

# **WIC Turns 35: Program Effectiveness and Future Directions**

Barbara Devaney  
Mathematica Policy Research

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The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides supplemental foods, nutrition education, and social service and health care referrals to low-income pregnant, breastfeeding, and postpartum women, infants, and children up to age 5 who are at nutrition risk. The WIC program is based on the premise that many low-income individuals are at risk of poor nutrition and health outcomes because of insufficient nutrition during the critical growth and development periods of pregnancy, infancy, and early childhood. The WIC program is a supplemental food and nutrition program to help meet the special needs of low-income women, infants, and children during these periods. WIC provides three main benefits to participants: (1) supplemental foods; (2) nutrition education; and (3) referrals to health care and social service providers.

WIC began as a pilot program in 1972 and was authorized permanently in 1974 (P.L. 94-105). In the intervening 35 years, WIC has become a key component of the nutrition safety net provided for low-income Americans. Today, WIC functions as a vital link in America's public health efforts to ensure that all of the nation's children have the resources they need to thrive. More than half of *all* U.S. infants and a quarter of *all* U.S. children ages one to five receive WIC benefits.

The WIC program has been the focus of numerous and varied evaluations. In general, these studies show WIC to be effective, although several methodological issues have been raised about the existing research. Most of the evaluation evidence on WIC focuses on the relationship between prenatal WIC participation and birth outcomes. A major methodological issue in these studies is separating the effect of prenatal WIC participation from other factors that are related to both WIC participation and birth outcomes. Despite some controversy over the research evidence on WIC's effectiveness, the recent Program Assessment Rating Tool (PART) from the Office of

Management and Budget rated WIC as “effective”, based on a review of the literature showing positive effects on key health outcomes and efficient use of program funds.<sup>1</sup>

This paper reviews what we know from the first 35 years of WIC operations and describes the challenges as WIC moves forward. It first reviews the history of the WIC program and provides a detailed description of program eligibility and benefits. The paper then describes major findings from evaluation studies of WIC, focusing on both the study findings and potential limitations of the research. The final sections of the paper focus on future program and research directions for WIC.

### ***HISTORY OF THE WIC PROGRAM***

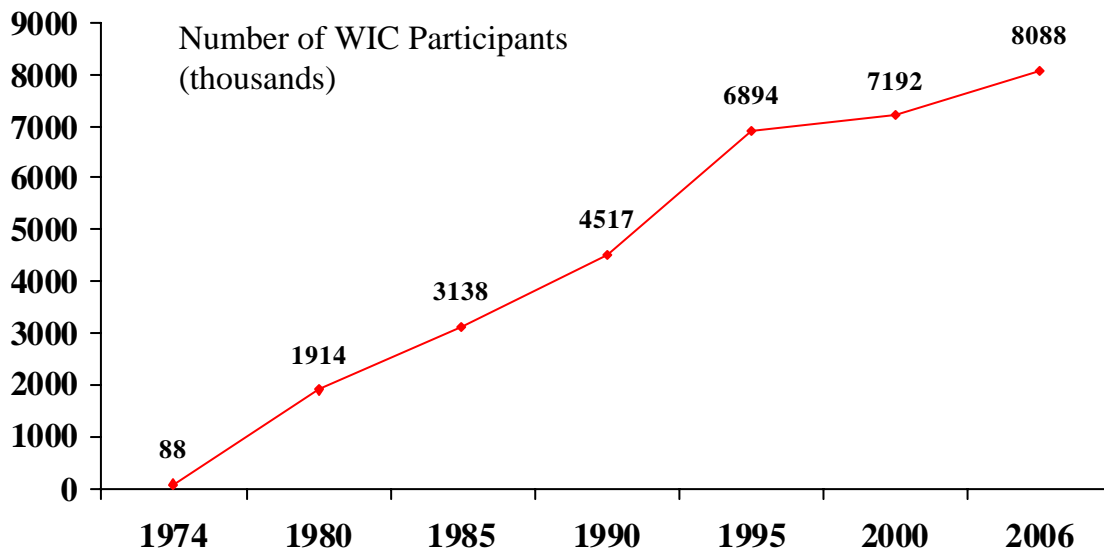
The origin of the WIC program is a 1969 White House Conference on Food, Nutrition, and Health, which recommended that special attention be given to the nutritional needs of low-income pregnant women and preschool children. Physicians had reported increasing numbers of disadvantaged pregnant women and their newborns complaining about a lack of food when visiting public health clinics.<sup>2</sup> In response, a group of community-based public health physicians and staff from both the U.S. Department of Agriculture and the U.S. Department of Health and Human Services met and developed a proposal to build food commissaries attached to neighborhood public health clinics. Food vouchers prescribed by clinic professionals would provide supplemental foods for low-income women, infants, and children. The first two food commissary-clinic programs were demonstration programs that operated in Atlanta, Georgia and Baltimore, Maryland.

In September 1972, Congress expanded these demonstration projects and authorized a two-year pilot program linking health care to food assistance for low-income pregnant and postpartum women, infants, and preschool children considered to be at health risk because of poor nutrition. Participants received specific foods, either by picking them up at WIC clinics or

by using coupons or vouchers at local grocery stores. Initially, participants had to live in areas with a high proportion of pregnant and postpartum women at nutrition risk. The 1972 law also mandated an evaluation of the pilot program.

Since its inception as a pilot program in 1972 and then as a permanent program starting in 1974, the WIC program has grown dramatically (Figure 1). In fiscal year 1974, WIC served 88,000 women, infants, and children at a cost of \$20.6 million. By fiscal year 1980, the program served 1.9 million women, infants, and children at a cost of \$725 million. Currently, WIC serves 8.1 million participants at an annual cost of \$5.1 billion.

**Figure 1**  
**WIC Participation**



***WIC PROGRAM BENEFITS, ELIGIBILITY, AND PROGRAM ADMINISTRATION***

WIC provides three main benefits to program participants: (1) supplemental foods, (2) nutrition education, and (3) referrals to health care and social service providers. Supplemental foods are provided to WIC participants through food instruments—in the form of a voucher,

check, or electronic benefit—that list the quantities of specific foods, as well as brand names, that can be purchased. The food packages are designed to provide specific nutrients thought to be lacking in the diets of eligible WIC participants—protein, vitamin A, vitamin C, calcium, and iron. WIC food packages for pregnant and postpartum women, infants, and children include iron-fortified formula, milk and cheese, eggs, iron-fortified ready-to-eat cereals, fruit and vegetable juices, dried peas or beans, and peanut butter. The WIC food packages are designed for seven categories of participants: (1) pregnant and breastfeeding women (basic); (2) postpartum, non-breastfeeding women; (3) breastfeeding women (enhanced); (4) infants from birth through three months of age; (5) infants 4 through 12 months of age; (6) children 1 through 4 years of age; and (7) women, infants, and children with special dietary needs. About 75 percent of WIC funds are used to provide these supplemental food packages.

Although the supplemental food packages are the cornerstone of the WIC program, WIC also provides nutrition education to program participants and health care and social service referrals. WIC nutrition education has two broad goals: (1) to stress the relationship between nutrition and good health, focusing on the needs of pregnant, postpartum, and breastfeeding women; infants, and children under age 5; and (2) to help individuals achieve changes in their food habits and consume more healthy diets. Referrals to health care providers are expected to increase the use of prenatal and postpartum care for women and to increase access to and use of routine preventive care for infants and children. Finally, social service referrals to programs such as housing assistance, Medicaid, Temporary Assistance for Needy Families, food stamps, and mental health and substance abuse programs are expected to address the broad range of needs that low-income women, infants, and children face.

WIC eligibility is based on categorical criteria, income, and evidence of nutritional risk. To be *categorically eligible*, an individual must be in one of the following five groups: (1) a

pregnant woman, (2) a breastfeeding woman less than one year postpartum, (3) a postpartum (non-breastfeeding) woman less than 6 months postpartum, (4) an infant up to one year of age, or (5) a child less than 5 years of age. As of April 2004, 50 percent of all WIC participants were children; 26 percent were infants; and the remaining 24 percent were pregnant (11 percent), breastfeeding (6 percent), or postpartum women (7 percent).<sup>3</sup>

States have the option of setting *income eligibility* at between 100 and 185 percent of the federal poverty level; as of April 2004, all State agencies use 185 percent of the poverty level as the income eligibility threshold. In addition, applicants may be adjunctively eligible for WIC if they can document participation in Medicaid, Temporary Assistance for Needy Families, or the Food Stamp Program.

Finally, each participant must be determined to be at *nutritional risk* based on a medical or nutritional assessment by a “competent professional”, such as a physician, nutritionist, nurse, or other health professional. For participants older than 6 months of age, assessment of nutritional risk includes, at a minimum, measures of height, weight, and a blood test for iron deficiency anemia. Nutritional risk conditions include abnormal nutritional conditions detected by biochemical or physical measurements, other documented nutritionally-related medical conditions, dietary deficiencies that may impair health, and conditions that predispose individuals to inadequate nutritional patterns or conditions.

The WIC program is federally funded by the Food and Nutrition Service (FNS) of the U.S. Department of Agriculture (USDA) and administered by state and local agencies. The three tiers of WIC administration are the following:

1. **Federal.** FNS issues regulations for the WIC program and, with its seven regional offices, monitors compliance with the regulations. Congress determines the funding amount annually, and FNS provides cash grants to state agencies.

2. ***State Agencies.*** The State agencies include agencies in the 50 states, Puerto Rico, Guam, American Samoa, the American Virgin Islands, the District of Columbia, and 33 Indian Tribal Organizations.
3. ***Local WIC Agencies.*** The local agencies provide services to WIC participants, including screening applicants for eligibility, certifying eligibility, and issuing benefits. In some states, the local agencies are arms of the State agency, while in other states they are autonomous agencies with contracts with the State agencies. Local agencies may be public health departments, community health care centers, community action agencies, public hospitals, or migrant worker health-care centers.

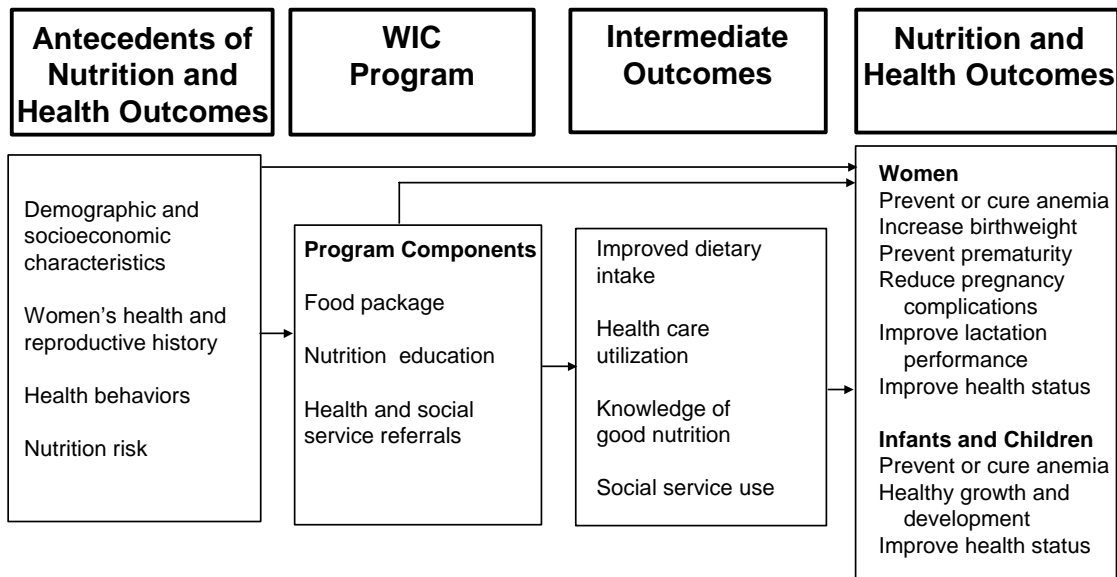
WIC is not an entitlement program; participation in the program is limited by the authorized funding level. If a local WIC agency reaches its maximum level of participation, it places all subsequent applicants on a waiting list. Participants are certified as eligible for a specified period of time. Pregnant women are certified for the duration of pregnancy and up to 6 weeks postpartum; postpartum women are certified for up to 6 months; and breastfeeding women are certified at 6-month intervals up to the infant's first birthday. Infants are certified up to their first birthday, and children are certified at 6-month intervals up to the end of the month in which a child reaches his or her fifth birthday.

### ***MAJOR FINDINGS ON WIC PROGRAM EFFECTIVENESS***

Conceptually, all aspects of the WIC intervention and benefits—supplemental food assistance, nutrition education, and health and social service referrals—are expected to improve the nutritional status of program participants by addressing the risk factors for poor outcomes (Figure 2). Supplemental foods offered through WIC are high in key nutrients needed during and after pregnancy, including protein, iron, calcium, and vitamins A and C. In conjunction with these supplemental foods, nutrition education can improve dietary quality and nutritional status both in the short-term during pregnancy and in the long-term by teaching key concepts of good nutrition and food preparation techniques. Finally, with its emphasis on risk assessment and referrals, WIC serves as a gateway to the health care and social service systems. In particular, access to health

care is enhanced through a referral process that includes advising clients about the types of health care available, accessible location of health care facilities, and how to receive health care and why it is useful.

**Figure 2:  
Conceptual Framework for the Effects of the WIC Program**



Based on the conceptual framework in Figure 2, evaluation studies of WIC have asked the following key research questions: (1) is prenatal WIC participation associated with improved birth outcomes and use of prenatal care; (2) is WIC participation associated with better iron status of infants and children and reduced iron deficiency anemia; (3) does WIC participation lead to better diets for women, infants, and children (4) do infant and child WIC participants comply with recommended use of preventive health care; and (5) does WIC participation affect children's physical growth and emotional and cognitive development? Given available data sources and ongoing surveys, some of these research questions are easier to answer than others. Specifically, information on dietary outcomes and use of health care is available from surveys of low-income women and can be used to address research questions related to dietary status and use of health care. Data from the standard U.S. birth certificate files can be used to analyze the

relationship between prenatal WIC participation and birth outcomes. Surveillance data collected by the U.S. Centers for Disease Control and Prevention are useful for assessing trends in iron deficiency anemia and WIC participation. However, because of the long-term nature and expense of collecting data on children's growth and development, only limited information is available on the relationship between WIC participation and physical growth and emotional and cognitive development of children.

### **Prenatal WIC Participation and Birth Outcomes**

Numerous studies document positive effects of WIC participation on birth outcomes, although variation in the magnitude of these effects exists due to differences in methodological approaches. By far the most common birth outcome examined in the literature is newborn birthweight, and many studies find a significant effect of prenatal WIC participation on birthweight.<sup>4-10</sup> Easily more than 50 studies over the past 35 years, using different data sets and study designs, have examined the relationship between prenatal WIC participation and birthweight. As a result, estimates of the increase in birthweight associated with prenatal WIC participation range widely:

- A five-state study of birth outcomes among Medicaid mothers found increases in birthweight ranging from 51 grams in Minnesota to 117 grams in North Carolina.<sup>4</sup>
- A study using the 1988 National Maternal and Infant Health Survey estimated an increase in birthweight of 68 grams for prenatal WIC participants compared with low-income nonparticipants.<sup>5</sup>
- A more recent study using data from the Pregnancy Risk Assessment Monitoring System (PRAMS) from 19 states found an increase in birthweight of 64 grams for prenatal WIC participants.<sup>6</sup>

Several of these studies also find that prenatal WIC participation is associated with reductions in the rate of preterm birth (birth before 36 weeks gestation) and the rates of low and very low birthweight (infant birthweight less than 2,500 grams and 1,500 grams, respectively). For example, the study using PRAMS data from 19 states found a 29 percent reduction in the rate of low birthweight and more than a 50 percent reduction in very low birthweight.<sup>6</sup>

Not surprisingly, these estimated increases in birthweight and reductions in both preterm birth and low birthweight translate into substantial cost savings associated with prenatal WIC participation. The five-state study of birth outcomes among Medicaid mothers reported that each dollar spent on prenatal WIC benefits resulted in savings that ranged from \$1.77 to \$3.13 in Medicaid costs during the first 60 days after birth.<sup>4</sup> In a synthesis of 17 major studies, the General Accounting Office (GAO) estimated that prenatal WIC services cost the federal government \$296 million (in 1990 dollars) but would save \$1.036 billion (present value) in federal, state, local, and private funds over the following 18 years.<sup>11</sup> The estimated cost savings were driven almost entirely by the estimated reductions in low birthweight and very low birthweight associated with prenatal WIC participation. These GAO estimates are the source of the frequently cited finding that “every dollar spent on WIC saves \$3.50.” ( $\$1.036 \text{ billion} / \$296 \text{ million} = \$3.50$ .)

In recent years, however, several researchers have questioned the WIC results, claiming that they are overstated due to methodological limitations. In particular, the large reductions in preterm birth and low birthweight appear inconsistent with the clinical literature on reproductive health outcomes which shows little or no impact of dietary supplementation on preventing preterm birth.<sup>9</sup> In fact, the clinical literature as a whole shows the lack of success of intensive medical and nutritional interventions in preventing preterm birth, the main reason for low birthweight. How, then, could prenatal WIC participation have such dramatic impacts on preterm delivery and low birthweight? Two main methodological issues are frequently cited—selection bias and gestational age bias.

**Selection Bias.** The most commonly cited limitation of the evidence on WIC effectiveness is selection bias. Almost all the studies of prenatal WIC participation used a comparison-group methodology in which prenatal WIC participants were compared with income-eligible nonparticipants. Comparison-group designs almost always have the potential of selection bias, which occurs when underlying and unobservable differences between program participants and a comparison group of nonparticipants create differences in outcomes that are incorrectly attributed to program participation. For example, if prenatal WIC participants are more

motivated and concerned about health and nutrition than nonparticipants, birth outcomes of WIC participants may be better than those of nonparticipants even in the absence of the WIC program. Alternatively, if WIC is successful at targeting and enrolling the highest-risk women, any differences in birth outcomes between WIC participants and nonparticipants are likely to be understated due to pre-existing differences in risk.

Most studies of prenatal WIC participation have not been successful at estimating models that adequately control for selection bias issues. In attempting to estimate models that control for potential selection bias, the main problem encountered is the lack of a suitable instrument for prenatal WIC participation, and estimates of “selection-bias adjusted effects” are all over the map, ranging from huge negative effects to similarly large positive effects.<sup>5</sup> Consequently, researchers either try to include a rich set of control variables to mitigate the effects of selection bias<sup>5,6</sup> or to create a comparison group that is as similar as possible to prenatal WIC participants.<sup>12</sup> In general, analyses using the richer set of controls or more narrowly defined comparison groups still find a relationship between prenatal WIC participation and birth outcomes. Part of the reason for this may be because comparisons of the observed characteristics of WIC participants and eligible nonparticipants typically find that program participants are negatively selected on a wide array for socioeconomic and demographic characteristics.<sup>5,6</sup>

**Gestational Age Bias.** A more serious limitation of the existing literature, and the limitation that explains the inconsistency between the clinical literature and WIC evaluations, has been called gestational age bias. Put simply, gestational age bias occurs because women whose pregnancies last longer have more time to become a prenatal WIC participant. Many of the existing studies that compared all prenatal participants and income-eligible nonparticipants did not control for or consider the timing of WIC enrollment. In particular, women who enter WIC late in pregnancy are likely to have good birth outcomes simply because the pregnancy lasted long enough, not because of WIC. In fact, when the timing of WIC enrollment is considered, the results show larger impacts of late WIC enrollment on birthweight and rates of preterm delivery and low birthweight than of early WIC enrollment. In the extreme, women who enter WIC after 36 weeks gestation could not

possibly have lower rates of preterm delivery (defined as delivery before 36 weeks) due to WIC, yet some studies consider them as prenatal WIC participants.

Two approaches are used to control for gestational age bias. The first is simply to include a control for gestational age in the birthweight and low birthweight equation. With this approach, the estimated effects of prenatal WIC participation decline, but are often still statistically significant. For example, the five-state WIC-Medicaid study found that gestation-adjusted savings in Medicaid costs during the first 60 days after birth associated with prenatal WIC participation were about half of the non-adjusted estimated savings, but estimates for four of the five states were still statistically significant.<sup>4</sup> A recent study using data from the Pregnancy Nutrition Surveillance System (PNSS) in 9 states found that increases in birthweight associated with prenatal WIC participation fell from 63 to 40 grams when a control for gestational age was included in the birthweight models (both statistically significant).<sup>12</sup>

A second way to control for gestational age bias is to restrict the sample to full-term births. This approach was used in at least two state studies of prenatal WIC participation. Both found significant effects of prenatal WIC participation on birthweight.<sup>13,14</sup> However, the recent study using the PNSS data found a statistically significant, but quite small, reduction in the rate of low birthweight for WIC participants with full-term births as compared with nonparticipants with full-term births.

In summary, reviews of the WIC evaluation studies often lead with “WIC Works.” In recent years, however, the evidence on WIC’s effectiveness has been scrutinized more carefully. Methodological issues—in particular, gestational age bias—are important to consider in interpreting the empirical evidence on WIC’s effectiveness. When these limitations are considered, WIC’s effects persist but they are substantially more modest than the estimated savings of \$3.50 for each \$1.00 spent on WIC.

## **WIC Participation and Breastfeeding**

Throughout its history, WIC has struggled with the competing priorities of promoting breastfeeding and providing iron-fortified formula to infants whose mothers cannot breastfeed or choose not to do so. Some question whether WIC's current practice of making adequate amounts of formula available to women who choose not to breastfeed may discourage breastfeeding. However, *not* to make formula available in WIC would discourage program participation, thereby denying important nutritional benefits to vulnerable infants, and might lead to even less desirable alternatives, such as feeding infants cow's milk.

Most of the literature on the relationship between WIC participation finds that participants are less likely to initiate breastfeeding and had shorter durations of breastfeeding than income-eligible nonparticipants.<sup>15-17</sup> One study, however, found that the impact of WIC participation on breastfeeding is mediated by the nutrition education and advice provided by the WIC clinic staff; women who reported that they received encouragement from WIC staff to breastfeed were more likely to breastfeed than other WIC participants.<sup>15</sup>

In general, the potential for selection bias in the estimates of the relationship between WIC participation and breastfeeding has never been adequately resolved. The estimated negative effect of WIC participation could well reflect underlying differences in the propensity to breastfeed that would persist even without WIC. Even the mediating analysis showing the positive effect of "receiving advice to breastfeed from WIC staff" could be the result of selection. One study estimated a selection-adjusted model and rejected the non-significant (but negative) findings in favor of the basic model that reported a negative effect of WIC on breastfeeding, based on a Hausman test suggesting that WIC participation was not endogenous.<sup>15</sup>

In response to concerns associated with the lower prevalence and shorter duration of breastfeeding among WIC participants, USDA has adopted standards and policies to promote

and support breastfeeding. Early legislation in 1989 provided \$8 million in breastfeeding support programs, while later legislation required a national breastfeeding promotion program and instituted an enhanced food package for women who exclusively breastfeed. As described in more detail below, the current WIC food package is undergoing revisions, and the redesign has a primary objective to increase breastfeeding among WIC participants.

### **WIC Participation by Infants and Children**

In contrast to the large body of literature examining the effects of prenatal WIC participation, many fewer studies focus on the effects of WIC participation by infants and children. Nevertheless, several studies report generally positive effects of WIC participation. Outcomes examined include anemia and iron status, growth, dietary status, and access to and use of health care.

**Anemia and Iron Status.** Iron-deficiency anemia has long been one of the primary public health problems facing infants and children in the United States, especially low-income infants and children. Not only is iron-deficiency anemia a severe health problem, but it leads to long-term deficits in cognitive development in children. Data from the Pediatric Nutrition Surveillance System indicate that the prevalence of anemia among low-income children decreased from 7.8 percent in 1975 when WIC first started to 2.9 percent in 1985, a finding largely attributed to improvements in childhood iron nutrition status and to positive effects of public health programs, especially supplemental foods offered through the WIC program.<sup>18</sup> In addition, a comparison of hematological tests of low-income children at enrollment in public health programs (primarily WIC) with tests at follow-up visits indicates declines in the prevalence of iron-deficiency anemia, suggesting positive impacts of participation in the public health programs, especially the WIC program.<sup>19</sup>

The literature suggests that WIC has had both a direct effect (as discussed above) and indirect effect on reducing the prevalence of childhood anemia. The indirect effect comes from the mandate that all infant formula and infant cereal provided in the WIC food packages be fortified with iron. Because more than half of all formula sold in the United States, and substantial proportions of infant cereals, are provided through WIC, food companies now routinely produce primarily iron-fortified formulas and cereals. Consequently, WIC has contributed to an improvement in the iron status of all U.S. children, regardless of whether they participate in WIC or not.

**Growth.** Most studies examining the effect of WIC on growth have used measures of children's weight and height. An early evaluation by Edozien and his colleagues used data from a nationally representative sample of over 6,000 infants and children ages 0 to 3 years in 1973-76 and compared outcomes of clinical examinations for infants and children who had participated in WIC for 6 months with clinical data on newly enrolled infants and children. Their results indicated that WIC had a statistically significant impact on children's growth in weight and height.<sup>20</sup> However, as low weight and height are used as criteria for WIC eligibility, the increase in weight and height after WIC participation may be due to regression to the mean. Results from the National WIC Evaluation, conducted early in WIC's 35-year history, showed that WIC had no significant impact on weight but had a positive effect on weight for height for infants and children who had participated either prenatally or within three months after birth.<sup>21</sup>

A crucial feature of these evaluations of the effects of WIC participation by infants and children is that they are based on data that are very old, and significant changes have since occurred in the WIC program. In addition, evaluating the effects of WIC participation on the physical growth and development of children is problematic; impacts of WIC may not be evident

until several years after a child has enrolled in WIC, and longitudinal studies of children participating in WIC are difficult to design and expensive to conduct.

A more recent study using data from the Children's Sentinel Nutrition Assessment Project found that WIC infants were significantly longer and significantly less underweight than low-income non-WIC infants.<sup>22</sup> However, despite attempts by the authors to create comparison groups of nonparticipants that mitigated the issue of selection bias, the empirical results could still reflect underlying differences between WIC participants and nonparticipants.

**Dietary Status.** Numerous studies have examined the relationship between WIC participation by children and nutrient and food intakes. Overall, despite the potential for selection bias, the overarching conclusion is that WIC participation is associated with higher intakes of key nutrients and more consumption of WIC foods.<sup>17</sup> Moreover, the evidence suggests that calorie intakes of WIC participants are not significantly different than the intakes of similar non-WIC children. Given the increasing prevalence of childhood overweight and adult obesity, the lack of a significant relationship between WIC participation and calorie intake is a positive program finding.

**Utilization of Health Care.** Finally, some studies examine the impact of WIC participation on utilization of health care services. Data from the National WIC evaluation showed that children receiving WIC benefits were significantly more likely to have a regular source of health care than non-WIC children, and that WIC participation was associated with immunizations for some subgroups of infants and children.<sup>21</sup> A study conducted using administrative data from the state of North Carolina found that low-income children participating in the WIC program are higher users of all types of health care services than low-income nonparticipants.<sup>23</sup> Compared with income-eligible WIC nonparticipants, child WIC participants use more preventive care services, more dental health services, and more emergency room and inpatient care. Moreover, children in WIC were more likely to be diagnosed and treated with common childhood

illnesses—otitis media, gastroenteritis, upper and lower respiratory infections, asthma, and other childhood illnesses. These results suggest that low-income children enrolled in WIC are linked to the health care system and are much more likely to be receiving preventive and curative care.

In summary, studies of infant and child WIC participation have examined a wide range of outcomes, especially in contrast to evaluation studies of prenatal WIC participation that focus primarily on birth outcomes. Despite the persistent concern about potential selection bias, the findings suggest that WIC participation by infants and children is associated with improved iron status of infants, lower rates and duration of breastfeeding, positive effects on child growth, improved dietary status, and greater access to and use of health care.

### ***LOOKING AHEAD: POLICY AND RESEARCH***

Since WIC first started, significant changes have occurred in the demographic characteristics and public health concerns of the population served by WIC, in the U.S. food supply and dietary patterns, and in knowledge of nutrient requirements and dietary guidance's history, yet the WIC food packages have changed very little since the 1970s. After 35 years, however, WIC is revising its food packages! Initially, the WIC food package focused solely on concerns about the nutrient adequacy of participants' diets. Specifically, the original (and current) food packages target specific nutrients that, at the time that WIC was first authorized, were lacking in the diets of low-income women, infants, and children—namely, protein, vitamin A, vitamin C, calcium, and iron. Foods in the WIC packages, including iron-fortified formula, milk and cheese, eggs, iron-fortified infant cereals and ready-to-eat cereals, 100% juices rich in vitamin C, dried peas or beans, and peanut butter, were specifically selected for their contributions to these targeted nutrients .

In recent years, many policy makers, stakeholder groups, and researchers have highlighted the need to review the WIC food packages and consider whether revisions should be undertaken.

This need was motivated by several factors:

- ***The characteristics of WIC participants have changed considerably since WIC's inception.*** The number of WIC participants increased from 88,000 women, infants, and children in fiscal year 1974 to 8.1 million in 2006. Also during this time period, the racial and ethnic distribution of WIC participants shifted considerably, with Hispanics and Asian and Pacific Islanders accounting for a significantly larger share of the total WIC population. Today, more low-income women are working than when WIC first started.
- ***The health risks of the WIC population have shifted dramatically over time.*** Over the 35 years of WIC's existence, concerns about diet and health have shifted from concerns about dietary adequacy to concerns about excessive intakes of calories and saturated fat, inadequate consumption of fruits, vegetables, and whole grains, and the problems of obesity and chronic disease that are associated with these dietary patterns.
- ***The food supply and dietary practices of the WIC population have changed.*** Over the past three decades, the food supply has increased dramatically, and a greater variety of foods and food establishments are available. More Americans of all income levels eat outside the home.
- ***Knowledge of nutrient requirements and dietary guidance has improved.*** Improved knowledge of nutrient requirements has resulted in a new set of nutrient reference standards and regular updates of the *Dietary Guidelines for Americans* have led to improved tools and guidance on how to eat a healthy diet.

In response to these substantial changes in the context in which the WIC program operates, the Food and Nutrition Service currently has a proposal to change the WIC food packages. The proposed revisions to the food packages are designed to be consistent with dietary guidance for infants and young children, especially to promote and support breastfeeding; to encourage the consumption of fruit, vegetables, and whole grains; to discourage the consumption of saturated fat; and to appeal to a diverse population.<sup>24</sup>

The new food packages, if consumed as intended, should improve the diets and health of program participants. Nonetheless, much can happen when design is put into practice. The WIC

program can control only the foods offered through the WIC food packages, not what participants actually consume. With the proposed food packages, food consumption patterns may change in unintended ways, leading to changes in food choices and nutrient intake. Additionally, the proposed food packages could increase or decrease the incentive of different groups to participate in the WIC program, and they could increase or decrease breastfeeding rates.

Thus, in thinking about the future policy and research agenda for WIC, it is critical to examine how the new food packages are implemented and whether they achieve the desired goal of more healthy diets and improved health of WIC participants. Given the reach of the WIC program in serving the target population—54 percent of *all* infants receive WIC benefits, for example—the proposed changes in the food package, especially if accompanied by effective nutrition education, has the potential to improve the diets of WIC participants and can contribute to approaches to reduce childhood and adult obesity. Several research questions should be answered about the changes resulting from the revised food packages.

### **Will More Mothers Breastfeed Their Infants?**

The proposed changes include a number of recommendations designed to encourage more breastfeeding and increase the duration of breastfeeding among WIC mothers. The first, and most controversial, recommendation was that during the first month after birth (called the “birth month”), mothers participating in WIC be required to choose (at least for purposes of providing program foods) between full formula feeding and full breastfeeding. That is, women would not be able to certify as a partially breastfeeding mother during the birth month. In addition, while recommending that iron-fortified formula continue to be available for *partially* breastfed infants after the first month, the revised food packages include a substantial reduction in the amount of formula provided to those infants, from the current maximum of 806 fluid ounces for partially breastfed infants ages 1 to 3 months to a maximum of 364 fluid ounces. Other enhancements to

the food packages for breastfeeding mothers and infants—namely increased amounts of baby foods (including baby food meats) for fully breastfed older infants and the more generous food package for fully breastfeeding women—are also expected to make breastfeeding a more attractive option.

The revised WIC food packages, however, could have unintended negative effects on breastfeeding decisions. Mothers may be reluctant to give up access to any formula, even if they intend to initiate breastfeeding, and, as a result, may decide to certify as fully formula feeding and even choose to formula feed rather than try to partially breastfeed. In addition, WIC mothers may be concerned about the reduced quantity of formula provided for their older infants if they choose to partially breastfeed. Again, this characteristic of the proposed food packages could have the potential unintended consequence of causing more WIC mothers to certify as fully formula feeding or even to switch to fully formula feeding to ensure they have adequate formula to feed their infants.

### **Will WIC Participants Eat More Fruit and Vegetables?**

The most fundamental proposed change to the WIC food packages is the increase in the amount and variety of fruits and vegetables in the food packages for all WIC participants 6 months of age and older. Currently, the WIC food packages provide two pounds of fresh carrots to fully breastfeeding mothers and significant quantities of vitamin C rich juice for infants, children, and women. The proposed food packages change this dramatically. Vitamin C rich juice would not be provided at all for infants and would be provided at substantially reduced quantities for children and all categories of women. The revised packages include baby food fruits and vegetables for infants 6 to 11 months of age, \$6 cash voucher for children 1 to 5 years of age, and \$8 cash voucher for prenatal, breastfeeding, and postpartum women. The cash vouchers could be used to purchase a wide variety of fresh fruits and vegetables. If fresh fruits

and vegetables are of limited availability, State WIC agencies could allow canned, dried, or frozen fruits and vegetables instead. The one exception to the recommendation of allowing a wide variety of fruits and vegetables to be obtained through WIC is that white potatoes will not be allowed, since white potatoes are already prevalent in the diets of WIC participants and are often consumed in forms that are high in calories and saturated fat (e.g., French fries).

### **Will the Delay in Complementary Foods Lead to Improved Diets?**

Currently WIC infants start receiving iron-fortified infant cereal and vitamin C rich juice at 4 months of age. To be consistent with current recommendations of the American Academy of Pediatrics and other expert groups, the revised food packages recommend that infant cereal not be provided until 6 months of age, and that no vitamin C rich juice be provided to infants at all. These recommendations are designed to increase the reliance on breastmilk or formula as the main source of energy in the diets of infants up to 6 months of age.

Recent research, however, shows that 70 percent of infants consume complementary foods before 6 months of age, suggesting that, despite the advice of most professionals, parents introduce complementary foods earlier than 6 months.<sup>25</sup> Moreover, some experts argue that complementary foods should be introduced when professionals and parents feel the child is developmentally ready, which is usually between 4 and 6 months of age. So, if WIC withholds nutritious complementary foods until 6 months of age, the empirical question is whether parents also will withhold other foods. If not, will the delay in providing appropriate complementary foods through WIC from 4 to 6 months lead some parents to introduce inappropriate foods?

## **What Will Be the Effects of the Changes to Whole Grains and Reduced-Fat Milk?**

To increase the nutrient content of WIC participants' diets, as well as to address the increasing prevalence of overweight and obesity, the proposed food packages emphasize the consumption of whole grain cereals and breads and limit milk to reduced-fat forms for children older than two years of age and for prenatal, breastfeeding, and postpartum women. If these foods are less appealing to WIC participants, the proposed changes could lead to reduced participation among eligible women and children or reduced consumption of grain products and milk.

### **Research Steps**

The proposed changes to the WIC food packages are substantial and should be studied systematically to ensure that WIC continues to be effective in meeting the changing needs of its participants. Because of the magnitude of the changes proposed, it is important to examine how WIC state and local agencies implement the proposed food packages, the effects of the proposed food packages on participation rates, and the extent to which the food and nutrient goals of the proposed revisions are achieved.

The first step in preparing to assess the effects of the food package changes is to document all the changes to the WIC food packages, provide the rationale for the change, and the possible changes in behavior that could result from the key changes. For example, limiting milk to reduced-fat forms could have four different effects: (1) reduced fat and saturated fat intakes (if WIC participants simply substitute reduced-fat for whole milk); (2) reduced calcium (and saturated fat) intakes (if WIC participants consume less milk); (3) increased consumption of non-milk beverages and, potentially increased sugar intakes (if participants substitute other beverages for milk); and/or (4) reduced WIC participation (if WIC participants find the proposed food packages to be less desirable).

After the possible changes in behavior are identified, the next step is to consider data sets and research designs that could be used to determine what actually happened after the changes to the WIC food packages were implemented. Although random assignment would be an ideal design for estimating the impacts of the changes to the WIC food package, the current timing of the implementation of the proposed food packages—soon—implies that randomized controlled trials are not feasible and other designs need to be considered.

To examine changes in food consumption and nutrient intake, the most likely data set is the National Health and Nutrition Examination Survey (NHANES). The current NHANES began in 1999 and is an ongoing annual survey conducted by the National Center for Health Statistics and includes 24-hour dietary recalls administered to a nationally representative sample of individuals of all ages. Each year approximately 7,000 randomly-selected residents across the United States are asked to participate in the survey. Although in a given year the number of WIC participants (by WIC category of pregnant and postpartum women, infants, and children) is likely to be small, pooling data across years could provide sufficient sample sizes for analytic research needs.

One feasible research design using NHANES data might be to estimate two models of food consumption and nutrient intake, one using the pre-implementation years of NHANES data and the other using post-implementation years. These models would estimate relationships between WIC participation and the consumption of the foods in the old and new food packages.<sup>1</sup> If the goals of the proposed food packages are achieved, we would expect to see a stronger relationship between WIC participation and consumption of foods in the new WIC food package in the post-implementation model than in the pre-implementation model.

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<sup>1</sup> The proposed analysis is similar to that conducted by Oliveira and Chandran for their report *Children's Consumption of WIC-Approved Foods*.<sup>26</sup>

In addition to NHANES data on food consumption and nutrient intake, WIC administrative data might also be a feasible data source for research on the effects of the changes in the WIC food packages on participation and on instrument redemption. In particular, obtaining and analyzing data on food instrument issuance and redemption could support an analysis of WIC food instrument redemption, including item-specific analyses (for example, the amounts of milk and breakfast cereals “purchased” with WIC vouchers).

After considering potential data sets and research designs, feasible approaches for conducting research on the changes to the WIC food packages need to be identified. It may not be feasible to study some aspects of the food package changes using extant data sources. For example, limited sample sizes of adult WIC participants in NHANES make it unsuitable for examining effects of changes in the WIC food package for fully breastfeeding women. Sample sizes in the full NHANES 1999-2004 may be adequate, however, to support analyses that used all women—pregnant, breastfeeding, and non-breastfeeding, postpartum women—in an NHANES analysis.

## ***SUMMARY***

In summary, WIC is generally a successful and popular program, largely because it serves a vulnerable population and because of its comprehensive research record over the past 35 years. At this critical time of change, with the scope and magnitude of the changes to the WIC food packages, the future research agenda of the effectiveness of the WIC program needs to change with the WIC food packages.

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