

Outcome-Based Issues in WIC

WIC serves more than 7 million persons each month at a cost to the Federal Government of almost \$4 billion annually. Given that its mission is to safeguard the health of low-income women, infants, and children, it is therefore important to ask how effective is WIC in improving the health of program participants, as measured by birth outcomes, nutritional status, and nutrient intake. WIC's impact on related topics, including breastfeeding rates and the incidence of childhood obesity, is also discussed.

WIC's Effect on the Health of Participants

Over WIC's history, many studies have looked at the program's effect on the health of its participants. In fact, much of the strong congressional support for WIC has been attributed to research that showed that WIC had positive impacts on the health of program participants. Two of the most influential studies of WIC were completed in the early 1990s. Devaney et al. (1990) found that each dollar spent on prenatal WIC services yielded a \$1.77 to \$3.13 savings for newborns and mothers in Medicaid costs over the first 60 days after birth. The study also found that prenatal WIC participation was associated with increased birthweight, fewer preterm births, and longer gestational age. The U.S. General Accounting Office (1992) statistically combined results from 17 studies that compared rates of low birthweight among WIC participants and similar nonparticipants. GAO concluded that each Federal dollar spent providing WIC prenatal benefits in 1990 saved an estimated \$3.50 over an 18-year period in Federal, State, local and private health costs, primarily in the health care area.

Despite the body of research on WIC health outcomes, questions remain about WIC's impact on the health of its participants because issues related to selection bias have complicated the interpretation of much of the

research. Selection bias may occur because WIC evaluation studies are not randomized for ethical reasons.²⁸ Instead, WIC research is typically limited to a quasi-experimental design comparing those who participate in the program with those who do not. A problem exists if WIC participants differ in unobservable ways from eligible nonparticipants, and if these unobservable differences influence outcomes. Selection bias can either enhance or downplay the effects of WIC participation. For example, it can exaggerate the benefits of WIC when individuals who value health and nutrition are more likely to participate in the program than individuals who are at higher risk and do not see the value of participating. WIC effects can be downplayed in research if those not participating in WIC are at lower health risk than the WIC sample. The potential for selection bias is evident in almost all WIC studies. While, researchers know that it is an issue and attempt to control for it in study design and analysis, it is uncertain how successful they are.²⁹

A recent ERS-funded review of USDA's food assistance programs reviewed the body of research examining WIC's effect on nutrition and health outcomes (table 4) (Fox and Hamilton, forthcoming). Much of this research focused on WIC's impact on birth outcomes. Birth outcomes have been the major focus of WIC research because they are the most critical: low birthweight, preterm delivery, and infant mortality are very serious health outcomes. These have also been relatively easy to study, because the outcomes are short-term and easily identified. The review concluded that even with the pervasive problem of selection bias

²⁸In an ideal evaluation, the effects of WIC would be obtained by randomly selecting from a group of persons eligible for WIC some persons to receive and some not to receive benefits. On average, the characteristics of the two groups would not differ other than whether or not they participated in WIC (assuming that all persons selected to participate in WIC did so). Differences in the health outcomes between the two groups could be attributed solely to the effects of WIC, and not the result of selection bias.

²⁹See Oliveira and Gundersen (2000) for results of a recent study that examined the impact of WIC on the nutritional outcomes of children while controlling for possible self-selection bias.

Table 4—Summary of WIC research findings in the areas of health outcomes, nutrient intake, and nutritional status

Outcome	Results of impact analyses of the WIC program	
	General findings	Comments
Health outcomes	Strong evidence of positive impact on birthweight, related outcomes, and associated Medicaid costs	No large-scale study of impacts on the health and development of infants and children has been done
Nutrient intake	Mostly positive significant impacts, particularly for nutrients targeted by WIC	Much of the available information is dated, and some population groups have no studies or very few studies
Nutritional status	Strong suggestion of impact on iron status of children; little useful information available for impacts on growth of infants and children	Many of the studies are old, essentially nothing is known about some population groups

Source: Adapted from Fox and Hamilton (forthcoming).

“the sheer weight of the research suggests that WIC does have a positive impact on birthweight as well as a number of other birth outcomes and significantly lowers birth-related Medicaid costs.” Other authors have reviewed WIC evaluation studies with similar conclusions (see, for example, Abrams, 1993; Ku et al., 1994; Owen and Owen, 1997; and Rossi, 1998). It is largely on the basis of these studies on birth outcomes, including the Devaney et al., and GAO studies cited above, that WIC is often cited as being one of the most cost-effective food assistance programs in the Nation.

Other health outcomes that may be associated with WIC participation have not been the subject of as many studies. The impact WIC has on the health of participating mothers is one area that has not been studied. WIC participation during pregnancy may have an impact on mothers’ postpartum health (which may affect future birth outcomes). The nutrition education received from WIC may result in long-term positive health effects on the mother such as a reduced risk of diabetes or heart disease. In addition, the health of breastfeeding mothers and their infants on WIC has not been studied. As breastfeeding rates in the WIC program increase, more research in this area will be important.

Another area that has not been thoroughly studied is the health effect of WIC on children despite the fact that children make up half of all WIC participants. For example, little is known about the effect of WIC on the long-term growth and development on both physical and cognitive/psychological scales of children (Fox and Hamilton, forthcoming). It is difficult to link future health outcomes with WIC participation. Assessing

WIC’s impact on the growth and development of children requires a longitudinal study because a long period of time may be necessary to detect changes. In the early 1990s, Congress canceled a planned FNS-funded longitudinal study of the long-term developmental effects of WIC on children due primarily to the high costs of the project (Devaney, 1998).

The strongest evidence of WIC’s positive impact on children is in the area of iron-deficiency anemia, a serious health concern. “Virtually all studies that have examined the issue have found that WIC participation has a positive effect on mean levels of hemoglobin or hematocrit and/or reducing the incidence of childhood anemia” (Fox and Hamilton, forthcoming). WIC may also have had an indirect effect on the iron status of nonparticipants since some WIC foods on supermarket shelves such as infant formula and cereal are required to be iron-fortified and are consumed by nonparticipants as well as WIC program participants (Devaney, 1998).

Future research on the health of women, children, and breastfeeding women and their infants would be useful yet challenging. “The complexity of the health outcomes that have been studied has presented unique challenges to WIC researchers, further compromising their ability to obtain clear estimates of program impact” (Fox and Hamilton, forthcoming).

WIC and Breastfeeding Rates

Breastfeeding is widely acknowledged to be the best method of feeding most infants. The American Academy of Pediatrics (AAP) recommends breastfeeding as the preferred form of feeding for all infants,

including premature and sick newborns, with rare exceptions (American Academy of Pediatrics, 1997).³⁰ In general, human milk provides all the necessary nutrients for the first 6 months of life. It helps protect infants against illness and allergy because of the antibodies from the mother that are transferred to the infant through breast milk. Breastfeeding may also provide benefits to the mother, including reduction in hip fractures, reduced risk of ovarian and premenopausal breast cancer, and a earlier return to prepregnancy weight. In their 1988 policy statement on the WIC program (reaffirmed in 1993), the Academy states that “breastfeeding should be aggressively promoted among WIC participants because of its exceptional nutritional value and its cost savings to the program” (American Academy of Pediatrics, 1988).

In spite of the benefits of breastfeeding, many women choose to formula-feed. There are many reasons for this: breastfeeding may be difficult to establish, it can be painful for the mother if she does not have proper instruction, some mothers feel breastfeeding is too time-consuming, and mothers may become concerned that their baby is not getting sufficient nourishment because one cannot measure the amount of milk the infant is consuming. It is also a challenge to return to work or school when breastfeeding, especially for low-income women who tend to work in environments that do not allow for breaks to pump breast milk and do not provide refrigerated storage facilities for the milk.

Through its nutrition education and breastfeeding promotion programs, the WIC Program encourages moth-

ers to breastfeed their infants if at all possible. In addition, breastfeeding women are a higher priority for certification into the program than are nonbreastfeeding postpartum women and are eligible to receive program benefits for up to 1 year postpartum compared with only 6 months postpartum for nonbreastfeeding women. The quantity and variety of food in the WIC food package for breastfeeding women is also greater than that for nonbreastfeeding women (see table 1).

However, breastfeeding rates among WIC women, both while they and their infants are in the hospital as well as when their babies are 6 months of age, have historically been significantly lower than those of non-WIC women (table 5). In 1999 (the latest data available), 56 percent of WIC women initiated breastfeeding (i.e., breastfed while in the hospital) compared with 77 percent of non-WIC women.³¹ Rates of breastfeeding at 6 months of age were also lower for WIC women than non-WIC women (20 percent versus 40 percent).³² Since the breastfeeding rate of women participating in WIC is so much lower than that of women not in the program, some have questioned whether WIC, by supplying infant formula, provides a disincentive to breastfeeding (Rossi, 1998).³³ However, women in lower socioeconomic groups, including mothers who are black, poor, and have low education levels, (i.e., women most likely to participate in WIC)

³¹Mothers who since the birth of their child either participated in WIC themselves or whose child participated in the program were considered to be WIC participants. Non-WIC women included all women who did not participate in WIC regardless of whether or not they were eligible for the program.

³²Breastfeeding women included those who breastfed exclusively as well as those who supplemented breast milk with infant formula, or milk from other sources.

³³The average cash value of the WIC food packages received by a nonbreastfeeding postpartum woman and her formula-fed infant is more than three times that received by a breastfeeding woman whose infant does not receive formula through WIC (USDA, 2000a).

³⁰AAP recommends exclusive breastfeeding for approximately the first 6 months after birth and the gradual introduction of iron-enriched foods in the second half of the infant's first year to complement the breast milk diet. Breastfeeding is recommended to continue for at least 12 months and thereafter for as long as mutually desired (American Academy of Pediatrics, 1997).

Table 5—Breastfeeding rates by WIC status, 1990-99

Status	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
In hospital:										
All infants	51.5	53.3	54.2	55.9	57.4	59.7	59.2	62.4	64.3	67.2
By WIC status:										
WIC	33.7	36.9	38.8	41.6	44.3	46.6	46.6	50.4	52.6	56.0
Non-WIC	62.9	65.2	66.4	67.9	68.8	71.0	70.8	73.4	75.2	76.9
At 6 months:										
All infants	17.6	18.2	18.9	19.0	19.7	21.6	21.7	26.0	28.6	30.7
By WIC status:										
WIC	8.2	9.0	10.1	10.8	11.6	12.7	12.9	16.5	18.9	19.9
Non-WIC	23.6	24.6	25.6	25.8	26.5	29.2	29.5	35.5	38.5	40.3

Source: Abbott Laboratories, 1999.

have traditionally been less likely to breastfeed their children (Abbott Laboratories, 1999). Furthermore, WIC women experienced great increases in the prevalence of breastfeeding during the 1990s; the percentage of WIC women who initiated breastfeeding increased by 66 percent from 1990 to 1999 while the percentage who were breastfeeding at 6 months increased by 143 percent.

WIC breastfeeding rates, although improving, continue to be significantly lower than the Healthy People 2010 target established by the U.S. Department of Health and Human Services—that at least 75 percent of women initiate breastfeeding and at least 50 percent continue breastfeeding for at least 6 months. Since 1989, a number of modifications have been made to the WIC Program in an attempt to increase breastfeeding rates. The Child Nutrition and WIC Reauthorization Act of 1989 earmarked \$8 million/year to be spent by WIC to promote breastfeeding. WIC State Agencies were required to hire a breastfeeding promotion coordinator, educate local agency staff on the benefits of breastfeeding, and coordinate promotion with programs in the State. In 1992, an enhanced WIC food package was established for women who exclusively breastfeed their infants. In 1998, the William F. Goodling Child Nutrition Reauthorization Act (P.L. 105-336) allowed food funds to be used to purchase breast pumps for participants.

In 1993, the General Accounting Office (GAO) studied the effect of WIC breastfeeding promotion activities on breastfeeding rates (including the relationship between prenatal WIC participation and breastfeeding initiation) and WIC food costs associated with increased breastfeeding (U.S. General Accounting Office, 1993). After controlling for factors such as education, income, race, age, parity, infant birthweight, marital status, and region, the authors found that there was no significant difference in breastfeeding rates between women who participated in WIC prenatally and those that did not. Therefore, it is unclear whether WIC promotion activities prenatally contributed to the increase in breastfeeding rates. The study was conducted in 1991, only 2 years after the authorization of funding specifically for breastfeeding promotion. GAO did find that efforts to increase breastfeeding rates had increased in WIC clinics by 1993.

WIC and Childhood Obesity

Another emerging issue with direct implications on the health of program participants is the relationship between WIC and childhood overweight and obesity. WIC was first established to combat the problem of malnutrition and hunger among low-income Americans. However, since that time, overweight and obesity have become one of the most serious health problems in the United States. Over one-third of all adults in this country, 12 percent of adolescents, and 14 percent of children 6-11 years old are overweight and the prevalence of overweight is increasing (Centers for Disease Control and Prevention, 1997).³⁴ Overweight and obesity among children is a concern because overweight children tend to become overweight adults, and there is a clear association between overweight and obesity in adults and chronic diseases such as cardiovascular disease, diabetes, and hypertension.

Different criteria for overweight have been used to estimate prevalence, usually either weight-for-height status above the 85th or 95th percentiles of the original 1977 National Center for Health Statistics/Centers for Disease Control and Prevention (NCHS/CDC) weight-for-height reference growth charts.^{35/36} Because infants and preschoolers are in a dynamic state of growth in which body size is continually in a state of flux, it is difficult to assign a single cutoff value to an age range. Similarly, there is no defined criterion for obesity in children. However, obesity generally refers to a more extreme case of overweight.

The proportion of children participating in the WIC program who are overweight or obese is growing. A recent study of low-income preschool children in 18 States who participated in several publicly funded health and nutrition programs (mostly WIC) found that 1 out of 10 children in these programs was overweight (based on the 95th percentile point for weight-for-

³⁴Overweight for adults was defined as body mass index (BMI) equal to or greater than 27.8 for men and 27.3 for women, while overweight for children and adolescents was defined as body mass index at or above the 95th percentile BMI cutoff points.

³⁵The growth charts were revised in 2000.

³⁶Weight-for-height does not directly measure the degree of overweight. For example, a person with a high degree of lean body mass could have high weight-for-height but would not be obese. However, weight-for-height is strongly correlated with body fatness.

height) in 1995 (Mei et al., 1998).³⁷ That is an increase of 20 percent from 1983. Since overweight (defined by most WIC State agencies at that time as being at or above the 90th percentile weight for length or height based on established growth charts) is one of the anthropometric nutrition risk criteria used for determining eligibility into the program, it is not surprising that there would be a high incidence of overweight among WIC participants.³⁸ In fact, for a given participant category (i.e., infant, child, pregnant women, etc.) the highest priority is given to persons demonstrating medically based nutrition risks, including anthropometric risks such as overweight (see table 2). Obesity is also more prevalent among certain minorities who disproportionately participate in the WIC program. However, the increasing prevalence of overweight among WIC children prompted concern about a possible association with the foods provided by WIC (Centers for Disease Control and Prevention, 1996). The WIC food basket can provide substantial amounts of foods to some participants. For example, the maximum quantity of milk (whole or low-fat), authorized in food package IV—children 1 to 5 years of age—is 24 quarts per month (see table 1).³⁹ However, a study by the Centers for Disease Control and Prevention (1996) concluded that WIC foods provide necessary nutrients without contributing to overweight.⁴⁰ Another more recent study found that WIC children were no more likely to be overweight than other low-income children (Burststein et al., 2000).

The increase in overweight among WIC children may be a reflection of the increase in overweight among the general population of children.⁴¹ In fact, WIC may have a positive effect on reducing overweight if participants substitute nutritious WIC foods for high-caloric-

³⁷The study was based on data collected on children younger than 5 years of age in the Centers for Disease Control and Prevention (CDC) Pediatric Nutrition Surveillance System.

³⁸Sixteen percent of all children in WIC in 1998 were reported as having high weight for height as a nutrition risk at certification (Bartlett et al., 2000).

³⁹It should be noted that foods provided by WIC are only a portion of the diet and when studying obesity, the whole diet must be considered.

⁴⁰The report acknowledged that small sample sizes for some subgroups and the inability to control for nutrition risk limit the study's findings (Centers for Disease Control and Prevention, 1996).

⁴¹The prevalence of obesity among all boys 4 to 5 years of age increased by almost 14 percent between 1971-74 and 1988-94. Among all girls age 4 to 5, the prevalence of obesity increased by 86 percent over the same period (Ogden et al., 1997).

content foods in their usual diet. In addition, local WIC agencies may tailor the WIC food package for an individual based on nutritional need. For example, the WIC food package may provide low-fat or nonfat milk instead of whole milk to overweight children.⁴² The nutrition education provided by WIC may also contribute to lowering the prevalence of obesity among WIC children. One of the suggested goals of the nutrition education counseling provided by WIC "is to help the infant/child achieve recommended rates of growth and development by emphasizing food choices of high nutritional quality while avoiding unnecessary calorie-rich foods and emphasizing age-appropriate physical activity and exercise, thereby minimizing further risks associated with increased childhood obesity" (USDA, 1998). The WIC program can also help individuals with clinical complications obtain early diagnosis and treatment by health professionals through its health referral function (Institute of Medicine, 1996).

Recently WIC has increased its proactive approach to preventing obesity among children. For example, FNS has awarded grants for a multi-State project titled "Fit WIC" to identify ways that WIC policies, practices, and operations might be changed to help prevent childhood obesity (USDA, 2001a). In the spring of 2001, FNS added new nutrition risk criteria for infants and children—at risk of becoming overweight—to the allowable criteria that may be used to establish WIC program eligibility (USDA, 2001d). The new criteria, based on expert recommendations, makes children (24 months old and older) at or above the 85th percentile weight for height at risk of becoming overweight. The new criteria also includes the existence of one or both obese parents as an allowable contributing factor to the overall risk of a child becoming overweight or obese in later years. This factor is based on scientific evidence that suggests that the presence of obesity in a parent greatly increases the risk of overweight in preschoolers.

The rise in obesity raises questions as to how WIC may improve its efforts to confront this growing issue. WIC, with its large number of children participants, has the potential to positively impact the issue of childhood obesity. More research on WIC's impact on childhood obesity is needed. USDA is currently funding several research studies that examine WIC-related obesity topics (see appendix).

⁴²The extent to which WIC clinics actually tailor the food package of overweight children has not been determined.

WIC's Nutrition Education and Health Care Referral Programs

As discussed earlier, the body of research, with some caveats, suggests that WIC is associated with positive health outcomes, especially with regard to prenatal participation. Although WIC's positive effects are usually attributed solely to the provision of supplemental food, they should be viewed as the joint effects of WIC's supplemental foods, nutrition education, and health care referrals (Rossi, 1998). Yet, very little research has been done to assess the impact of WIC's nutrition education and referrals to health care services.

Since the nutrition education provided by clinics varies, it is difficult to generalize findings of a few clinics to the Nation. Nutrition education can be provided to clients either individually or in a group setting using a variety of methods. The topics covered are designed to be easily understood and bear a practical relationship to participant nutritional needs, household situation, and cultural preferences. Recently, USDA's Food and Nutrition Service funded an exploratory study of the nutrition education component of the WIC program for pregnant women (Fox et al., 1998). Researchers followed pregnant women from six WIC sites in three States from their enrollment in WIC to 4-6 months postpartum. The authors measured their nutrition knowledge, attitudes, and behaviors at baseline and compared these at 32-36 weeks gestation (prenatal survey) and then at 4-6 months postpartum (postpartum survey).

The study found that nutrition knowledge increased significantly from baseline to the prenatal survey. Knowledge continued to increase in the postpartum survey but to a lesser degree. Nutrition education in the content areas of breastfeeding and infant feeding practices increased the most dramatically. Baseline nutrition knowledge was found to be significantly higher in those women who had been WIC participants with a previous child.

Nutrition attitudes and perceptions were found to change over time but to a modest degree. When looking at the nutrition-related behaviors over time, the researchers found that the use of prenatal vitamins and iron supplements increased significantly from the baseline survey to the prenatal survey. Researchers also found that the consumption of WIC foods increased from the baseline survey to the prenatal sur-

vey. However, by the postpartum survey only the increased consumption of WIC cereals was maintained. While most women followed recommended infant feeding guidelines during the first few months of life, the prevalence of undesirable feeding practices increased for older infants. For example, the use of solid foods before 4 months of age ranged from 39 percent to 67 percent of families across the six sites.

A limitation to this study was that no control group was identified to compare the change in knowledge, attitudes, and behaviors from the prenatal to postpartum period for those not participating in the WIC program. The influence of other sources of information, as well as hands-on experience, are likely to impact nutrition knowledge, attitudes, and behavior.

FNS also recently sponsored several demonstration studies (one for prenatal WIC participants and one for child WIC participants) on the effectiveness of innovative approaches to nutrition education. The prenatal study incorporated two approaches: a computerized touch-screen video for individual nutrition education and a facilitated group intervention (Randall et al., 2001b). Results of the study found no increase in nutrition knowledge from the interventions. However, the study reports that the assessment tool used in the study (1) measured knowledge only and may or may not have affected behavior; and (2) would not detect knowledge in areas not covered by the test.

The demonstration study for children's nutrition education consisted of a preschool lesson that focused on the areas of the Food Guide Pyramid, variety in the diet, and making healthy food choices for 3- and 4-year-old children (Randall et al., 2001a). Results of the study found that children who received the preschool lesson scored significantly higher on the nutrition knowledge test than children not exposed to the preschool lesson. The researchers concluded that providing nutrition education directly to 3- and 4-year-old WIC participants is feasible and can increase nutrition knowledge.

The provision of health and social service referrals to WIC participants is also one of the primary objectives of the WIC program. One of the few studies in this area documented the number and type of referrals provided over a 2-month period by nutritionists at a Lawrence, MA, WIC clinic in 1990 (Sargent et al., 1992). WIC nutritionists were asked to document each

referral provided. Over this 2-month period, 1,850 persons were seen and 597 (27 percent) were given referrals. Multiple referrals were reported for 21 percent of the participants. The majority of referrals (59 percent) were for nutrition-related services such as supplemental and emergency food. Twenty-three percent of referrals were for medical needs such as prenatal care, primary care, family planning, emergency care, dental care, failure to thrive, and hematocrit and lead testing. The remaining referrals were for education and development programs and to social services.

One limitation to the study is that it was done in one WIC clinic, and therefore is not representative of all WIC sites. Second, the study asked WIC nutritionists to document referrals provided. On one hand, this requirement could have resulted in an increased awareness by the nutritionists to provide referrals, inflating the frequency of referrals. On the other hand, nutritionists may not have documented every referral provided because of the extra paperwork involved, underestimating the number of referrals. The authors suggest that WIC nutritionists would benefit from education on the variety of social and medical services available in their neighborhoods so that they can provide appropriate referrals.

Nutrition education and referrals to health and social services are, along with supplemental food, key components of the WIC program. However, more research is needed to estimate their effectiveness separately. If nutrition education and referrals are found to be effective, it might suggest that more program funds be allocated to each. Conversely, if they are found to be ineffective, it might be better to try new ways to improve them or else de-emphasize these components and re-allocate their funds to providing supplemental foods to additional participants.

Impact of the WIC Farmers' Market Nutrition Program

The dual objectives of the WIC Farmers' Market Nutrition Program are (1) to provide resources in the form of fresh, nutritious, unprepared foods (fruits and vegetables) from farmers' markets to persons who are either participating in WIC or who are on the waiting list for WIC; and (2) to expand the awareness, use of and sales at farmers' markets (7 CFR 248.1). Since its beginnings as a demonstration project in 10 States during the late 1980s, the WIC Farmers' Market Nutrition

Program has grown substantially and now operates in 35 States, the District of Columbia, Guam, and on 4 Indian reservations.⁴³ In fiscal 2000, more than 12,800 farmers in over 1,600 farmers' markets were authorized to participate in the program (USDA, 2001b). That same year, about 1.9 million persons participated in the program and they redeemed approximately \$17.5 million worth of coupons. However, despite its growth, the impact of the WIC Farmers' Market Nutrition Program on farmers and WIC participants has not been studied thoroughly.

In 1991, USDA funded an evaluation of the then Farmers' Market Coupon Demonstration Project (FMCDP) (Galford et al., 1991). At the time, the FMCDP operated in only 10 States serving 250,000 WIC participants with 2,500 participating farmers. The study looked at three issues: (1) the relationship between the FMCDP and participants' consumption of fruits and vegetables, (2) the effect of nutrition education on fruit and vegetable consumption, and (3) the effect of the FMCDP on farmers. The study found that those who received the FMCDP coupons consumed about 6 percent more fruit and 5 percent more vegetables than WIC participants who did not receive the coupons. Researchers also found that those receiving FMCDP coupons were almost twice as likely to patronize farmers' markets, even when they had stopped receiving the coupons. Some WIC clinics also provided education on fruit and vegetable preparation in conjunction with the FMCDP. Women who said they had received the produce preparation information reported greater intake of fruits and vegetables than those not receiving the information, independent of FMCDP participation. The authors note that this finding may not be conclusive since health-conscious participants may be more likely to report having received education. Finally, the report questioned women about their satisfaction with the Farmers' Market Nutrition Program and found that two-thirds were "very satisfied" with the program.

These results of the 1991 survey were similar to those of a 1998 study conducted by the National Association of Farmers' Market Nutrition Programs (1999). Over half (58 percent) of Farmers' Market Nutrition Program participants had never visited a farmers mar-

⁴³Compared with the total WIC program, the Farmers' Market Nutrition Program is relatively small—about \$15 million in Federal funds were earmarked for the farmers' market program in fiscal year 2000 (USDA, 2001b).

ket before taking part in the Farmers' Market Nutrition Program. Seventy-one percent of the participants reported that they would continue to shop at farmers' markets, even without coupons. Seventy-four percent said they ate more fresh fruits and vegetables last summer than usual.

The 1991 FMCDP survey also looked at the impact of the program on farmers. The survey reported that sales increased slightly as a result of program participation; over 80 percent of farmers reported receiving less than \$500 in FMCDP coupons. As such, farmers noted that their farming operations were not altered as a result of the program. (Even though farmers' direct benefits

from the program were small, there may be significant indirect benefits to farmers. For example, a large proportion of the participants stated that they will use the farmers' markets more even without the coupons.) Farmers indicated strong support for the program; 90 percent believed the program should continue.

As the Farmers' Market Nutrition Program continues to expand, continued research looking at the outcomes and effectiveness of the program would be useful. For example, examining how the increased availability of fresh fruits and vegetables contributes to the diet and nutrition of WIC participants is an important area for future study.