECLS-B coverage rate used data only up to the child's second birthday, while the official WIC coverage rates for children used data on children up to their fifth birthday. Second, the ECLS-B coverage rate calculation relied on a fixed sample of eligible households, while the official coverage rate used estimates of concurrent numbers of eligible households.

In addition to producing comparable patterns of WIC coverage over time, the ECLS-B produced similar demographic statistics on WIC participants as those generated using administrative data. Tiehen and Jackowitz (2008) demonstrated that the demographic characteristics, such as race, ethnicity, and age, of prenatal WIC participants in the ECLS-B were quite similar to those of participants in administrative data. The comparability of coverage rates and the demographic characteristics of WIC participants is evidence that the ECLS-B data are appropriate for our analysis of WIC participation dynamics.

Dynamic WIC Participation Rates

In table 3, we arranged the eight possible WIC dynamic participation patterns into groups that display the dynamic transitions in participation that are the focus of our study. Panel A of table 3 shows the percentage of WIC participants who remained in the program from one study period to the next, as well as the percentage who exited the program between study periods. As

shown in panel A, almost all prenatal participants (95.4 percent) stayed in the program during the postnatal-infant period; only 4.6 percent left the program between the prenatal and postnatal-infant periods. While it is unusual for a prenatal WIC participant to leave WIC during the postnatal-infant period, the rate of exit between the postnatal-infant period and the child period was much higher. Almost a fourth (22.9 percent) of postnatal-infant participants left WIC when the survey child turned 1 year old.²⁶

Panel B of table 3 displays the percentage of WIC participants in the later two study periods who had participated in a previous period, and the percentage that entered the program between study periods. About a fifth (17.6 percent) of postnatal-infant participants entered WIC after the survey child's birth.²⁷ In contrast, it was unusual for a participating household to enter WIC between the survey child's first and second birthdays. Almost all (96.5 percent) participants in the child period had received WIC in a previous period.

In summary, among households that participated in WIC at some point during the study periods, the two most common transitions in participation were:

1. From nonparticipation in the prenatal period to participation in the postnatal-infant period (delayed entrance); and
2. From participation in the postnatal-infant period to nonparticipation in the child period (early exit).

Given the importance of these two transitions, we focused on postnatal-infant participants, examining the factors associated with a delay in their WIC enrollment until after an eligible woman gives birth and the exit from WIC after a child turns 1 year old.

Results for Postnatal-Infant WIC Entrants

As shown in table 4, delayed entrants appear to be more advantaged than households that participated in both the prenatal and postnatal-infant periods

²⁶It is important to note that we only observed households up to the second wave of the survey, when the child was approximately 2 years old.

²⁷The finding that 17.6 percent of postnatal-infant participants entered WIC after the survey child's birth is consistent with evidence from Cole et al. (2001) that 22 percent of mothers of WIC infants did not participate in WIC while pregnant.

Table 3

Entry and exit patterns of eligible WIC households from prenatal period to child period

	Participation pattern	Prenatal participants	Postnatal-infant participants	Child participants
		Percent		
Panel A: Continuation and exit rates				
Continuation rate for prenatal to postnatal-infant period	1 and 2	95.4		
Exit rate for prenatal period	3 and 4	4.6		
Continuation rate for postnatal-infant period to child period	1 and 5		77.1	
Exit rate for postnatal-infant period	2 and 6		22.9	
Panel B: Previous participation and entry rates				
Previous participation for postnatal-infant period	1 and 2		82.4	
New entry rate for postnatal-infant period	5 and 6		17.6	
Previous participation for child period	1, 3, and 5			96.5
New entry rate for child period	7			3.5

Notes: See table 2 for a description of each participation pattern. Percentages are weighted. A blank cell indicates that the participation pattern is not exhibited by participant subgroup.

Source: Authors' calculations using the Early Childhood Longitudinal Study-Birth Cohort.

with respect to maternal education, marital status, participation in other assistance programs, employment, and utilization of private insurance to pay for prenatal care. The estimated marginal effects from the probit regression of postnatal WIC entry are displayed in table 5. It is important to note that, because the analysis compared those who entered in the postnatal period with those who entered in the prenatal period, it did not provide information on the factors that prevent WIC receipt altogether.

The regression results supported the fact that WIC participants in better economic circumstances were more likely to delay WIC participation until the postnatal-infant period. WIC participants with better maternal education and higher household income relative to the poverty line were more likely to delay entrance until the postnatal-infant period. For example, a household with a mother holding a college degree was 8.6 percentage points more likely to delay entry than a household with a mother without a high school degree. These factors suggest that households that delay entry into the program may not have been eligible in the prenatal period.

The regression results also indicated a strong relationship between prenatal Medicaid coverage and prenatal receipt of WIC. Compared with those covered by private health insurance, WIC participants with Medicaid coverage during the prenatal period were 15.0 percentage points less likely to delay WIC participation until the postnatal period. Given that participation in Medicaid provides adjunctive eligibility for WIC, these findings were not surprising. Those with neither private insurance nor Medicaid were also less likely to delay receipt of WIC until the postnatal period, although the estimated marginal effect was relatively small.

There was also evidence that geographic location may be a factor in the timing of WIC participation; women who reside in the Northeast and those who reside in urban areas with a population of at least 50,000 (the omitted category) were more likely to delay participation until after having a child.

State policies also influence the decision to delay participation. WIC participants residing in States where participation in SSI confers WIC eligibility were less likely to delay, while those living in States that allow the food package to be tailored to reduce sucrose content were more likely to delay. Counter to expectations, participants in States with a greater number of WIC offices per 1,000 individuals living below the poverty level were more likely to delay. As noted previously, it was difficult to identify the effect of State-level policies in a cross-sectional analysis, given that they may be correlated with other unobserved State characteristics. To test the sensitivity of our regression results to the inclusion of the State policy variables, we examined two other specifications of both the delayed entry and early exit equations. The two other specifications were identical to our full specification, except that the first excludes the WIC State policy variables and the second includes State fixed effects (results available from authors). The results were generally not sensitive to these two alternative specifications.

Results for Participants Exiting WIC

As shown in table 4, households that exited the program after a child turned 1 year old were more economically advantaged than those that remained on

Table 4

**Characteristics of postnatal-infant WIC participants,
by the timing of WIC participation**

	Proportion that delayed entry: Enters WIC in postnatal period		Proportion that exited early: Exits WIC as a child	
	Yes	No	Yes	No
Mother's characteristics:				
Non-Hispanic White	0.400	0.389	0.440*	0.376
Non-Hispanic Black	0.224	0.227	0.247	0.220
Hispanic	0.316	0.336	0.260*	0.354
Other	0.061	0.048	0.054	0.049
Did not graduate high school	0.423*	0.485	0.409*	0.493
High school graduate	0.248	0.288	0.303	0.274
Some college or vocational/technical degree	0.280*	0.205	0.238	0.213
College degree	0.049*	0.022	0.050*	0.020
Younger than 20 years old	0.132	0.137	0.124	0.140
Age 20-34	0.745	0.783	0.827*	0.761
Age 35 or older	0.124*	0.079	0.049*	0.099
Mother is a U.S. citizen	0.767	0.792	0.850*	0.769
Mother's relationship status:				
Married	0.478*	0.408	0.417	0.422
At least one other child under age 5 in household	0.381	0.395	0.406	0.389
At least one child age 5-17 years old in household	0.476	0.454	0.420	0.470
Child is twin or higher-order birth	0.022	0.016	0.014	0.018
Income, employment, and assets:				
Household income below poverty level	0.430*	0.494	0.395*	0.509
Household income between poverty level and 185 percent poverty level	0.429	0.387	0.423	0.385
Household income above 185 percent poverty level	0.141	0.119	0.182*	0.106
Household income increased between surveys			0.506*	0.448
Owns home	0.233	0.210	0.225	0.210
Mother employed during year before birth	0.706*	0.638	0.699*	0.635
Mother did not work anytime after birth			0.257*	0.340
Program participation:				
Participated in other programs since birth of child			0.719*	0.773
Mother received cash welfare most/all of childhood	0.061	0.066	0.052	0.069
Mother received cash welfare some/half of childhood	0.070	0.095	0.091	0.090
Mother did not receive cash welfare as a child	0.869	0.839	0.857	0.841
Prenatal care and infant health:				
Prenatal care paid by private insurance	0.375*	0.195	0.276*	0.212
Prenatal care paid by Medicaid	0.498*	0.699	0.620*	0.677
Prenatal care paid by neither Medicaid nor private health insurance	0.081	0.093	0.077	0.095
No prenatal care received	0.047*	0.013	0.027	0.017
Mother smoked at least 100 cigarettes during her lifetime	0.356	0.387	0.437*	0.365

—continued

Table 4

Characteristics of postnatal-infant WIC participants, by the timing of WIC participation—continued

	Proportion that delayed entry: Enters WIC in postnatal period		Proportion that exited early: Exits WIC as a child	
	Yes	No	Yes	No
<i>Prenatal care and infant health:</i> —continued				
Child never breastfed			0.432	0.404
Child breastfed for less than 6 months			0.404	0.377
Child breastfed 6 months or more			0.165*	0.218
Child had low birthweight			0.080	0.082
<i>Region and urbanicity:</i>				
Northeast	0.205*	0.127	0.127	0.145
Midwest	0.196	0.202	0.194	0.203
South	0.389	0.418	0.459*	0.399
West	0.210	0.253	0.220	0.253
Population of 50,000 and over	0.753*	0.666	0.716	0.671
Population of 2,500 to 49,999	0.120	0.154	0.150	0.147
Population less than 2,500	0.127*	0.180	0.135*	0.181
<i>State-level WIC policies and practices in 2000:</i>				
SSI confers WIC eligibility	0.092	0.084	0.083	0.086
School lunch confers WIC eligibility	0.183*	0.132	0.146	0.140
Food packages tailored for type of milk	0.864	0.865	0.890*	0.857
Food packages tailored to reduce sucrose	0.107	0.092	0.161*	0.075
WIC voucher issued monthly	0.183*	0.239	0.175*	0.245
Average retail value of WIC food packages (\$s)	49.120	49.441	49.728*	49.282
WIC offices per 1,000 below the poverty level	0.076	0.071	0.070	0.072
WIC-only stores per 1,000 below the poverty level	0.014	0.017	0.014*	0.017
All nutritional risk criteria documented	0.750	0.715	0.720	0.722
Dietary intake information required of all participants	0.857	0.864	0.826*	0.873
Twenty-four hour recall used to obtain dietary intake information	0.757	0.802	0.794	0.794
Observations	700	2,950	800	2,900

SSI=Supplemental Security Income.

* Indicates that the value is significantly different from that of those in the “no” category at the 5 percent level using a two-tailed test.

Notes: Statistics are weighted. Sample sizes are rounded to the nearest 50, per National Center for Education Statistics’ regulations. No statistic is reported for variables that are not included in the delayed entry regression equation.

Source: Authors’ calculations based on the Early Childhood Longitudinal Study-Birth Cohort.

Table 5

**Marginal effects from probit regression:
Delayed entry into WIC among postnatal-infant WIC participants**

	Marginal effect (1)	Standard error (2)
Mother's characteristics:		
Non-Hispanic Black	-0.016	(0.027)
Hispanic	-0.048*	(0.027)
Other	-0.008	(0.031)
High school graduate	-0.016	(0.019)
Some college or vocational/technical degree	0.034*	(0.020)
College degree	0.086*	(0.052)
Age 20-34	-0.039	(0.029)
Age 35 or older	-0.002	(0.039)
Mother is a U.S. citizen	-0.037	(0.029)
Mother's relationship status:		
Married	0.025	(0.028)
At least one other child under age 5 in the household	0.003	(0.016)
At least one child age 5-17 years old in household	0.009	(0.016)
Child is twin or higher-order birth	0.025	(0.032)
Income, employment, and assets:		
Household income below poverty level	-0.036*	(0.019)
Household income between poverty level and 185 percent poverty level	-0.038**	(0.019)
Owns home	-0.005	(0.020)
Mother employed during year before birth	0.028*	(0.015)
Program participation:		
Mother received cash welfare most/all of childhood	0.007	(0.035)
Mother received cash welfare some/half of childhood	-0.037	(0.042)
Prenatal care and mother's smoking:		
Prenatal care paid by Medicaid	-0.150***	(0.025)
Prenatal care paid by neither Medicaid nor private health insurance	-0.082***	(0.019)
No prenatal care received	0.104	(0.075)
Mother smoked at least 100 cigarettes during her lifetime	-0.002	(0.015)
Region and urbanicity:		
Northeast	0.128*	(0.069)
Midwest	0.025	(0.035)
South	0.047	(0.038)
Population between 2,500 and 49,999	-0.050**	(0.019)
Population less than 2,500	-0.072***	(0.023)
State-level WIC policies and practices:		
SSI confers WIC eligibility	-0.055**	(0.023)
School lunch confers WIC eligibility	0.053*	(0.032)
Food packages tailored for type of milk	-0.001	(0.034)
Food packages tailored to reduce sucrose	0.049*	(0.025)

—continued

Table 5

**Marginal effects from probit regression:
Delayed entry into WIC among postnatal-infant WIC participants—
continued**

	Marginal effect (1)	Standard error (2)
State-level WIC policies and practices: —continued		
WIC voucher issued monthly	-0.013	(0.034)
Average retail value of WIC food packages (\$s)	-0.004**	(0.002)
WIC offices per 1,000 below the poverty level	0.294**	(0.125)
WIC-only stores per 1,000 below the poverty level	0.049	(0.615)
All nutritional risk criteria documented	0.010	(0.035)
Dietary intake information required of all participants	-0.001	(0.031)
Twenty-four hour recall used to obtain dietary intake information	-0.007	(0.038)
Observations		3,700

SSI=Supplemental Security Income.

*** p<0.01, ** p<0.05, and * p<0.1.

Notes: Estimates are weighted. Marginal effects were calculated at the means of the independent variables. Standard errors were adjusted to account for heteroskedasticity and multiple observations from the same State. The specifications included a variable that indicated data on maternal receipt of welfare as a child was missing. Sample sizes are rounded to the nearest 50, per National Center for Education Statistics' regulations.

Source: Authors' calculations based on the Early Childhood Longitudinal Study-Birth Cohort.

the program along a variety of outcomes, including their household income relative to the poverty line, maternal employment before and after birth, and participation in other assistance programs. Interestingly, households that exited were less likely to have breastfed their child for 6 months or more.

Table 6 shows the estimated marginal effects from the probit regression of early exit from the WIC program. The estimation results in columns 1 and 2 of table 6 provide further evidence that households exiting the WIC program after the child turns 1 year old were more advantaged than those that remained in the program. Households in which the mother has a college degree were more likely to exit, and those in which the mother had not been employed since the birth of her child were less likely to exit. In addition, there was a negative association between a participating household's income relative to the poverty level and the likelihood that the household exits WIC.

As noted previously, our analysis sample consists of households that were estimated to be eligible in the year before the 9-month survey. Therefore, it is possible that more advantaged households leave the WIC program because they lose their eligibility, which we did not capture in our primary analysis sample. Table 6 demonstrates that postnatal-infant WIC participants who experienced an increase in household income between the two waves of the survey were 6.0 percentage points more likely to leave WIC than those whose incomes remained constant or decreased.

In order to address the possible loss of program eligibility, we used data from the second wave of the ECLS-B to estimate eligibility for WIC after the child turned 1 year old. Unfortunately, the timing and structure of the survey questions in the second wave did not allow us to estimate WIC eligibility as

precisely in the child period as in the year before the 9-month survey.²⁸ Using a rough estimate of WIC eligibility, however, can shed some light on the role of loss of program eligibility on program exits. We estimated that 8.9 percent of all postnatal-infant WIC participants and 19.2 percent of exiting households lost WIC eligibility in the year prior to the second wave of the ECLS-B.

Columns 3 and 4 of table 6 display the results of the probit regression of child exits from WIC among the sample of roughly 90 percent of postnatal-infant WIC participants that were estimated to have remained WIC eligible after the survey child turned 1 year old (the restricted sample). Even among the sample that retained eligibility, the regression results indicated that WIC exits were more likely among more advantaged households, although the estimated marginal effects were not as large.

Among both the primary analysis sample and the restricted sample, WIC households in which the mother never breastfed or breastfed for less than 6 months were more likely to exit than WIC households in which the mother breastfed for 6 months or more. This finding suggests that the transition from receipt of the infant food package, which contains infant formula, to receipt of the child food package may play a role in the decision to exit WIC.

Self-Reported Explanations for Early Exits

The ECLS-B contains information from a subset of mothers on why they stopped receiving WIC benefits for their child.²⁹ Mothers were asked:

“Why are you no longer using WIC vouchers to buy food or formula for [CHILD] or [TWIN]?”

Possible responses included:

“Not eligible anymore,”

“Eligible but denied benefit due to lack of program funds,”

“No longer need food benefit,”

“Program is too much effort (benefits are not worth the time and effort to get them),”

“Lack of transportation and/or scheduling problems,” and

“Temporary administration issues prevent child from participating (plan to reapply to program).”

Mothers were allowed to choose only one response. Table 7 shows that approximately a third of exiting households reported that they no longer participated because they believed they were no longer eligible. Over a fourth (27.8 percent) of mothers reported that their children exited the program because they no longer needed the food benefits. For exiting households that reported a lack of eligibility or a lack of need, the program appears to be operating as intended. However, of exiting households that reported lack of eligibility, we estimated only a third lost eligibility in the year prior to the second wave of the ECLS-B. This discrepancy may be due to the limitations

²⁸There are two primary limitations to estimating WIC eligibility in the child period. The first limitation is that, for over half of the primary analysis sample, the second wave of data collection occurred after the survey child turned 2 years old. For these households, the data collected on income during the previous 12 months did not cover the point at which they exited WIC. The second limitation is that the structure of the questions on program participation (used to determine adjunctive eligibility) between the two surveys made it difficult to ascertain the time period for program participation.

²⁹Not all mothers were asked about the reasons for their children exiting the WIC program when the child turned 1 year old. Mothers of children who exited during the first wave of data were not asked about the reason for their exit. Households where only the mother participated in the postnatal-infant period and then exited were not asked the survey question.

Table 6

**Marginal effects from probit regressions:
Early exit from WIC among postnatal-infant WIC participants**

	Primary analysis sample		Households estimated to remain eligible in child period	
	Marginal effect (1)	Standard error (2)	Marginal effect (3)	Standard error (4)
Mother's characteristics:				
Non-Hispanic Black	0.013	(0.023)	0.021	(0.026)
Hispanic	-0.039*	(0.021)	-0.031	(0.023)
Other	0.010	(0.040)	0.034	(0.042)
High school graduate	0.024	(0.022)	0.024	(0.024)
Some college or vocational/technical degree	-0.001	(0.027)	-0.004	(0.022)
College degree	0.224***	(0.065)	0.147**	(0.069)
Age 20-34	0.022	(0.025)	0.029	(0.026)
Age 35 or older	-0.108***	(0.035)	-0.084*	(0.039)
Mother is a U.S. citizen	0.041	(0.037)	0.040	(0.039)
Mother's relationship status:				
Married	-0.002	(0.023)	-0.013	(0.023)
At least one other child under age 5 in the household	0.029	(0.019)	0.024	(0.019)
At least one child age 5-17 years old in household	-0.014	(0.017)	-0.008	(0.018)
Child is twin or higher-order birth	-0.053***	(0.019)	-0.034*	(0.020)
Income, employment, and assets:				
Household income below poverty level	-0.141***	(0.031)	-0.093**	(0.037)
Household income between poverty level and 185 percent poverty	-0.097***	(0.026)	-0.067*	(0.033)
Household income increased between surveys	0.060***	(0.019)	0.024	(0.019)
Owns home	0.006	(0.022)	-0.003	(0.025)
Mother employed during year before birth	0.008	(0.021)	0.008	(0.024)
Mother did not work anytime after birth	-0.033**	(0.016)	-0.024	(0.016)
Program participation:				
Participated in other programs since birth of child	-0.041	(0.027)	-0.039*	(0.024)
Mother received cash welfare most/all of childhood	-0.037	(0.021)	-0.026	(0.020)
Mother received cash welfare some/all of childhood	0.005	(0.027)	-0.001	(0.025)
Prenatal care and infant health:				
Prenatal care paid by Medicaid	-0.059**	(0.031)	-0.051*	(0.029)
Prenatal care paid by neither Medicaid nor private health insurance	-0.032	(0.047)	-0.014	(0.045)
No prenatal care received	0.102	(0.087)	0.118	(0.089)
Mother smoked at least 100 cigarettes during her lifetime	0.048**	(0.023)	0.038*	(0.023)
Child never breastfed	0.048**	(0.019)	0.051**	(0.020)
Child breastfed child less than 6 months	0.041**	(0.020)	0.054***	(0.016)
Child had low birth weight	-0.005	(0.015)	-0.008	(0.014)

—continued

Table 6

**Marginal effects from probit regressions:
Early exit from WIC among postnatal-infant WIC participants—continued**

	Primary analysis sample		Households estimated to remain eligible in child period	
	Marginal effect (1)	Standard error (2)	Marginal effect (3)	Standard error (4)
Region and urbanicity:				
Northeast	-0.072	(0.051)	-0.077	(0.044)
Midwest	-0.016	(0.031)	-0.018	(0.032)
South	-0.033	(0.030)	-0.033	(0.028)
Population between 2,500 and 49,999	-0.007	(0.035)	-0.010	(0.035)
Population less than 2,500	-0.091***	(0.020)	-0.076***	(0.020)
State-level WIC policies and practices in 2000:				
SSI confers WIC eligibility	-0.032	(0.023)	-0.040*	(0.022)
School lunch confers WIC eligibility	-0.015	(0.025)	0.003	(0.022)
Food packages tailored for type of milk	0.046*	(0.025)	0.031	(0.023)
Food packages tailored to reduce sucrose	0.127***	(0.031)	0.081***	(0.028)
WIC voucher issued monthly	-0.062*	(0.032)	-0.063**	(0.028)
Average retail value of WIC food packages (\$s)	0.000	(0.003)	0.001	(0.002)
WIC offices per 1,000 below the poverty level	-0.228*	(0.125)	-0.187	(0.120)
WIC-only stores per 1,000 below the poverty level	-0.575	(0.706)	-0.827	(0.628)
All nutritional risk criteria documented	0.012	(0.029)	0.011	(0.025)
Dietary intake information required of all participants	-0.077***	(0.027)	-0.070***	(0.022)
Twenty-four hour recall used to obtain dietary intake information	-0.008	(0.033)	-0.008	(0.031)
Observations	3,700		3,350	

SSI=Supplemental Security Income.

*** p<0.01, ** p<0.05, and * p<0.1.

Notes: Estimates are weighted. Marginal effects were calculated at the means of the independent variables. Standard errors were adjusted to account for heteroskedasticity and multiple observations from the same State. The specifications included a variable that indicated data on maternal receipt of welfare as a child was missing. Sample sizes are rounded to the nearest 50, per National Center for Education Statistics' regulations.

Source: Authors' calculations based on the Early Childhood Longitudinal Study-Birth Cohort.

of our estimate of WIC eligibility in the child period, or it may indicate that these households were not clear about WIC eligibility rules.

In addition, other explanations cited by mothers, including that the program requires too much effort or that they have scheduling and/or transportation problems, suggest that the costs of participation may be a barrier to continued WIC participation for some children. Interestingly, very few households (less than 1 percent) reported that they were eligible for the program, but were denied benefits due to the lack of program funds. This finding offers important evidence that, although WIC is not an entitlement program, very few WIC households exit the program when a child turns 1 year old due to funding shortfalls.

Table 7

Explanations for WIC exits once the child turns 1 year old

Explanation	Percent reporting
Not eligible anymore	32.3
No longer need food benefits	27.8
Program is too much effort; benefits are not worth the time	26.2
Lack of transportation and/or scheduling problems	9.3
Other	2.5
Temporary administrative issues prevent participation, but plan to participate again	1.3
Eligible but denied benefits due to lack of program funds	0.5
Observations	600

Notes: Percentages are weighted. Sample size is rounded to the nearest 50, per National Center for Education Statistics' regulations.

Source: Authors' calculations using the Early Childhood Longitudinal Study-Birth Cohort.

To gain further insight into these exits from WIC, we used multinomial logit regression to examine the factors associated with the four most common explanations for WIC exits. The regression results, presented in table 8, compare each of the four groups leaving WIC with those who stayed in the program. The estimates are presented as odds ratios, which indicate how the ratio of the probability of exiting WIC for a specific reason to the probability of remaining on the program changes with a 1 unit change in the independent variable. Therefore, an odds ratio greater than 1 implies that the characteristic was associated with an increased probability of leaving WIC for the specified reason.

Households that were more economically advantaged had a greater chance of leaving WIC because they were no longer eligible or because they no longer needed the food benefits. WIC participants with more education and those who had an increase in income between the two surveys were more likely to exit the program due to reported ineligibility. Those with low income relative to the poverty line and those who participated in other assistance programs in the 9 months after the birth of the survey child were less likely to exit the program due to reported ineligibility. In addition, if the mother did not work after the birth of the survey child, there was a lower likelihood that the household would exit WIC due to a lack of need for food benefits.

No breastfeeding and a shorter duration of breastfeeding by the mother were associated with a greater chance that the household would leave WIC because the household no longer needed the benefits. This result corroborates the evidence from the probit regression on early exit that infant feeding practices play a role in the decision to exit the program and suggests that some nonbreastfeeding mothers who stop receiving infant formula when their child turns 1 year old may not see a need for the lower-value WIC benefits available in the child package. It is important to note that the relationship between breastfeeding and WIC exits may differ in the context of the revised WIC food packages, which have been available since 2009, after the period of this study.

The other two explanations for WIC exits indicated that the household was challenged by the effort required to participate in WIC. Living in the South or the Northeast was associated with a higher likelihood of exiting WIC

because the program required too much effort and the benefits were not worth the time.³⁰

Residing in a State that allows WIC food packages to be tailored to reduce sucrose was associated with a greater likelihood of exiting WIC for three of the four reasons discussed, but the policy was more strongly associated with WIC exits due to the program requiring too much effort and/or scheduling or transportation problems than to exits due to lack of perceived eligibility.

³⁰It should be noted that when we make a Bonferroni adjustment to the significance level cut-offs to account for the multiple hypotheses tested with the multinomial logit, the estimated effect of the region variables becomes insignificant.

Table 8

Multinomial logit results: Factors associated with WIC exits, by reason for exit

	No longer eligible	No longer need food benefits	Program too much effort, benefits not worth the time	Transportation or scheduling problems
<i>Mother's characteristics:</i>				
Non-Hispanic Black	0.774 (0.185)	1.671** (0.431)	1.556* (0.401)	0.996 (0.385)
Hispanic	0.716 (0.178)	1.298 (0.372)	1.141 (0.360)	0.769 (0.358)
Other	0.956 (0.221)	0.883 (0.271)	0.899 (0.299)	1.074 (0.480)
High school graduate	1.521** (0.302)	1.333 (0.288)	1.181 (0.245)	0.701 (0.240)
Some college or vocational/technical degree	1.548** (0.331)	1.621** (0.380)	0.750 (0.195)	0.836 (0.315)
College degree	4.700*** (1.407)	2.164 (1.041)	0.976 (0.551)	1.132 (0.897)
Age 20-34	1.018 (0.270)	0.652* (0.159)	0.895 (0.224)	1.531 (0.665)
Age 35 or older	0.795 (0.282)	0.159*** (0.090)	0.288** (0.151)	0.960 (0.649)
Mother is a U.S. citizen	1.203 (0.297)	0.930 (0.268)	1.150 (0.374)	0.789 (0.358)
<i>Mother's relationship status:</i>				
Married	1.095 (0.191)	0.976 (0.194)	0.883 (0.184)	0.564* (0.190)
At least one other child under age 5 in household	0.862 (0.141)	1.519** (0.270)	0.952 (0.177)	1.309 (0.359)
At least one child age 5-17 years old in household	1.107 (0.173)	0.747 (0.134)	1.019 (0.182)	0.669 (0.184)
Child is twin or higher-order birth	0.715 (0.206)	0.463* (0.189)	0.785 (0.266)	2.045* (0.773)
<i>Income, employment, and assets:</i>				
Household income below poverty level	0.260*** (0.065)	0.496*** (0.135)	0.708 (0.224)	1.539 (0.804)
Household income between poverty level and 185 percent poverty	0.514*** (0.114)	0.580** (0.149)	1.107 (0.330)	1.096 (0.576)
Household income increased between surveys	2.369*** (0.382)	1.260 (0.226)	1.161 (0.210)	0.869 (0.242)
Owns home	1.229 (0.218)	1.127 (0.245)	0.872 (0.203)	0.718 (0.291)
Mother employed during year before birth	0.951 (0.175)	1.163 (0.239)	1.381 (0.291)	0.831 (0.245)
Mother did not work anytime after birth	0.979 (0.177)	0.648** (0.142)	0.964 (0.199)	1.147 (0.342)
<i>Program participation:</i>				
Participated in other programs since birth of child	0.610*** (0.116)	0.691 (0.160)	0.791 (0.199)	0.913 (0.380)
Mother received cash welfare most/all of childhood	1.280 (0.411)	0.217** (0.130)	1.172 (0.356)	0.284* (0.213)
Mother received cash welfare some/half of childhood	1.758** (0.419)	0.469** (0.169)	0.625 (0.208)	1.154 (0.443)

—continued

Table 8

Multinomial logit results: Factors associated with WIC exits, by reason for exit—continued

	No longer eligible	No longer need food benefits	Program too much effort, benefits not worth the time	Transportation or scheduling problems
Prenatal care and infant health:				
Prenatal care paid by Medicaid	0.666** (0.133)	1.011 (0.247)	0.961 (0.248)	1.091 (0.440)
Prenatal care paid by neither Medicaid nor private insurance	0.819 (0.235)	1.006 (0.368)	0.726 (0.327)	0.569 (0.392)
No prenatal care received	0.725 (0.460)	1.519 (0.809)	2.462* (1.147)	0.000 (0.000)
Mother smoked at least 100 cigarettes during her lifetime	1.102 (0.191)	1.530** (0.299)	1.457* (0.292)	1.686* (0.516)
Child never breastfed	1.370 (0.307)	2.098** (0.629)	1.125 (0.343)	1.199 (0.543)
Child breastfed less than 6 months	1.178 (0.252)	1.747* (0.508)	1.257 (0.373)	1.413 (0.606)
Child had low birthweight	0.830 (0.155)	1.006 (0.204)	0.875 (0.178)	1.086 (0.334)
Region and urbanicity:				
Northeast	0.766 (0.326)	0.544 (0.266)	4.150** (2.430)	1.729 (1.314)
Midwest	1.330 (0.444)	0.942 (0.348)	1.642 (0.833)	0.872 (0.535)
South	1.058 (0.340)	0.611 (0.223)	3.278** (1.576)	1.482 (0.915)
Population between 2,500 and 49,999	0.832 (0.185)	0.843 (0.211)	0.748 (0.213)	0.771 (0.314)
Population less than 2,500	0.532*** (0.124)	0.498** (0.143)	0.758 (0.194)	0.295** (0.150)
State-level WIC policies and practices in 2000:				
SSI confers WIC eligibility	1.022 (0.300)	0.987 (0.328)	0.432** (0.176)	0.653 (0.441)
School lunch confers WIC eligibility	0.621* (0.172)	0.737 (0.226)	1.250 (0.417)	2.177 (1.140)
Food packages tailored for type of milk	1.502 (0.442)	1.498 (0.483)	0.884 (0.299)	0.582 (0.267)
Food packages tailored to reduce sucrose	1.805** (0.535)	1.663 (0.548)	2.634*** (0.891)	3.105** (1.549)
WIC voucher issued monthly	0.588 (0.208)	0.824 (0.303)	0.639 (0.345)	0.815 (0.496)
Average retail value of WIC food packages (\$s)	0.975 (0.021)	1.008 (0.024)	1.056** (0.027)	0.991 (0.041)
WIC offices per 1,000 below the poverty level	0.363 (0.462)	0.190 (0.286)	11.010 (18.200)	0.410 (1.223)
WIC-only stores per 1,000 below the poverty level	42.840 (268.600)	0.036 (0.236)	10.520 (98.630)	100.000 (1146.000)
All nutritional risk criteria documented	1.181 (0.318)	0.758 (0.223)	1.138 (0.359)	0.670 (0.300)
Dietary intake information required of all participants	0.477*** (0.128)	0.718 (0.209)	1.797 (0.662)	2.528 (1.466)
Twenty-four hour recall used to obtain dietary intake information	0.888 (0.212)	0.860 (0.232)	1.070 (0.306)	0.878 (0.372)
Constant	0.608 (0.805)	0.102 (0.152)	0.001*** (0.001)	0.0215 (0.054)
Observations	3,450	3,450	3,450	3,450

SSI=Supplemental Security Income. *** p<0.01, ** p<0.05, and * p<0.1.

Notes: Estimates are odds ratios and represent the estimated change in the ratio of the probability of the specified outcome over the probability of not leaving WIC due to a change in the independent variable. Odds ratios are weighted. Standard errors in parentheses were adjusted to account for heteroskedasticity and multiple observations from the same State. Sample size is rounded to the nearest 50, per National Center for Education Statistics' regulations.

Source: Authors' calculations based on the Early Childhood Longitudinal Study-Birth Cohort.

Discussion

Our findings show that economically advantaged households were more likely to delay WIC participation until the postnatal period and more likely to exit after a child turns 1 year old. We also found that prenatal Medicaid coverage was strongly correlated with earlier receipt of WIC, suggesting that each program may serve as a gateway for the other, especially since Medicaid recipients are adjunctively eligible for WIC. Results suggest that WIC's provision of infant formula and participants' breastfeeding decisions played a role in the early exit from the program. Households in which the mother breastfed for a longer time were less likely to exit WIC. Other explanations that play a role in the early exit from the WIC program included loss of eligibility, reduced need, and difficulties accessing benefits. There were almost no reports from participants exiting WIC that they were denied benefits due to lack of program funds, which supports anecdotal evidence that States have received sufficient funds in recent years to provide benefits to all eligible people.

The regression results, indicating that economically advantaged households were more likely to delay entry into the program and to exit early, and the maternal self-reports on exit reasons suggest that loss of eligibility played a role in nonparticipation. Results also suggest that nonparticipants had a reduced need for benefits, indicating that the program was operating effectively for many households. We found evidence, however, that late entrants and early leavers still exhibit need and may be confused about their WIC eligibility, suggesting that increased outreach or program changes could increase the duration of these participants' exposure to WIC services. For example, mothers in participant households who did not breastfeed or breastfed for less than 6 months were more likely to exit, and therefore may warrant special attention by WIC agencies.

References

- Besharov, Douglas J., and Peter Germanis. *Rethinking WIC: An Evaluation of the Women, Infants, and Children Program*, Washington, DC: The American Enterprise Institute Press, 2001.
- Bitler, Marianne P., and Janet Currie. “Does WIC Work? The Effects of WIC on Pregnancy and Birth Outcomes,” *Journal of Policy Analysis and Management* 24 (1): pp. 73-91, 2005a.
- Bitler, Marianne P., and Janet Currie. “The Changing Association between Prenatal Participation in WIC and Birth Outcomes in New York City: What Does It Mean?” *Journal of Policy Analysis and Management* 24 (4): pp. 687-90, 2005b.
- Bitler, Marianne P., Janet Currie, and John Karl Scholz. “WIC Eligibility and Participation,” *Journal of Human Resources* 38 (S): pp. 1139-79, 2003.
- Bitler, Marianne P., Craig Gundersen, and Grace S. Marquis. “Are WIC Nonrecipients at Less Nutritional Risk Than Recipients? An Application of the Food Security Measure,” *Review of Agricultural Economics* 27 (3): pp. 433–38, 2005.
- Brien, Michael J., and Christopher Swann. *Prenatal WIC Participation and Infant Health: Selection and Maternal Fixed Effects*, Discussion Paper No. 295, University of Virginia, Thomas Jefferson Center for Political Economy, 1997.
- Burstein, Nancy, Mary Kay Fox, Jordan Hiller, Robert Kornfeld, Ken Lam, Cristofer Price, and David T. Rodda. *WIC General Analysis Project: Profile of WIC Children*, U.S. Department of Agriculture, Food and Nutrition Service, 2000.
- Castner, Laura A., James Mabli, and Julie Sykes. *Dynamics of WIC Program Participation*, U.S. Department of Agriculture, Food and Nutrition Service, 2009.
- Chatterji, Pinka, Karen Bonuck, Simi Dhawan, and Nandini Deb. *WIC Participation and the Initiation and Duration of Breastfeeding*, Discussion Paper No. 1246-02, University of Wisconsin Institute for Research on Poverty, 2002.
- Cole, Nancy, David Hoaglin, and John Kirlin. *National Survey of WIC Participants*, U.S. Department of Agriculture, Food and Nutrition Service, 2001.
- Currie, Janet. “U.S. Food and Nutrition Programs,” *Means-Tested Transfer Programs in the United States*, Robert Moffitt (ed.), University of Chicago Press for NBER, pp. 199-290, 2003.
- Currie, Janet. “The Take-up of Social Benefits,” *Poverty, the Distribution of Income, and Public Policy*, Alan Auerbach, David Card, and John Quigley (eds.), New York City, NY: Russell Sage Press, pp. 80-148, 2006.

- Daponte, Beth Osborne, Seth Sanders, and Lowell Taylor. "Why Do Low-Income Households Not Use Food Stamps? Evidence from an Experiment," *Journal of Human Resources* 34(3): pp. 612-28, 1999.
- Davis, David E., and Ephraim S. Leibtag. *Interstate Variation in WIC Food Package Costs: The Role of Food Prices, Caseload Composition, and Cost-Containment Practices*, Food Assistance and Nutrition Research Report No. 41, U.S. Department of Agriculture, Economic Research Service, 2005.
- Figlio, David, Sarah Hamersma, and Jeffrey Roth. "Does Prenatal WIC Participation Improve Birth Outcomes? New Evidence from Florida," *Journal of Public Economics* 93, pp. 235-45, 2009.
- Fox, Mary Kay, William Hamilton, and Bing-Hwan Lin. *Effects of Food Assistance and Nutrition Programs on Nutrition and Health, Volume 3, Literature Review*, Food Assistance and Nutrition Research Report No. 19-3, U.S. Department of Agriculture, Food and Nutrition Service, 2004.
- Gundersen, Craig. "A Dynamic Analysis of the Well-being of WIC Recipients and Eligible Non-recipients," *Children and Youth Services Review* 27 (1): pp. 99-114, 2005.
- Institute of Medicine. *Dietary Risk Assessment in the WIC Program*, The National Academies Press, 2002.
- Jacknowitz, Alison, Daniel Novillo, and Laura Tiehen. "Special Supplemental Nutrition Program for Women, Infants, and Children and Infant Feeding Practices," *Pediatrics* 119 (2): pp. 281-89, 2007.
- Jacknowitz, Alison, and Laura Tiehen. "Transitions into and out of the WIC Program: A Cause for Concern?" *Social Service Review* 83(2): pp. 151-83, 2009.
- Joyce, Theodore, Diane Gibson, and Silvie Colman. "The Changing Association between Prenatal Participation in WIC and Birth Outcomes in New York City," *Journal of Policy Analysis and Management* 24 (4): pp. 661-85, 2005.
- Joyce, Theodore, Andrew Racine, and Christina Yunzal-Butler. "Reassessing the WIC Effect: Evidence from the Pregnancy Nutrition Surveillance System," *Journal of Policy Analysis and Management* 27 (2): pp. 277-303, 2008.
- Kowaleski-Jones, Lori, and Greg J. Duncan. *Effects of Participation in the WIC Food Assistance Program on Children's Health and Development: Evidence from NLSY Children*, Discussion Paper No. 1207-00, University of Wisconsin Institute for Research on Poverty, 2000.
- Ku, Leighton. "Factors Influencing Early Prenatal Enrollment in the WIC Program," *Public Health Reports* 104 (3): pp. 301-6, 1989.

- Ludwig, Jens, and Matthew Miller. "Interpreting the WIC Debate," *Journal of Policy Analysis and Management* 24 (3): pp. 691-701, 2005.
- Martin, Joyce A., Brady E. Hamilton, Paul D. Sutton, Stephanie J. Ventura, Fay Menacker, and Martha L. Munson. "Births: Final Data for 2003," *National Vital Statistics Reports*, National Center for Health Statistics, No. 54 (2), 2005.
- Moffitt, Robert. "An Economic Model of Welfare Stigma," *American Economic Review* 73(5): pp. 1023–35, 1983.
- Neuberger, Zoe, and Robert Greenstein. *WIC-Only Stores and Competitive Pricing in the WIC Program*, Center on Budget and Policy Priorities, 2004, <http://www.cbpp.org/5-17-04wic.htm>.
- National Governors Association, Center for Best Practices. *Maternal and Child Health (MCH) Update: States Have Expanded Eligibility and Increased Access to Health Care for Pregnant Women and Children*, NGA Health Policy Studies Division, 2001.
- Nord, Christine, Brad Edwards, Carol Andreassen, James L. Green, and Kathleen Wallner-Allen. *Early Childhood Longitudinal Study, Birth Cohort (ECLS-B) User's Manual for the ECLS-B Longitudinal 9-Month–2-Year Data File and Electronic Codebook*, NCES 2006-046, U.S. Department of Education, National Center for Education Statistics, 2006.
- Oliveira, Victor, and Elizabeth Frazão. *The WIC Program: Background, Trends, and Economic Issues, 2009 Edition*, Economic Research Report No. 73, U.S. Department of Agriculture, Economic Research Service, 2009.
- Swann, Christopher A. "The Timing of Prenatal WIC Participation," *The B.E. Journals of Economic Analysis and Policy* 7 (1-Topics): Article 5, 2007.
- Tiehen, Laura, and Alison Jacknowitz. "Why Wait?: Examining Delayed WIC Participation Among Pregnant Women," *Contemporary Economic Policy* 26(4): pp. 518-38, 2008.
- U.S. Department of Agriculture, Food and Nutrition Service. *The Integrity Profile Report for Fiscal Year 2000*, 2001, <http://www.fns.usda.gov/wic/resources/tipreport2000.htm>.
- U.S. Department of Agriculture, Food and Nutrition Service. *WIC Participant and Program Characteristics 2000*, 2002.
- U.S. Department of Agriculture, Food and Nutrition Service. *WIC Participant and Program Characteristics 2002*, 2003.
- U.S. Department of Agriculture, Food and Nutrition Service. *WIC Program Coverage: How Many Eligible Individuals Participated in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC): 1994 to 2003?* 2006.

- U.S. Department of Agriculture, Food and Nutrition Service. *WIC Food Package Costs and Rebates Summary: Fiscal Year 2005, 2007*, <http://www.fns.usda.gov/ora/WICFoodCosts/FY2005/FY2005.pdf>.
- U.S. Department of Agriculture, Food and Nutrition Service. *WIC Eligibles and Coverage - 1994 to 2007: Estimates of the Population of Women, Infants, and Children Eligible for WIC Benefits*, 2009.
- U.S. Department of Agriculture, Food and Nutrition Service. *WIC Program Monthly Data*, 2010a, <http://www.fns.usda.gov/pd/wicmain.htm>.
- U.S. Department of Agriculture, Food and Nutrition Service. *WIC Participant and Program Characteristics 2008*, 2010b.
- Ver Ploeg, Michelle, and David Betson. *Estimating Eligibility and Participation for the WIC Program*, The National Academies Press, 2003.

Appendix: State-Level WIC Policies and Practices

WIC Eligibility Variables

States may offer automatic WIC income eligibility to individuals who participate in Supplemental Security Income (SSI), the National School Lunch Program, or other means-tested transfer programs. Prior to 2000, some States required that applicants provide income documentation, 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 through participation in other means-tested transfer programs. WIC eligibility variables include:

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

WIC Food Package and Voucher Distribution Variables

Federal guidelines limit the maximum amount of food that States can distribute in each food package. Within this limit, State and local agencies may allow food packages to be tailored to better meet the nutritional needs or preferences of individual WIC participants. For example, some States may allow WIC staff to alter the types of milk offered, such as reduced-fat or soy, or to specify cereal with reduced sucrose content. States also have discretion over the frequency that vouchers (food instruments) are distributed to WIC participants, with distribution periods ranging from 1-3 months. There are seven different WIC food packages, which vary by type of participant. The average retail cost of the food packages for all WIC participants varies by State (from \$33.38 to \$61.84 in 2000), depending on differences in food prices and tailoring allowances (USDA, 2002). The WIC food package and voucher distribution variables include:

- *Food packages tailored for type of milk* indicates whether a State can tailor the type of milk in food packages.
- *Food packages tailored to reduce sucrose* indicates whether a State can tailor the type of cereal in food packages to reduce sucrose content.
- *WIC voucher issued monthly* indicates that a pregnant participant¹ must collect the WIC food voucher each month, rather than less frequently.
- *Average retail value of WIC food packages* is the real average cost of food packages for all WIC participants in 2000 dollars.

¹The authors of this report only used the information on voucher frequency for pregnant participants to create this variable. A State could have different policies for pregnant and post-natal participants.

WIC Offices and WIC-Only Stores

There were 2,196 local WIC offices in the United States in 2000. The number of WIC-only stores, which serve only or predominantly WIC customers, began to increase rapidly in the late 1990s. In 2000, there were 523 WIC-only stores in 13 States (Neuberger and Greenstein, 2004). These stores carry only WIC products and may reduce the challenges and stigma associated with redeeming WIC vouchers. WIC office and WIC-only store variables include:

- *WIC offices per 1,000 below the poverty level; and*
- *WIC-only stores per 1,000 below the poverty level.*

WIC Nutritional Risk Variables

To receive WIC, an applicant must be determined to be at nutritional risk. Although there is evidence that nearly all income-eligible individuals are at nutritional risk (Ver Ploeg and Betson, 2003), the documentation of nutritional risk can vary across States. Some States require dietary intake information from all participants as part of the nutritional risk assessment, while other States require this information only from high-risk participants. States also may have various methods for collecting dietary intake information. The two most common collection methods routinely used by States during the period of our study are the 24-hour recall and the food frequency checklist. A recent study (Institute of Medicine, 2002) notes that 24-hour recall takes an average of 20-30 minutes to complete, while a food frequency checklist takes an average of 10-15 minutes to complete. Nutritional risk variables include:

- *All nutritional risk criteria documented* indicates that WIC agencies in a State must document all of the nutritional risks faced by a participant, rather than documenting just the primary nutritional risks.
- *Dietary intake information required of all participants* indicates whether States require dietary intake information be collected from all participants, rather than just high-risk participants, to determine WIC nutritional risk eligibility.
- *Twenty-four hour recall used to obtain dietary intake information* indicates that the State routinely uses the 24-hour recall method to collect dietary intake information.