May 4, 2015

WIC Works: Addressing the Nutrition and Health Needs of Low-Income Families for 40 Years

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Extensive research has found the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) to be a cost-effective investment that improves the nutrition and health of low-income families — leading to healthier infants, more nutritious diets and better health care for children, and subsequently to higher academic achievement for students. As a result of the research documenting WIC’s effectiveness, Administrations and Congresses of both parties have provided sufficient funding since 1997 to ensure that WIC can serve all eligible low-income pregnant women, infants, and young children who apply for it.

WIC provides nutritious foods, nutrition education, breastfeeding support, and referrals to health care and social services for millions of low-income families, and it plays a crucial role in improving lifetime health for women, their infants, and young children. Part of the nation’s nutrition safety net for over 40 years, WIC now serves more than 8 million pregnant and post-partum women, infants, and children through their fifth birthday. For a family to participate, it must have gross income of no more than 185 percent of the federal poverty level (now $36,612 for a family of three) and be at nutritional risk. To simplify program administration, an applicant who already receives SNAP (formerly food stamps), Medicaid, or Temporary Assistance for Needy Families cash assistance is automatically considered income-eligible.²

Over four decades, researchers have investigated WIC’s effects on key measures of child health such as birth weight, infant mortality, diet quality and nutrient intake, initiation and duration of

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breastfeeding, cognitive development and learning, immunization, use of health services, and childhood anemia. Two comprehensive reviews of the research literature catalogued the findings on WIC’s effectiveness through 2010. This paper builds on those reviews, summarizing the evidence from earlier studies and more recent research. Taken as a whole, the evidence demonstrates WIC’s effectiveness.

- Women who participate in WIC give birth to healthier babies who are more likely to survive infancy.
- WIC supports more nutritious diets and better infant feeding practices. WIC participants now buy and eat more fruits, vegetables, whole grains, and low-fat dairy products, following the introduction of new WIC food packages that are more closely aligned to current dietary guidance.
- Low-income children participating in WIC are just as likely to be immunized as more affluent children, and are more likely to receive preventive medical care than other low-income children.
- Children whose mothers participated in WIC while pregnant scored higher on assessments of mental development at age 2 than similar children whose mothers did not participate, and they later performed better on reading assessments while in school.
- Improvements made to the WIC food packages in recent years have contributed to healthier food environments in low-income neighborhoods, enhancing access to fruits, vegetables, and whole grains for all consumers regardless of whether they participate in WIC.

### Why the Early Years Are So Important

It has long been recognized that poor children lag behind non-poor children on a wide range of indicators of physical, mental, academic, and economic well-being. Poor children are more likely to have health, behavioral, learning, and emotional problems. This is especially true of poor children whose families experience deep poverty, those who are poor during early childhood, and those who are poor for a long time. Poor children are also more likely to be food insecure, and food insecurity in households with children is associated with inadequate intake of several important nutrients, deficits in cognitive development, behavioral problems, and poor health.

The consequences of adversity during early childhood can extend well beyond childhood and can affect physical, mental, and economic well-being. Harvard University’s Center on the Developing Child, for example, writes that:

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4 See, for example, Brooks-Gunn J, Duncan G (1997). The effects of poverty on children. The Future of Children 7(2).

Toxic stress experienced early in life and common precipitants of toxic stress — such as poverty, abuse or neglect, parental substance abuse or mental illness, and exposure to violence — can have a cumulative toll on an individual’s physical and mental health. The more adverse experiences in childhood, the greater the likelihood of developmental delays and other problems.\textsuperscript{6}

Poverty in early childhood may be particularly harmful:

Not only does the astonishingly rapid development of young children’s brains leave them sensitive (and vulnerable) to environmental conditions, but the family context (as opposed to schools or peers) dominates children’s everyday lives.\textsuperscript{7}

Urban Institute researchers have shown that children who are born into poor families are more likely to drop out of high school, have teen premarital births, have inconsistent employment records, and be poor as adults than children not born poor.\textsuperscript{8} Research on the causal impact of childhood poverty — apart from other disadvantages often associated with poverty that may be detrimental to children, such as low levels of parental education or living with a single parent — reveals that family income early in childhood appears to matter for a range of employment outcomes in adulthood, including earnings and work hours.\textsuperscript{9}

Sound investments that reduce early childhood adversity can strengthen the foundations of physical and mental health, with lifelong consequences for educational achievement, economic productivity, health, and longevity. According to the American Academy of Pediatrics:

When developing biological systems are strengthened by positive early experiences, children are more likely to thrive and grow up to be healthy, contributing adults. Sound health in early childhood provides a foundation for the construction of sturdy brain architecture and the achievement of a broad range of skills and learning capacities.\textsuperscript{10}

\textsuperscript{6} Center on the Developing Child at Harvard University (2010). The foundations of lifelong health are built in early childhood. Available at: \url{www.developingchild.harvard.edu}. Accessed on December 5, 2014.


\textsuperscript{9} Duncan GJ, Ziol-Guest K, Kalil A (2010). Early-childhood poverty and adult attainment, behavior, and health. \textit{Child Development} 81 (1):306-325. The authors estimate that a $10,000 annual increase in low-income families’ income before a child’s fifth birthday is associated with a 68 percent increase in adult earnings and more than 500 additional work hours per year after age 25.

Nutrition influences health at every stage of life. Good nutrition during pregnancy is especially important to support fetal development and protect mothers from pregnancy-related risks of gestational diabetes, excessive weight gain, hypertension, and iron deficiency anemia. Good nutrition in early childhood can promote development and foster healthy behaviors that may carry over into adulthood.

Researchers at the University at Buffalo School of Medicine and Biomedical Sciences recently found substantial differences in the solid foods fed to babies from different socioeconomic classes. Specifically, the babies of less educated mothers and poorer households were more likely to be fed diets high in sugar and fat, while diets that more closely followed infant feeding guidelines were linked to higher education and higher income. These disparities are important because of new evidence that links early postnatal nutrition to long-term health outcomes.

WIC aims to improve the health and nutritional well-being of low-income women and their young children by intervening at critical times of growth and development. Thus, WIC has the potential to improve the life chances of millions of infants and children.

**Impacts on Pregnancy and Birth Outcomes**

Numerous studies have shown that women who participate in WIC give birth to healthier babies who are more likely to survive infancy. Seminal USDA research early in WIC’s history found that prenatal WIC participation resulted in longer pregnancies, fewer premature births, lower incidence of moderately low and very low birth-weight infants, and fewer infant deaths. While much has changed since those early years, the evidence remains strong that WIC helps improve birth outcomes. Study after study has shown that participation in WIC during pregnancy is associated with longer gestations, higher birth weights, and generally healthier infants, and that the effects tend to be largest for children born to the most disadvantaged mothers.

- **WIC helps mothers give birth to healthier infants.** Maternal and child health experts carefully monitor birth weight and gestational age of newborns because they are important indicators of an infant’s health and likely survival. Babies born early or with low birth weight

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are at higher risk of early death. Low birth-weight babies who survive are more likely to experience cognitive and developmental delays and struggle with disabilities during their childhood and adolescence; they also face higher risks of chronic disease as adults.

WIC supports healthier pregnancies and births by providing the nutritious foods pregnant women and their babies need, referring mothers for essential medical care, and encouraging them to adopt healthy behaviors (such as not smoking during pregnancy).

The available research strongly suggests that women who participate in WIC give birth to healthier infants than non-participants. A review of more than three dozen studies published between 1979 and 2004 concluded that WIC increased average birth weight, reduced the incidence of low birth weight, and improved several other key birth outcomes. A subsequent review of the next generation of studies published through 2010 echoed this conclusion, noting consistent findings that WIC increased average birth weight and reduced the incidence of low and very low birth weight.

There is less consensus on the size of WIC’s positive impact. Research in the last decade has generally shown that WIC participation is associated with increases in birth weights ranging from about 25 to 70 grams. (See Figure 1.) One influential study estimated that WIC reduced the probability of low birth weight by about 30 percent and the probability of very low birth weight by about half. Few of these studies, however, account for the fact that

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14 This review, sponsored by USDA’s Economic Research Service, points out that “the consistency of the results across studies is noteworthy. This is especially true when . . . the bulk of the literature is comprised of relatively large, well-conducted studies, [and] includes both national samples and state-level data . . . from a number of different time periods” (USDA, Economic Research Service 2004).

15 USDA, Food and Nutrition Service (2012).


17 These increases are likely to be clinically relevant. “Small WIC impacts on birth outcomes may be sufficient for program benefits to exceed costs, given the relatively modest program costs per pregnant mother and the substantial medical and other social savings associated with averting even a small number of poor birth outcomes” (Ludwig J and Miller M (2005). Interpreting the WIC debate. *Journal of Policy Analysis and Management* 24(4):691-701.)

women whose pregnancies last longer have more opportunity to enroll in WIC (see discussion of gestational age bias in the appendix), so the positive outcomes seemingly associated with WIC participation may reflect the longer pregnancy. Studies that correct birth weight for gestational age still find that WIC makes a positive, but more modest, difference. One study, for example, reports an 11 percent reduction in the incidence of small-for-gestational-age births; another found infants participating in WIC to be about 6 percent less likely to be low birth weight and 5 percent less likely to be small for gestational age.  

- **Prenatal WIC participation lowers the risk of infant mortality.** Infant mortality — death in the first year of life after a live birth — takes a serious toll on the health and well-being of many families and is a key indicator of the health and well-being of communities and the nation. About 24,000 infants die each year, according to the Centers for Disease Control and Prevention (CDC); infant mortality rates are about twice as high among African American mothers as white mothers. Many factors contribute to infant mortality, including the quality of health care and maternal nutrition.

  WIC reduces the risk of infant mortality by connecting expectant mothers to essential prenatal health care, promoting healthy eating through nutrition assessments and counseling, and providing healthy foods tailored to the specific needs of pregnant women and their babies.

  Several early studies suggested that prenatal WIC participation was associated with reductions in infant mortality.  

  ![](image)

  * Birth weight adjusted for gestational age (length of pregnancy).

recent study in Ohio found a lower infant mortality rate among WIC participants (8.0 infant deaths per 1,000 live births) than non-WIC participants (10.6). (See Figure 2.) The difference was especially striking for African Americans, with a rate of 9.6 among WIC participants compared to 21.0 among non-WIC participants, significantly reducing the racial disparity between African American and white mothers.21

**Infant Mortality Is Lower Among WIC Participants, Especially African Americans**

Infant deaths per 1,000 live births in Hamilton County, Ohio

![Bar chart showing infant mortality rates among WIC participants and non-participants for all, white, and African American categories.](chart)


**Impacts on Nutrition**

WIC supports healthier diets, promotes breastfeeding and better infant feeding practices, and may improve food security among children. Since the introduction of improved food packages better aligned with current dietary guidance, WIC participants are purchasing and consuming more fruits, vegetables, whole grains, and low-fat dairy.

Adequate nutrition during infancy and early childhood is essential to the growth, health, and development of children to their full potential. Moreover, it is important to establish healthful eating behaviors early in life. CDC research teams have linked detailed data on infants’ feeding practices to information on their diet, health, and development six years later to show the importance of early nutrition for long-term health outcomes. Infants who are breastfed longer and introduced to foods or beverages other than breast milk later, for example, tend to have lower rates of ear, throat, and sinus infections by age 6; infants who consume sugar-sweetened beverages are

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twice as likely to consume them and to be obese at age 6; and infants who consume fruits and vegetables infrequently are more likely to be infrequent consumers at age 6.\textsuperscript{22}

WIC provides supplemental foods designed to meet the special nutritional needs of low-income women, infants, and their young children. In December 2007, USDA updated the rules governing WIC foods based on recommendations from the Institute of Medicine to align them more closely with the latest nutrition science and guidance, including the 2005 Dietary Guidelines for Americans and the American Academy of Pediatrics’ infant feeding practice guidelines. The changes were designed to promote sound nutrition and healthy weight by providing vouchers for fruits and vegetables; adding whole grain and soy products; reducing milk, cheese, and juice allowances; restricting the fat content of milk; reducing saturated fat, cholesterol, and sugar; and giving state agencies more flexibility to accommodate the food preferences of specific cultural groups.\textsuperscript{23} All states were required to implement the new food packages by October 2009.

- **WIC supports more nutritious diets.** A healthy diet helps put children on a path to realizing their full potential. Moreover, establishing healthful eating habits early in life can help prevent the onset of diet-related disease.

WIC improves the quality of participants’ diets by providing healthy foods tailored to meet the nutrient needs of mothers and their children during pregnancy, breastfeeding, infancy, and childhood. Participants can use WIC vouchers only for specific healthy foods, such as whole grains, dairy, fish, peanut butter, beans, and fruits and vegetables. In addition, WIC makes nutrition education available to parents and caretakers. Mothers — individually or in groups — meet with a nutritionist, registered dietitian, or trained paraprofessional to learn about the important relationships among nutrition, physical activity, and health. They also discuss issues such as healthy eating during and after pregnancy, developing healthy eating habits in children, reading food labels when shopping, and cooking healthy meals.

There is strong evidence that the introduction of WIC increased infants’ and children’s intakes of some essential vitamins and minerals, especially iron. While vitamin and mineral intake has improved for most children since those early years, more recent research suggests that WIC participation increases the iron density of preschoolers’ diets, reduces the intake of fat as a percentage of food energy, increases the intake of carbohydrates as a percentage of food energy, and reduces consumption of added sugars.\textsuperscript{24}


\textsuperscript{23} On February 28, 2014, USDA released a final rule, replacing the interim rule issued in December 2007. The final rule raises the dollar amount for children’s fruit and vegetable purchases by more than 30 percent. It also expands whole-grain options available to participants, provides yogurt as a partial milk substitute for women and children, allows parents of older infants to purchase fresh fruits and vegetables instead of jarred infant food if they choose, and gives state and local agencies more flexibility to meet the nutritional and cultural needs of participants.

\textsuperscript{24} U.S. Department of Agriculture, Food and Nutrition Service (2012).
Introduction of the revised food packages enhanced WIC’s impact on healthy diets. A number of researchers examined the impact of the changes in the food packages on participants’ overall food purchases and consumption choices. Regardless of locale, population group, or research method, the results are generally consistent: WIC participants are purchasing and consuming more fruits, vegetables, whole grains, and low-fat dairy. For example:

- Surveys of WIC participants in California before and after implementation revealed that the new food package increases the consumption of fruit, vegetables, whole grains, and lower-fat milk. Consumption of whole-grain foods increased more than 50 percent, the percentage of caregivers and children who usually consumed lower-fat milk increased by 20 to 30 percent, nearly 20 percent of WIC families ate more vegetables, and the frequency of fruit and vegetable consumption increased by 5 to 10 percent.\(^\text{(25)}\) (See Figure 3.)

- Analyses of more than 3.5 million WIC records in New York before and after implementation showed rapid and consistent increases in daily fruit, vegetable, whole grain, and low- and non-fat milk consumption among young children.\(^\text{(26)}\)

- Scanner data from a New England supermarket chain revealed that after implementation, WIC participants purchased more vegetables (up 9 percent), fruits (up 26 percent),

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reduced-fat milk (up 56 percent), and 100-percent whole grains (up 211 percent).\(^{27}\) (See Figure 4.)

- Six months after the WIC food package revisions were implemented, a natural experiment in 12 WIC clinics in Chicago found a significant decrease in whole-milk consumption, a significant increase in lower-fat milk consumption for all except African American mothers, an increase in fruit consumption among Hispanic mothers, and an increase in the availability of whole grains in the household.\(^{28}\) A follow-up study after 18 months found continued improvements in intakes of total fat, saturated fat, fiber, and overall dietary quality among Hispanic children. In addition, the prevalence of reduced-fat milk intake significantly increased for African American and Hispanic children, and the prevalence of whole-milk intake significantly decreased for all groups.\(^{29}\)

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• **WIC promotes and supports breastfeeding.** Breastfeeding is a beneficial source of nutrition that provides the healthiest start for an infant. The American Academy of Pediatrics recommends that new mothers breastfeed exclusively for about the first six months of a baby’s life and continue for as long as mutually desired by mother and baby. In addition to its nutritional benefits, breastfeeding protects against a number of illnesses and allergies, and is associated with reductions in Sudden Infant Death Syndrome and obesity. It also promotes a unique and emotional connection between mother and baby.

WIC promotes breastfeeding as the optimal infant feeding choice and supports mothers along the way. WIC offers new mothers breastfeeding counseling, peer support, and enhanced benefits (while also providing safe and appropriate food for formula-fed infants). Mothers who choose to breastfeed receive counseling, educational materials, and follow-up support from other mothers with personal experience. Breastfeeding mothers also retain their eligibility for WIC benefits longer. Mothers who exclusively breastfeed receive a food package that is both larger and more varied.

In general, despite WIC’s strong policy and operational emphasis on promoting breastfeeding, mothers participating in WIC have been less likely than non-participating mothers to breastfeed their infants. Whether this is because providing free infant formula creates an incentive for formula feeding or because mothers who are less likely to breastfeed are also more likely to participate in WIC remains unclear. It is clear, however, that women who are African American, less educated, lower income, or younger are less likely to breastfeed than other women and more likely to participate in WIC.

There are indications that the difference between breastfeeding rates among all women and WIC participants has narrowed. Between 2001 and 2011, the percentage of all children who were breastfed increased from 71.6 percent to 79.2 percent. Over roughly the same period, from 2000 to 2012, the percentage of infants participating in WIC who were breastfed increased from 44.5 percent to 67.1 percent. (See Figure 5.) Thus, while mothers participating in WIC are less likely than others to begin breastfeeding, the gap is substantially smaller than it was only ten years ago.

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33. Johnson B, Thorn B, McGill B, Suchman A, Mendelson M, Patlan KL, Freeman B, Gotlieb R, Connor P (2013). *WIC Participant and Program Characteristics 2012.* Prepared by Insight Policy Research under Contract No. AG-3198-C-11-0010. Alexandria, VA: Food and Nutrition Service, USDA. While these are the best data available, it is important to note that some of the increase in breastfeeding rates among women participating in WIC may be due to improved reporting over this period. In 2000, 68 state agencies reported WIC breastfeeding rates; by 2012 this had grown to 86 state agencies (covering more than 99 percent of all WIC participants). While the true increase between 2000 and 2012 may be somewhat smaller than reported, the growth in breastfeeding rates among WIC mothers still exceeds the national trend.
In response to recommendations from the Institute of Medicine, USDA strengthened the incentives and support for breastfeeding when the new food packages were implemented in 2009. To encourage mothers to begin breastfeeding, WIC no longer routinely provides formula for the first month after birth. To encourage greater duration and intensity of breastfeeding, WIC provides only a limited amount of formula in subsequent months to partially breastfeeding infants. Mothers who require more formula now receive the full-formula food package, even if they are still partially breastfeeding. The full-formula package provides less food for the mother than the partially breastfeeding and fully breastfeeding packages, and the maternal benefits end when the infant is six months old (for the partially or fully breastfeeding packages, they last throughout the infant’s first year).

Even as the Institute of Medicine recommended these changes, there was concern that they might have unintended negative consequences on program participation and breastfeeding practices. Fortunately, USDA’s subsequent evaluation of breastfeeding practices during the first month of infant life found no evidence of adverse impacts. 

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As the committee’s report noted, “[a] breastfeeding mother — especially one who intends to combine breastfeeding and formula feeding, who needs to return to work, or who faces other personal challenges to breastfeeding — may need some formula to nourish her infant adequately during the first month postpartum. Some mothers who might otherwise try breastfeeding may choose formula feeding to be sure they can obtain formula (a high-cost item) if they run into breastfeeding difficulties.”

This evaluation assessed initiation, intensity, and duration of breastfeeding. It also found that after the change, fewer WIC participants who were mothers of new infants received the partially breastfeeding package and more received the fully breastfeeding package, but more mothers also received the fully formula feeding package. Wilde P, Wolf A, Fernandez M, Collins A (2011). Evaluation of the Birth Month Breastfeeding Changes to the WIC Food Packages. Alexandria, VA: Food and Nutrition Service, USDA.
Moreover, although research findings are not yet conclusive, some early evidence suggests that the new policies may encourage breastfeeding, as intended.\footnote{At least one study, while observing that rates of ever breastfed children increased across the nation, concluded that the increase is not associated with changes in the WIC food package. See Joyce T, Reeder J (2014). Changes in breastfeeding among WIC participants following implementation of the new food package. \textit{Maternal and Child Health Journal}, published online August 6, 2014.} The number of mothers participating in WIC who breastfed exceeded the number who did not for the first time in 2012.\footnote{In 2012, there were 665,500 breastfeeding postpartum women participating in WIC and 651,000 postpartum women who were not breastfeeding (see Johnson et al (2013)).} An analysis of the WIC administrative records of more than 180,000 infants in Los Angeles concluded that changes to the food packages and policies for breastfeeding mothers and infants significantly increased the rates of breastfeeding initiation and duration. Issuance rates of the fully breastfeeding package at infant WIC enrollment increased by 86 percent, while issuance rates of packages that included infant formula decreased significantly.\footnote{Whaley SE, Koleilat M, Whaley M, Gomez J, Meehan K, Saluja K (2012). Impact of policy changes on infant feeding decisions among low-income women participating in the Special Supplemental Nutrition Program for Women, Infants, and Children. \textit{American Journal of Public Health}, 102(12):2269-2273. It is possible that some of this increase was due to a successful breastfeeding promotion campaign for WIC participants and staff that began shortly before the introduction of the revised food packages. As noted above, Parke et al. (2011) report a reduction in the number of mothers receiving the partial breastfeeding package but an increase in the number receiving the full formula package in a random sample of 17 local WIC agencies.} An analysis of WIC records in New York showed rapid and consistent increases in breastfeeding initiation and delayed introduction of solid foods to infants.\footnote{Chiasson et al. (2013).}

\textbf{WIC supports better infant feeding practices.} The American Academy of Pediatrics recommends that parents introduce solid foods into their baby’s diet around six months and delay the introduction of cow’s milk until a child’s first birthday. Babies who start eating solid food too early are more likely to be overweight or obese later in life. Cow’s milk is not only difficult for infants to digest, but fails to provide all of the fat, calories, and nutrients (especially iron) that babies need to grow well and be healthy.

WIC supports healthy infant feeding by excluding all cow’s milk from infant food packages, introducing infant cereal, fruits, and vegetables at six months, and, for fully breastfed babies, introducing infant meats at six months. The inclusion of infant formula in food packages for those mothers who are unable or choose not to breastfeed ensures that all infants have a safe and appropriate source of good nutrition.

Early research found higher iron intakes and lower calcium, magnesium, and phosphorus intakes among infants participating in WIC — a finding consistent with decreased use of cow’s milk.\footnote{Rush D, Seaver WB, Horvitz, DG et al. (1986). \textit{The National WIC Evaluation: An Evaluation of the Special Supplemental Food Program for Women, Infants, and Children, Volumes I-III.} Alexandria, VA: Food and Nutrition Service, USDA.} In addition, infants participating in WIC were significantly less likely to be fed solid foods before they were four months old.\footnote{Burstein N, Fox MK, Puma MJ (1993). \textit{Study of the Impact of WIC on the Growth and Development of Children: Field Test. Final Report, Volume II: Preliminary Impact Estimates.} Cambridge, MA: Abt Associates, Inc.} More recent research generally suggests that infants participating in WIC are less likely than eligible non-participants to consume cow’s
milk, and that mothers — especially those who enroll early in their pregnancy — are more likely to delay its introduction.\textsuperscript{42, 43}

- **WIC may improve food security.** Food security — access to a safe and secure source of enough food to sustain an active, healthy life — is important for children to develop normally and grow up healthy. Food insecurity among children is associated with many adverse consequences for cognitive development as well as for school readiness, academic performance, and educational attainment; physical, mental, and social health; and behavior. Recent research shows that even marginal food security is associated with poor health and developmental outcomes.\textsuperscript{44}

WIC could improve food insecurity and reduce hunger as part of the national nutrition safety net, though these goals are not a central part of its mission. In general, food hardships fall as food spending rises. WIC’s monthly food package effectively supplements household food budgets, increasing participants’ resources to buy food and potentially improving food security.\textsuperscript{45}

Relatively few studies have looked directly at the relationship between WIC and food security. There is some indication, however, that longer participation in WIC is associated with improvements in food security among both women and infants. The risk of post-partum household food insecurity among the most at-risk mothers in Massachusetts was about one-third lower if they enrolled in WIC in the first trimester of their pregnancy rather than the third.\textsuperscript{46}


\textsuperscript{43} USDA fielded the first WIC Infant and Toddler Feeding Practices Study 20 years ago. Since then, recommended infant feeding practices have changed markedly, particularly with the introduction of revised food packages and adoption of a stronger emphasis on nutrition education and breastfeeding. To better understand the current influences that shape a mother’s infant and toddler feeding decisions and how they change as children develop, USDA launched a second WIC Infant and Toddler Feeding Practices Study in 2011. The new study is gathering national, longitudinal data on contemporary infant and toddler feeding practices, including the duration of breastfeeding, the age and pattern of introduction of foods other than breast milk or formula, and the age of introduction of cow’s milk.


\textsuperscript{45} We would expect WIC’s impact on food security to be relatively modest given the value of the monthly WIC food benefit — about $62 per person in fiscal year 2014. (Note that the average monthly cost to the federal government was much lower — about $44 — due to discounts on infant formula.) By way of comparison, the Supplemental Nutrition Assistance Program (food stamps) provided a monthly benefit of $133 per person in 2014.

Impacts on Immunization, Health, and Cognitive Development

Low-income children participating in WIC have immunization rates comparable to more affluent children and significantly higher than low-income children who never participated — and are more likely to receive preventive medical care than other low-income children. Participation in WIC may also help reduce childhood obesity and reduce the prevalence of anemia. In addition, new evidence suggests that early exposure to WIC may improve children’s educational prospects.

- **WIC helps ensure that children are properly immunized.** Immunizing children against disease is important to help them stay healthy and to protect others from diseases that once injured or killed thousands of children. Because of advances in medical science, immunized children are protected against more diseases than ever before. Widespread immunization also helps protect those who are too young or unable to be vaccinated. And by reducing, and in some cases eliminating, harmful diseases, today’s vaccinations can protect future generations from harm.

As an adjunct to health care services, WIC screens the immunization records of all infants and children under age 2 and refers parents to immunization services to help ensure that coverage is up to date.

Low-income children who have never participated in WIC have immunization rates ranging from 5 to 19 percent lower than current participants, while children who remain in WIC tend to have immunization coverage comparable to higher-income children. (See Figure 6.)

- **WIC improves access to health care.** Children’s health depends partially on their access to health care services. Parents and children with access to health care are diagnosed and treated promptly and can obtain quality preventive care, which can enable them to avoid illness or complications. WIC serves as a gateway to health care, connecting families to resources such as prenatal, obstetric, maternal, and pediatric care; dental care; and counseling for smoking cessation drug and alcohol abuse.

In general, research has shown that children who participate in WIC — or whose mothers do — make more use of health care services than non-participants. Researchers in North Carolina, for example, concluded that WIC participation among children was associated with increased use of preventive care and increased diagnosis and treatment of common childhood illnesses. Similar results regarding the frequency of well-child visits were found in a survey of unmarried, low-income urban mothers in 20 cities nationwide. Infants and children who participate in WIC are linked to the health care system and are much more likely to receive both preventive and curative care.

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WIC may help reduce childhood obesity. One out of every five children in the United States is overweight or obese. Childhood obesity is particularly troubling because it can start children on the path to health problems once confined to adults, such as diabetes, high blood pressure, and high cholesterol.

WIC can reduce the risk of obesity among young children in several ways. Revised food packages provide fewer calories for most participants. The fruits, vegetables, and whole grains in the food package are consistent with recommended food patterns associated with healthy weight. In addition, rising breastfeeding rates among participating mothers may protect against excessive weight gain.

Recent data suggest the rise in early child obesity rates has halted, and obesity may even be falling among preschoolers. Because children become overweight and obese for a variety of reasons — the most common of which are genetic factors, lack of physical activity, and

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* Protection against multiple childhood diseases, including measles, chickenpox, polio, and diphtheria.

unhealthy eating patterns — it is difficult to tease out the contribution of any single factor. Nonetheless, a multi-pronged response to child obesity by the federal government and health professionals appears to be playing an important role in these developments.\(^{49}\) CDC has stated that federal policy reforms in child nutrition programs, such as the 2009 revisions to the WIC food package, may have contributed to the halt in the rise in obesity rates among low-income preschool children.\(^{50}\)

Other studies document small but significant decreases in childhood obesity in a number of states. Between 2008 and 2011, for example, the prevalence of obesity among low-income preschool children fell in 18 states, did not change in 20 states, and increased in only 3 states. Similarly, the prevalence of obesity among 3- to 4-year-old children participating in WIC in Los Angeles County fell between 2009 and 2011, reversing an earlier upward trend. The prevalence of obesity among 3- to 4-year-old children participating in WIC in New York City fell between 2003 and 2009 and held steady between 2009 and 2011.\(^{51}\)

**WIC helps reduce the prevalence of anemia.** Iron is an essential mineral that, among other functions, carries oxygen throughout the body and helps muscles store and use that oxygen. Iron deficiency anemia, resulting from too little iron in the body, can increase the risk of premature birth, delay normal motor skills and cognitive processing in infants, and cause fatigue or memory loss in adolescents and adults. In addition, the American Academy of Pediatrics notes that iron deficiency without anemia during infancy and childhood can also have lasting implications for development and behavior.\(^{52}\) While the nutrient intakes of infants, toddlers, and young children generally meet or exceed dietary recommendations, there is evidence of a subset of older infants whose iron intake falls short of those recommendations.\(^{53}\)

WIC was created, in part, to reduce the prevalence of iron deficiency and iron deficiency anemia by providing only iron-fortified infant formulas, infant foods, and breakfast cereals in prescribed food packages for infants and young children. It may also have had an indirect effect, as manufacturers brought iron-fortified products reformulated for WIC to market, making them available to all children, whether they participate in WIC or not. The evidence suggests that WIC played a role in reducing the prevalence of childhood anemia. CDC researchers found a steady decline in the prevalence of anemia between 1976 and 1985.

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(from 7.8 percent to 2.9 percent) and a reduction of more than 5 percent between 1980 and 1995, periods of substantial growth in WIC participation.\textsuperscript{54} In addition, several studies have found that participation in WIC is associated with increased iron intake.\textsuperscript{55}

- **WIC improves children’s educational prospects.** There is substantial evidence that disadvantages during critical periods of brain development can affect children’s cognitive development and readiness to learn, producing disparities in skills and academic achievement. These disparities may grow as children age. WIC supports sound nutrition during critical periods of cognitive development to mitigate the detrimental effects of poverty.

New research suggests that prenatal and early childhood participation in WIC is associated with improved cognitive development and academic achievement. WIC is quite effective in reaching women during, rather than after, their pregnancy: 83 percent of new mothers participating in WIC enrolled during their pregnancy.\textsuperscript{56} Children whose mothers participated in WIC while pregnant scored higher on assessments of mental development at age 2 than similar children whose mothers did not participate. The benefit associated with WIC participation persisted into the school years, as children whose mothers participated in WIC when they were in utero performed better on reading assessments.\textsuperscript{57}

### Impacts on Neighborhood Food Environments

Improvements to the WIC food packages and requirements that participating stores stock a wider array of more nutritious foods have helped create healthier neighborhood food environments, improving access to fruits, vegetables, and whole grains for many low-income communities.

The environments in which people make food choices can affect their diet quality and health.\textsuperscript{58} For some, eating a healthy diet may be difficult because nutritious options are not readily available, easily accessible, or affordable in their communities. Many low-income and underserved communities have few stores that sell healthy food, especially high-quality fruits and vegetables. Limited availability of healthy foods can increase the risk of poor nutrition and chronic health conditions.

\begin{itemize}
\item \textsuperscript{56} U.S. Department of Agriculture, Food and Nutrition Service (2012). *National Survey of WIC Participants II: Participant Characteristics Report*, prepared by ICF Macro for the Office of Research and Analysis.
\item \textsuperscript{57} Jackson MI (forthcoming). Early childhood WIC participation, cognitive development and academic achievement. *Social Science & Medicine*, accepted manuscript available online December 15, 2014.
\end{itemize}
Revisions to the WIC food packages are helping to reshape the food retailing landscape in many communities. To obtain authorization to accept WIC food vouchers, stores must meet minimum food inventory requirements established by states. As a result of the food package revisions, all WIC-authorized grocery stores must now stock at least two varieties of fruits, two varieties of vegetables, and at least one whole-grain cereal, potentially increasing their availability for all consumers.

The latest generation of research strongly suggests that the new requirements have increased the supply of healthy foods, especially in low-income communities. Multiple studies, conducted in various locations using different study designs, have consistently found that availability of healthy foods increased after implementation. For example:

- **Within months of implementation**, WIC-approved convenience and grocery stores in Connecticut, especially those in low-income areas, offered more and a wider variety of healthy foods, especially whole-grain products. (See Figure 7.)

- **In two low-income neighborhoods in Philadelphia**, the availability of reduced-fat milk, whole-grain bread, brown rice, 100-percent juice, and varieties of fruits and vegetables increased after implementation.

- **While supermarkets and larger grocery stores were likely to carry a wide range of healthy foods prior to the policy change**, a natural experiment in New Orleans found large and significant increases in the percentage of small stores that carried nutritious foods, such as whole-wheat bread and brown rice.

- **The availability of** commonly consumed fresh fruit and vegetables increased in WIC-approved stores in seven northern Illinois counties after introduction of the revised food packages.

- **The availability of fruits, vegetables, and whole grains in small stores across Colorado, New Hampshire, Pennsylvania, and Wisconsin increased significantly.** The availability of low-fat (1

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percent) milk increased in New Hampshire and Wisconsin, which did not allow participants to purchase reduced-fat (2 percent) milk.

Conclusion

Research shows that poverty and adversity during early childhood can have lifelong consequences for physical, mental, and economic well-being. WIC is designed to support sound nutrition and health at critical points in children’s development—in utero, during infancy, and during the toddler and early childhood years.

An extensive body of research over four decades shows that WIC participation is associated with healthier births, reduced infant mortality, better infant-feeding practices, more nutritious diets, better access to primary and preventive health care, and improved cognitive development and academic achievement. These striking results highlight the importance of ensuring that all eligible women and young children can get WIC benefits during pregnancy and critical periods of child development.

Are WIC’s Impacts Underestimated?

WIC originated with the desire to improve participants’ health and nutrition, but its benefits may reach further; a complete accounting of WIC’s effectiveness should capture the full range of direct and indirect benefits. Some of the beneficial consequences of WIC participation have not been fully measured, in part because they are not easily assessed with the methods available to today’s researchers. Many analysts have pointed to a variety of factors that may independently affect WIC’s impact and could also plausibly be affected by participation in WIC. For example,

- Controlling for early initiation of prenatal care may help account for differences between WIC participants and non-participants in the importance that mothers place on obtaining early health care during their pregnancy. But getting mothers into early prenatal care may be one way WIC improves birth outcomes.
- Controlling for gestational age may help account for the fact that longer gestation is linked to both healthier outcomes and more opportunities to enroll in WIC. But it comes at the cost of omitting improvements in gestational age that result from WIC participation.
- Controlling for smoking and drug use may help account for differences in the prevalence of risky behaviors among mothers. But smoking cessation counseling and referrals to substance abuse programs may be one way WIC leads to better birth outcomes.

In assessing the non-experimental evidence of WIC’s effectiveness, it is important to consider the tradeoff between controlling too little and too much for factors that may affect both birth outcomes and WIC participation, and or could be affected by WIC.

It is similarly difficult to disentangle the effects of WIC on health care costs. Connecting women and children to the health care system may increase short-term costs associated with the prevention, diagnosis, and treatment of disease. But underutilization of health care in early childhood can lead to more health problems — and costs — when children go undiagnosed and untreated. And if participation in WIC contributes to better birth outcomes and healthier babies, as the evidence reviewed here suggests it does, then WIC has the potential to reduce costs associated with hospitalization and post-natal care.a

WIC can also have economic ramifications extending beyond program recipients. There is some evidence, for example, that WIC expanded during recent economic downturns and contracted during periods of economic growth. Thus, WIC helps reduce economic hardships for millions of participants when the economy falters and unemployment rises. In addition, to the extent that WIC increases total food expenditures, WIC benefits the country’s farmers. USDA estimates that farmers received almost $1.3 billion from the sale of commodities used in producing the $4.6 billion in WIC retail food sales (after rebates) in fiscal year 2008. This amounts to a net addition of $331 million to farm revenues after accounting for the food purchases participants would have made without WIC.b

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a In the mid-1990s, the General Accounting Office conducted a comprehensive meta-analysis of 17 studies that examined the impact of WIC on Medicaid costs. It concluded that prenatal WIC participation reduced post-partum medical costs in the first year by more than enough to offset the entire cost of the prenatal WIC program. Research conducted for USDA similarly concluded that every dollar spent on the prenatal component of WIC was associated with Medicaid savings during the first 60 days after birth, ranging from $1.77 to $3.13. Much has changed since these studies were conducted, but both illustrate the potential for realizing savings through WIC participation.

Appendix: Assessing the Strength of Evidence

WIC is one of the most thoroughly studied federal programs. The extensive research literature on WIC provides strong evidence of its effectiveness but has certain limitations. Three commonly cited limitations are that these studies (1) are almost entirely non-experimental, based on statistical comparisons between those who received benefits and those who did not; (2) are subject to potential selection bias as a consequence; and (3) do not fully address the problem of gestational age bias.

- **Experimental versus non-experimental evidence.** Some research methods provide better evidence than others. The “gold standard” for evaluating the effectiveness of a program or intervention is the randomized control trial, which is designed to minimize the risk that factors unrelated to the intervention or program benefit will influence the results. Randomized control trials entail a random assignment process (like tossing a coin) that places people into a treatment or control group. Researchers can accurately estimate the impact of program participation as the difference in outcomes between the treatment (program) and control groups because they were randomly selected from the same population, lived through the same shifting programmatic, economic, and social conditions, and differ only in their program experience.

  However, randomized control trials are generally not feasible to evaluate WIC’s effectiveness for a number of reasons, including the ethical issues raised by withholding beneficial nutrition and health benefits from a random sample of low-income mothers and children. As a result, researchers rely on a variety of quasi- and non-experimental approaches.

- **Selection bias.** In the absence of a randomized control trial, research results may be biased by the self-selection of low-income mothers and their children into WIC. If mothers who enroll in WIC are more able, more motivated, healthier, or have access to better health care than other mothers, then selection bias may lead researchers to mistakenly conclude that WIC is more effective than it really is. Similarly, if mothers who enroll in WIC are more disadvantaged, exhibit more risky behaviors, or are more likely to experience adverse birth outcomes than other mothers, then selection bias may lead to conclusions that WIC is less effective than it really is.

  However, the potential of selection bias does not justify discounting findings from non-experimental research. A vast number of studies reflecting different time periods, samples, and ways of addressing selection bias support the conclusion that WIC works. Moreover, several important studies suggest that selection bias is more likely to lead to *underestimates* of WIC’s beneficial impacts. Bitler and Currie (2005), for example, report that mothers who participate in WIC are more disadvantaged than other eligible women (a group approximated by mothers whose deliveries are covered by Medicaid) in terms of education, age, marital status, father involvement, smoking behavior, obesity, use of public assistance, employment,

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and incidence of a previous low birth weight or premature infant. Despite these disadvantages, WIC participation is associated with positive outcomes.\textsuperscript{66}

- **Gestational age bias.** Women whose pregnancies last longer have better birth outcomes; they also have more opportunities to enroll in WIC. Thus, women whose pregnancies last longer may have better birth outcomes because of their longer pregnancies, not because of WIC. Some researchers argue that the strong association observed among prenatal WIC participation, birth weight, and the frequency of preterm births is largely spurious, the result of not controlling for gestational age bias. As a result, they focus on measures of fetal growth (such as birth weight adjusted for gestational age) and find positive but more modest associations with WIC participation.\textsuperscript{67}

Others argue that this view overstates the medical consensus on the effectiveness of prenatal interventions on the probability of preterm births.\textsuperscript{68} Moreover, it treats WIC as simply a nutritional benefit when its main benefit may be to lead women to begin prenatal care sooner and receive more continuous care. These researchers are more persuaded by the substantial evidence of negative selection bias (that WIC mothers are more disadvantaged and prone to adverse birth outcomes than non-WIC mothers), which would attenuate the observed positive impact of WIC.\textsuperscript{69}

Our assessment acknowledges the valid evidential contribution of different research methods while giving greater weight to evidence generated from groups of studies across multiple populations, settings, and circumstances. While the research about WIC’s effectiveness may rely on methods that fall short of the “gold standard,” few public programs have so consistent a body of positive research findings.


\textsuperscript{68} For example, one attempt to reconcile these opposing views concluded that “[t]here is no conceptual or theoretical reason why the bundle of services provided by WIC could not affect preterm birth rates. The possibility of WIC impacts on preterm births is instead an empirical question, and on this point the previous empirical research within the medical literature in our view cannot rule out the possibility of WIC impacts on preterm births. Although the existing clinical evidence of a beneficial effect of isolated prenatal interventions on preterm births isn’t very good, weak evidence about the efficacy of prenatal care is fundamentally different from good evidence that prenatal care is ineffective.” Ludwig J and Miller M (2005). Interpreting the WIC debate. *Journal of Policy Analysis and Management*, 24(4):691-701.