

Effects of Food Assistance and Nutrition Programs on Nutrition and Health

Volume 4, Executive Summary of the Literature Review

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Introduction

Since the mid-1940s, the U.S. Government has been committed to ensuring that its citizens neither go hungry nor suffer the consequences of inadequate dietary intake. Over the years, Federal programs have been implemented to meet this commitment. Today, the Federal nutrition safety net includes 16 distinct food assistance and nutrition programs (FANPs) (table 1). Administered by the Food and Nutrition Service (FNS), U.S. Department of Agriculture (USDA), together the 16 programs were funded at a level of about \$38 billion in fiscal year (FY) 2002.¹ An estimated one in five Americans participated in one or more FANPs at some point during FY 2002 (Oliveira, 2003).

Although FANPs vary greatly in size, target population, and benefit-delivery strategy, all provide vulnerable groups of citizens with food, the means to purchase food, and/or with nutrition education (table 2).² All FANPs share the main goal of ensuring the health of vulnerable Americans by providing access to a nutritionally adequate diet. In 1998, FNS renewed its commitment to nutrition education in all FANPs, with the goal of increasing the role of the programs in improving the Nation's eating habits (USDA/FNS, 2003a). As part of this renewed focus, one of two key goals defined in the FNS strategic plan for 2000-05 is "improved nutrition for children and low-income people" (USDA/FNS, 2000a). Core objectives under this goal include

¹The list of FANPs used here differs slightly from the list used by FNS. FNS considers the Nutrition Education and Training Program and the Team Nutrition Initiative to be part of the National School Lunch Program and the School Breakfast Program. FNS also operates the Disaster Relief Program, a program that is not considered in this review because its role in the nutrition safety net is substantively different from that of the other FANPs.

²Several programs also provide avenues for distributing surplus agricultural commodities.

improving food security, promoting healthy food choices among FANP participants, and improving the quality of meals, food packages, commodities, and other program benefits. This emphasis on nutrition and nutrition education differentiates the FANPs from other federally sponsored income support programs.

In recognition of the renewed emphasis on nutrition and nutrition education in the FANPs, as well as the increasing Federal focus on program accountability, USDA's Economic Research Service (ERS) contracted with Abt Associates Inc. to conduct the Nutrition and Health Outcomes Study. A major focus of the study was a comprehensive review and synthesis of existing research on the impact of FANPs on nutrition- and health-related outcomes (see p. 3 for an explanation of the term "outcomes"). This report summarizes key findings from that effort. Detailed reviews of relevant research, on which this summary is based, are published in a companion volume (Fox, Hamilton, and Lin, 2004).³

Objective and Scope of the Review

The objective of the literature review was to summarize current knowledge about the effects of FANP participation on nutrition- and health-related outcomes. The first step was a comprehensive literature search to identify

³The Nutrition and Health Outcomes Study produced six other reports. Two are companion volumes to this report. One of the reports reviews the research designs available to researchers interested in studying the effects of FANPs (Hamilton and Rossi, 2002), and the other describes existing data sources that might be useful in these endeavors (Logan, Fox, and Lin, 2002). Four additional reports summarize the nutrition and health characteristics of low-income populations, using data from the third National Health and Nutrition Examination Survey (NHANES-III). The reports cover Food Stamp Program participants and nonparticipants (Fox and Cole, 2004a), WIC participants and nonparticipants (Cole and Fox, 2004a), school-age children (Fox and Cole, 2004b), and older adults (Cole and Fox, 2004b).

Table 1—Federal food assistance and nutrition programs

Program	Year begun ¹	FY 2002 costs ²	FY 2002 participation ²
		<i>\$ millions</i>	
National School Lunch Program (NSLP)	1946 ³	6,857 ⁴	28,006,873 lunches per day
Special Milk Program (SMP)	1955	16	112,781,614 total half pints
Commodity Supplemental Food Program (CSFP)	1968	110	427,444 participants per month
Summer Food Service Program (SFSP)	1968	263	121,865,417 total meals and snacks
Food Stamp Program (FSP)	1974	20,677	19,099,524 participants per month ⁵
Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)	1975	4,319 ⁶	7,490,841 participants per month
School Breakfast Program (SBP)	1975	1,566 ⁴	8,144,384 breakfasts per day
Nutrition Services Incentive Program (NSIP) ⁷	1975	152	252,748,643 total meals ⁸
Nutrition Education and Training Program (NET)	1977	0	0
Food Distribution Program on Indian Reservations (FDPIR)	1977	69	110,122 participants per month
Child and Adult Care Food Program (CACFP)	1978 ⁹	1,852 ⁴	1,691,448,979 total child meals and snacks; 44,570,764 total adult meals and snacks
Nutrition Assistance Program in Puerto Rico, American Samoa, and the Northern Marianas (NAP)	1981	1,362 ¹⁰	Not available
The Emergency Food Assistance Program (TEFAP)	1981 ¹¹	435 ¹²	611 million total pounds of food distributed
WIC Farmers' Market Nutrition Program (FMNP)	1992	25 ¹³	2+ million total participants ¹³
Team Nutrition Initiative (TN)	1995	10 ¹⁴	Not available
Senior Farmers' Market Nutrition Program (SFMNP)	2002	13 ¹⁵	Not available

¹Year of permanent authorization. Several food assistance and nutrition programs started as pilot projects before being established as permanent programs.

²Unless otherwise noted, data on costs and participation were obtained from USDA/FNS administrative data for FY 2002 (<http://www.fns.usda.gov/pd>, accessed April 2003). Reported costs include all cash benefits/reimbursements, food/commodity costs (as applicable), and administrative costs.

³In 1998, the program began covering snacks served in after-school programs. In FY 2002, a total of 122,914,873 snacks were served.

⁴In FY 2002, an additional \$124 million was spent on State administrative expenses for the NSLP, the SBP, and the CACFP.

⁵Individuals in participating households.

⁶Excludes estimated cost of WIC Farmers' Market Nutrition Program (FMNP), based on FY 2002 appropriation for FMNP.

⁷Formerly known as the Nutrition Program for the Elderly (NPE). In FY 2003, administration for the program was transferred to the U.S. Department of Health and Human Services. FNS continues to supply commodities and financial support to the program.

⁸Total meals for FY 2001, the latest year for which FNS collected data.

⁹The adult day care component was added in 1989. In 1999, the program expanded to serve children living in homeless shelters.

¹⁰The FY 2002 grant for Puerto Rico was \$1,351 million, the grant for American Samoa was \$5.3 million, and the grant for the Northern Marianas was \$6.1 million.

¹¹Until 1996, FNS operated a separate Commodity Distribution Program for Charitable Institutions, Soup Kitchens, and Food Banks. Under the Personal Responsibilities and Work Opportunities Reconciliation Act (PRWORA), this program was merged into TEFAP.

¹²In FY 2002, FNS donated an additional \$16 million in commodities to disaster relief and charitable institutions.

¹³Cost reflects FY 2003 appropriation. Source: <http://www.fns.usda.gov/wic/FMNP/FMNPfaqs.htm>, accessed April 2003.

¹⁴FY 2002 appropriation. Source: L. French (2002). Personal communication.

¹⁵Based on FY 2002 appropriation (\$15 million) and residual carried over into FY 2003 (\$1.7 million). Source: <http://www.fns.usda.gov/wic/SeniorFMNP/SFMNPFY02.htm> and [SFMNPFY03.htm](http://www.fns.usda.gov/wic/SeniorFMNP/SFMNPFY03.htm), accessed April 2003.

potentially relevant research for each FANP.⁴ The search covered published research papers and books, research reports to government agencies, and unpublished works, such as doctoral dissertations, working papers of research institutes, and conference presentations.⁵

Several hundred citations were identified through the initial search of selected computerized databases. However, many did not deal directly with the core objective of this review and were excluded from further consideration. These citations included, for example, general program descriptions, program manuals, research on program participation or participant characteristics, and research on program operations, costs, and integrity. In addition, research that involved FANP participants but did not explicitly compare participants and nonparticipants was excluded.

This winnowing process narrowed the list of citations to research that explicitly examined the impact of FANP participation by comparing nutrition- and health-related outcomes of program participants and nonparticipants. Program-specific authors identified other relevant citations as they reviewed papers and reports.

Overview of the Literature on Nutrition and Health Outcomes

An extensive amount of research has assessed the impact of specific FANPs on nutrition and health, but the coverage is neither comprehensive nor even. Table 3 shows the number of studies identified for each program and the major outcomes examined. Outcomes can be grouped into six categories:

- Household food expenditures.
- Household nutrient availability.
- Individual dietary intake.
- Measures of nutrition and health status other than dietary intake (food security, birth outcomes, nutritional status, and health status).
- Health-related behaviors.
- Other relevant, but not specifically health-related, outcomes.

⁴The Senior Farmers' Market Nutrition Program was not included in the search because the program was not established until 2002.

⁵The initial search was conducted in 1999 and updated in 2002 before preparation of the final version of the report. The 2002 update included only published research. Additional published research was incorporated before publication of the report in 2004.

The last category includes cognitive development and school-related performance among children, social isolation among the elderly, and nutrition knowledge or attitudes (examined for only the programs focused specifically on nutrition education—the Nutrition Education and Training Program and the Team Nutrition Initiative).

Conclusions from studies that have examined the impact of FANP participation on nutrition and health status must be interpreted with caution. Establishing causality between FANP participation and long-term nutrition and health outcomes requires that data support a logical time sequence. For long-term outcomes (measures that develop over time, such as linear growth and body weight), FANP participation must precede the outcome for a reasonable period of time and be of sufficient intensity to provide a plausible basis for a hypothesized impact. In addition, reliable assessment of impacts on such measures as linear growth and nutritional biochemistries requires at least two measurements, one before and one after participation. Finally, a complex interplay of diet, heredity, and environment influence nutrition and health status, which makes the task of determining the specific impacts of FANPs on these long-term outcomes a challenge. Comparable concerns exist for studies that have examined the impact of FANP participation on food security status.

As table 3 illustrates, the Food Stamp Program (FSP) and the Special Supplemental Nutrition Program for Women Infants and Children (WIC) have been studied extensively, and a broad number of outcomes have been examined. For several other programs, impact research is totally or virtually nonexistent. For some of these programs, such as the Food Distribution Program on Indian Reservations (FDPIR), the Commodity Supplemental Food Program (CSFP), and the Special Milk Program (SMP), little research of any kind is available. For other programs, including the Child and Adult Care Food Program (CACFP), the Summer Food Service Program (SFSP), and The Emergency Food Assistance Program (TEFAP), research is available, but none of it has focused on measuring program impacts on individual participants or their households.

Limitations of Available Research

Many studies of the effects of FANP participation on nutrition- and health-related outcomes share three key limitations. These limitations include research design and the potential for selection bias, the relative age of the available research, and the standards used to assess dietary intake.

Table 2—Populations served and benefits provided by Federal food and nutrition assistance programs

Program	Target population	Income-eligibility requirement (percent of Federal poverty guideline)	Benefits provided
Food Stamp Program	Low-income households	≤130% ¹	Electronic benefits for use in purchasing food for home consumption ² Nutrition education may be offered
WIC program	Low-income pregnant, breastfeeding, and postpartum women; infants; children ages 1-4	≤185% ³	Supplemental foods, nutrition education, and referrals to health care and social services
Child Nutrition Programs			
National School Lunch Program	School-age children	≤130% receive free meals/snacks 131-185% receive reduced-price meals/snacks >185% may participate but pay full-price for meals/snacks	Lunches that meet specific nutrition standards ⁴ After-school snacks
School Breakfast Program	School-age children	≤130% receive free meals 131-185% receive reduced-price meals >185% may participate but pay full-price for meals	Breakfasts that meet specific nutrition standards ⁴
Child and Adult Care Food Program	Children and adults attending licensed, nonresidential day care facilities, homeless shelters, and after-school programs ⁵	Any child or adult in participating center may participate. Reimbursements to providers are based on relative poverty status of populations they serve ⁶	Meals and snacks that meet defined meal patterns
Summer Food Service Program	Low-income school-age children	Any child attending an approved feeding site may participate ⁷	Free meals and snacks that meet defined meal patterns
Special Milk Program	School-age children enrolled in schools that do not participate in other Child Nutrition Programs or who attend part-day programs that do not allow them to receive meals	≤130% receive free milk 131-185% receive reduced-price milk >185% may participate but pay full-price for milk	½ pint of milk
Food Distribution Programs			
Commodity Supplemental Food Program	Low-income pregnant and postpartum women, infants, children up to their 6 th birthday, and adults ages 60 and older	≤130% for adults ages 60 and older ≤185% for women, infants, and children	Commodity foods, nutrition education, referrals to health care and social services
Food Distribution Program on Indian Reservations	Low-income American Indian or non-Indian households living on reservations ⁸	≤130%	Commodity foods (alternative to the FSP)

See notes at end of table.

Continued—

Table 2—Populations served and benefits provided by Federal food and nutrition assistance programs—Continued

Program	Target population	Income-eligibility requirement (percent of Federal poverty guideline)	Benefits provided
The Emergency Food Assistance Program	Low-income individuals and families	Determined by States ⁹	Commodity foods distributed through food banks, food pantries, emergency kitchens, and homeless shelters
Nutrition Services Incentive Program	Adults ages 60 and older	None	Cash or commodities to support provision of meals through the Elderly Nutrition Program ¹⁰
Nutrition Education Programs			
Team Nutrition Initiative	School-age children, parents, school foodservice workers, teachers, and administrators	None	Nutrition education
Nutrition Education and Training Program	School-age children, school foodservice workers, teachers, and administrators	None	Nutrition education
Other			
Nutrition Assistance Program in Puerto Rico, American Samoa, and the Northern Marianas	Low-income households in Puerto Rico, American Samoa, and the Northern Marianas	Determined by individual commonwealths	Cash subsidies (replacement for the FSP)
WIC Farmers' Market Nutrition Program	WIC participants and eligible nonparticipants who are on waiting lists ¹¹	≤185% ¹²	Coupons for use in purchasing locally grown fresh fruits, vegetables, and herbs
Senior Farmers' Market Nutrition Program	Adults ages 60 and older	≤185%	Coupons for use in purchasing locally grown fresh fruits, vegetables, and herbs

¹Must also meet certain resource, work-related, and categorical requirements.

²In mid-2004, a nationwide changeover from the use of food stamps (coupons) to the use of electronic benefits was completed.

³Must also be certified by a recognized health care professional to have a nutritional risk. Participation is not guaranteed. Local programs can serve only as many participants as their funding will allow. Priority system is used to fill slots when funding is tight.

⁴Participating schools receive cash subsidies for each meal served (and donated commodities for each lunch served), including those served to students who pay full price. Reimbursement rates are higher for meals served to students free or at a reduced price than for meals served at full price.

⁵Nonprofit child care centers are eligible to participate in the CACFP, as are for-profit centers in which at least 25 percent of the center's enrollment or licensed capacity receive either Title XX funds or are eligible for free or reduced-price meals.

⁶Providers receive cash subsidies for every meal and snack served. Centers are reimbursed based on the financial need of the children and adults they serve, using the income-eligibility and meal-reimbursement rates used in the NSLP and SBP. Homes are reimbursed based on the economic need of providers and the children they serve. Homes located in low-income areas or operated by providers with incomes <185 percent of poverty are reimbursed at higher rates than other homes.

⁷Most feeding sites are located in areas where at least 50 percent of the children are from households with incomes ≤185 percent of poverty or in programs where 50 percent of the enrolled children are eligible to receive free or reduced-price meals, using the income-eligibility criteria defined for the NSLP and SBP. Residential summer camps may receive reimbursement for meals and snacks served to children whose documented household income makes them eligible for free or reduced-price meals.

⁸Low-income households that contain at least one member of a federally recognized tribe and reside in approved areas near reservations or in Oklahoma may also participate.

⁹Under TEFAP, USDA makes commodity foods available to States. States provide the food to local agencies they have selected, and these agencies distribute the food to the public, either in prepared meals or for home consumption. Each State sets criteria for determining which households are eligible to receive food for home consumption. However, recipients of prepared meals are considered to be needy and are not subject to a means test.

¹⁰The NSIP supports the Elderly Nutrition Program operated by the U.S. Department of Health and Human Services, Administration on Aging. ENP sites, rather than individuals, participate in the NSIP.

¹¹The WIC Farmers' Market Nutrition Program (FMNP) is not available in all WIC sites. In FY 2003, 36 States, the District of Columbia, Puerto Rico, Guam, and five Indian Tribal Organizations operated the FMNP.

¹²Must also be certified, by a recognized health care professional, to have a nutritional risk.

Table 3—Number of studies by program and outcome

Program	Household food expenditures	Household nutrient availability	Individual dietary intake	Measures of nutrition and health status other than dietary intake					
				Food security	Birth outcomes	Nutrition status ¹	Health status ²	Health behaviors ³	Other ⁴
Food Stamp Program (FSP)	32	14	26	14	2	8	2	0	0
WIC program ⁵	2	2 ⁶	25	2	39	28	10	15	5
National School Lunch Program (NSLP)	3	0	18	0	0	8	0	0	1
School Breakfast Program (SBP)	0	0	15	1	0	4	2	0	8
Child and Adult Care Food Program (CACFP)	0	0	0	0	0	0	0	0	0
Summer Food Service Program (SFSP)	0	0	0	0	0	0	0	0	0
The Emergency Food Assistance Program (TEFAP)	0	0	0	0	0	0	0	0	0
Nutrition Services Incentive Program (NSIP) ⁷	0	0	14	1	0	6	1	0	3
Nutrition Assistance Program in Puerto Rico, American Samoa, and the Northern Marianas (NAP)	2	3	0	0	0	0	0	0	0
Commodity Supplemental Food Program (CSFP)	0	0	0	0	1	1	0	1	0
Food Distribution Program on Indian Reservations (FDPIR)	0	0	0	0	0	0	0	0	0
WIC Farmers' Market Nutrition Program (FMNP)	0	0	2 ⁸	0	0	0	0	0	0
Special Milk Program (SMP)	0	0	2 ⁸	0	0	0	0	0	0
Team Nutrition (TN)/Nutrition Education and Training Program (NET)	0	0	6 ⁸	0	0	0	0	0	6

Notes: Many studies examined more than one outcome. Counts reflect the number of studies that included at least one measure in this category.

The Senior Farmers' Market Nutrition Program is not included in this summary because it was not established until 2002 and was not included in the literature review.

¹Includes nutritional biochemistries, measures of height and/or body weight, and composite measures of nutritional risk.

²Includes measures of general or specific health status and use of health care services.

³Includes breastfeeding initiation and duration and immunization status.

⁴Includes measures that are not health-specific, such as school attendance, cognitive development/performance, social isolation, and nutrition knowledge and/or attitudes. Research that examined impacts on nutrition knowledge and/or attitudes was considered only for the FANPs that are specifically devoted to nutrition education—the Team Nutrition Initiative and the Nutrition Education and Training Program.

⁵For the WIC Program, studies were counted within four participant groups: prenatal women, infants and children, postpartum women (both breastfeeding and nonbreastfeeding), and undifferentiated. Thus, studies that examined outcomes in more than one participant group are counted more than once.

⁶These studies looked at diet-related outcomes at the household level, not household nutrient availability per se. One study looked at dietary quality, and the other looked at food use.

⁷These studies are actually studies of the Elderly Nutrition Program, the program sponsored by the U.S. Department of Health and Human Services, Administration on Aging. The NSIP and its precursor, the Nutrition Program for the Elderly (NPE) contribute commodity and cash assistance to the ENP.

⁸These studies (with the exception of one SMP study) included measures of self-reported eating behaviors—for example, usual or recent consumption of fruits and vegetables—rather than detailed assessments of dietary intake.

Research Design and the Potential for Selection Bias

The research designs used in most of the available research limit the confidence that can be placed in the findings. The randomized experiment is recognized as the “gold standard” of program evaluation, but this design is virtually nonexistent in FANP research.

The fundamental requirement of randomized experimentation is that the program service be deliberately withheld from some people who are otherwise like the people who receive the service. Potential program participants are randomly assigned to either receive (treatment group) or not receive (control group) program benefits. Random assignment is difficult to implement in FANP research. It generally cannot be done in entitlement programs, such as the FSP, the National School Lunch Program (NSLP), and the School Breakfast Program (SBP), because law and regulation require that program benefits or services be provided to everyone who meets eligibility requirements and takes the necessary steps to qualify.

Nonentitlement programs can pose similar problems. For nonentitlement programs that approach full saturation, such as WIC, finding a reasonably representative set of nonparticipants to whom the program could be considered unavailable can be virtually impossible. Moreover, if program services would normally be provided to everyone who applies and is eligible, withholding services from people who might apply may be considered unethical.

Because of these constraints, the reviewed literature included only one study that used a randomized experiment to evaluate the impacts of a specific FANP on the nutrition and health outcomes of program participants.⁶ This study was completed during the early years of the WIC program (Metcoff et al., 1985). A randomized experiment was feasible in this case because, at the time, the demand for WIC participation at the study site exceeded the available funding.

A few studies have used randomized experiments to estimate the impact of demonstrations or pilot programs, rather than of a FANP per se. These demonstrations typically represented policy initiatives that were tested on a limited scale before full-scale implementation. The

⁶Studies of the Team Nutrition Initiative and Nutrition Education and Training Program have used random assignments of volunteer schools or classrooms to assess impacts on nutrition-related knowledge, attitudes, and self-reported behaviors.

most prominent examples are demonstrations of cashing out food stamps—the so-called “cashout” studies (Fraker et al., 1992; Ohls et al., 1992)—and a recent pilot project in which school breakfasts were offered free to all school children, regardless of household income—the so-called “universal-free breakfast” demonstration (McLaughlin et al., 2002). While results of such studies possess all the strengths associated with the randomized experiment design, the results cannot always be applied to the FANP involved. Evaluations of demonstration projects do not compare program participants and nonparticipants. Rather, they compare the status quo—or the program as it exists without the modification introduced by the demonstration—with the demonstration program. In the case of the food stamp cashout demonstrations, the evaluations estimated the effects of receiving benefits in the form of checks rather than as food stamps (coupons) but did not estimate the overall impact of the FSP itself.

Virtually all of the research that has examined the impact of FANPs on nutrition- and health-related outcomes has used nonrandomized or quasi-experimental designs. In quasi-experiments, nonparticipants are identified through some means other than random assignment. Most quasi-experimental designs are subject to problems of selection bias. The underlying problem is that identified nonparticipants may not be sufficiently comparable to participants.

Selection bias often occurs because participants are more highly motivated to achieve the program-relevant outcomes than nonparticipants. Suppose, for example, that the women who seek WIC benefits for themselves or their children tend to be very concerned about the effect of diet on their children’s health. Such women may well take other actions with the same objective, such as following dietary guidelines in brochures they pick up in the doctor’s office—or getting to a doctor’s office at all. If this were true, one would expect the children of mothers who seek WIC benefits to have better nutrition and health outcomes, even in the absence of the program, than children of mothers who are less motivated and do not seek WIC benefits. A simple comparison of WIC and non-WIC children would, therefore, reveal that the WIC children had more positive outcomes even if the program had no effect at all.

Sometimes selection bias operates in the opposite direction. Mothers of children with nutrition-related problems might be especially motivated to seek WIC benefits, for example, whereas mothers of healthy children might be less inclined to participate. WIC might improve the

participating children's condition, but the children might not catch up with their nonparticipating, healthier counterparts. In this example the simple comparison would find WIC children to have less positive outcomes even though the program had a positive effect. The fact that WIC specifically targets individuals who are at nutritional risk increases the likelihood of this type of bias.

Participant motivation toward the program outcome is one of the most common sources of potential bias and one of the most difficult to counteract. Other common sources of selection bias include need (often proxied by income), potential for gain (often proxied by the dollar value of the benefit), and the individual's desire not to depend on public assistance.

Selection bias may also result from program rules or procedures. In nonentitlement programs, local staff often decide which applicants will be approved for participation based on a combination of program policies and individual judgment. In all programs, outreach practices, referral networks, office locations and hours, and community customs may make some people more likely to participate than others.

Finally, some selection bias occurs when program participation is based on transitory characteristics. For example, some people who qualify for means-tested programs are permanently poor, or nearly so, and would be income-eligible for program participation for periods of many years. Other people who qualify are not permanently poor, but are at a temporary low point in a fluctuating income pattern. In an earlier period, their income was high enough that they did not qualify for the program, and at some point, they will regain that level of income. These two types of people might have similar incomes at the time they enter the program, but their subsequent outcomes, in the absence of the program, might not be at all similar.

Researchers have used a variety of approaches to try to counteract selection bias (see Hamilton and Rossi, 2002, or Fox, Hamilton, and Lin, 2004, chapter 2, for a detailed description of these techniques and their relative strengths and weaknesses). All of these techniques have the basic objective of making the participant and nonparticipant groups "alike" on certain specified dimensions, thereby minimizing the potential influence of selection bias on study results. However, none of the techniques can guarantee that selection bias has been eliminated.

Well-conceived approaches to controlling for selection bias in FANP research have yielded both plausible and

implausible results. The situations that produce implausible results cannot be identified a priori, and none of the customary approaches has consistently yielded plausible results. Moreover, a plausible selection bias adjustment has not necessarily accomplished its purpose just because it is plausible. After decades of research and debate, the statistical community has not yet reached a consensus that any particular approach will consistently remove selection bias.

In addition, data limitations hamper nearly all attempts to counter selection bias. Careful theorizing about the determinants of participation usually suggests many factors that are not measured in existing datasets. Even with special data collection, many of the factors pertain to the period before the individual began participating (or not participating) and cannot be measured reliably on a retrospective basis.

Although the extent of remaining bias cannot be known for sure, testing the robustness of the results is usually informative. A program impact estimate that remains stable under various alternative specifications is somewhat more credible than one that varies dramatically. Of course, if several specifications fail equally to remove the bias, the results will be consistent with one another but inaccurate.

Relative Age of the Available Research

Another limitation affecting much of the existing research is the relative age of the data. Many of the datasets used date back to the 1980s and even the 1970s. Application of findings from these studies to today's FANPs must be done with some caution. Although this general caution applies to all research, a compelling argument can be made that impacts on nutrition- and health-related outcomes are more sensitive to temporal considerations than impacts on food expenditures. For example, the American food supply has changed dramatically in the past 20-30 years, with important implications for both nutrient availability at the household level and individual dietary intakes. Americans are eating substantially more grains than they were two decades ago, particularly refined grains, as well as record-high amounts of caloric sweeteners and some dairy products and near-record amounts of added fats (Putnam and Gerrior, 1999).

In addition to myriad new products on the market and changes in food enrichment policies and standards, a number of sociodemographic trends may have influenced food purchasing behaviors. These trends include, for example, an increase in the amount of

food eaten away from home, smaller households, more two-earner and single-parent households, an aging population, and increased ethnic and racial diversity (Putnam and Gerrior, 1999).

Finally, the design and implementation of some FANPs has changed substantially over the past 30 years. Studies based on data from 30, 20, or even 10 years ago cannot be assumed to represent current program operations or participants. As discussed later, this point is particularly true for the NSLP and SBP.

Standards Used To Assess Dietary Intake

Most studies that examined the impact of FANPs on dietary intake focused on nutrient intake—most often food energy (kilocalories) and vitamins and minerals—rather than on food intake, and were interested in the adequacy of the diets being consumed rather than the quality. Most studies assessed nutrient intakes as a percentage of age-and-gender-appropriate Recommended Dietary Allowances (RDAs) rather than as raw intakes in kilocalories, milligrams (mg) or grams (gm) (National Research Council (NRC), 1989a). Most FANP researchers compared mean intakes of participants with intakes of nonparticipants, although some researchers compared the proportion of individuals in each group who had intakes below a defined cutoff, generally between 70 and 100 percent of the RDA. The latter approach is less common, perhaps because an expert panel convened by USDA in the early 1980s specifically recommended against the use of fixed cutoffs relative to the RDAs as a means of assessing the prevalence of inadequate intakes (NRC, 1986).

In assessing program impacts, researchers generally deemed a significantly greater mean intake among participants or a significantly greater percentage of participants with intakes above a specified cutoff as evidence of a positive program effect. Effects were characterized as program participation leading to “increased intake(s).” Although these interpretations are common in the available literature, information on differences in the mean percentage of the RDA consumed or in the proportion of individuals consuming some percentage of the RDA does not provide information on the underlying question: Are FANP participants more likely than nonparticipants to consume an adequate diet? Even when the mean nutrient intake of a group approximates or exceeds the RDA, a significant share of the population may have inadequate intakes. On the other hand, use of RDA-based cutoffs seriously overestimates the proportion of a group at risk of inadequate intake because, by definition, the

RDA exceeds the needs of nearly all (97-98 percent) healthy individuals in the group (Institute of Medicine (IOM), 2001).

Thus, the available research provides an imperfect picture of both the prevalence of inadequate intakes and the substantive significance of differences in intakes of FANP participants and nonparticipants. That is, the available data provide information on whether FANP participants have “increased intakes” of food energy or key nutrients relative to nonparticipants but do not provide information on whether these differences affect the likelihood that FANP participants consume adequate amounts of food energy or nutrients.

This imperfect picture of the risk of inadequacy reflects a limitation in the reference standards and dietary assessment methods available when most of the existing FANP research was conducted rather than shortcomings in the research per se. This limitation has been addressed in the Dietary Reference Intakes (DRIs), a revised set of nutrient intake standards that has replaced the RDAs (IOM, 2002a, 2002b, 2000a, 2000b, 1999).

The development of the DRIs has led to statistically based guidance on estimating the prevalence of inadequate intakes of population groups (IOM, 2001). The recommended approach, referred to as the “EAR cut-point method,” differs in two important ways from the approach used in previous research. First, assessment of adequacy is based on the Estimated Average Requirement (EAR) rather than the RDA. The EAR is the level of intake estimated to meet the requirements of half of the healthy individuals in a given gender and life-stage group.⁷ It was developed specifically to provide a better standard for assessing the adequacy of nutrient intakes than is possible with the RDA.

Second, assessment is based on estimates of usual rather than observed intakes. Estimation of usual intakes requires 2 nonconsecutive or 3 consecutive days of intake data for a subgroup of the population(s) under study. These data are used to adjust the distribution of intakes to remove within-person variation and better represent usual intake patterns.

⁷For some nutrients, most notably calcium, available data were insufficient to establish an EAR. In these instances, a different DRI—an Adequate Intake, or AI—was established. The AI is a level of intake that is assumed to be adequate, based on observed or experimentally determined intake estimates. The DRIs also define Tolerable Upper Intake Levels (ULs) for selected nutrients. The UL is the highest intake likely to pose no risk of adverse health effects. The DRI applications report provides guidance on appropriate uses of AIs and ULs in assessing nutrient intakes of groups (IOM, 2001).

Compared with estimates from previous research, the recommended approach is likely to yield lower estimates of the prevalence of inadequacy because, as noted, using the RDA as a reference point for assessing adequacy always leads to an overestimation of the problem.⁸ Similarly, using observed intakes rather than usual intakes tends to overestimate the percentage of individuals falling below a given cutoff because the distribution of observed intakes is usually wider than the distribution of usual intakes. These improved dietary assessment methods are just beginning to appear in FANP research (Cole and Fox, 2004a; Ponza et al., 2004; and McLaughlin et al., 2002).

Relatively few studies have looked the impact of FANP participation on the quality of dietary intakes, for example, in comparison with recommendations made in the *Dietary Guidelines for Americans* (USDA and the U.S. Department of Health and Human Services (HHS), 2000) and the Food Guide Pyramid (USDA, Center for Nutrition Policy and Promotion (CNPP), 1996) or with the Healthy Eating Index (HEI), a summary measure of overall diet quality developed by CNPP (Kennedy et al., 1995). Many of the studies completed since the mid-1990s have examined dietary quality at some level, but few of the earlier studies did.

Overview of the Findings

The sections that follow summarize key findings from the research available for each FANP. Basic background information on the subject research can be found in detailed tables provided in appendix A. These tables summarize important characteristics of each study, including the year published (or written, for nonpublished reports), data sources, population studied, sample size, research design, measure of program participation, and analysis methods. Tables are provided for all FANPs that had at least one impact study. All identified research that described differences between participants and nonparticipants is included in these tables. Although some of the studies had relatively weak designs or used rudimentary or, in some cases, no statistical analysis, they are included in the interest of completeness.

In interpreting findings from the complete body of research for a given program, greater weight was

⁸For some nutrients, the estimated prevalence of inadequate intakes would be lower even if the old approach was replicated using the latest RDAs because the new RDAs for some nutrients differ substantially from previous RDAs. For example, for children ages 1-3, the 1989 RDAs for zinc and vitamin C were, respectively, 10 mg and 40 mg. The new RDAs for these nutrients are substantially lower, at 3 mg (zinc) and 15 mg (vitamin C).

given to findings from studies that had the strongest research design and analysis methods and that used the most recent data. This report does not comment at length about the strengths and limitations of various studies. These detailed discussions are included in Volume 3 (Fox, Hamilton, and Lin, 2004).

Appendix B includes the reference lists from each program-specific chapter in Volume 3. The lists can be used to obtain full citations for studies cited in the appendix A tables. They can also be used to identify related and background literature used in preparing the comprehensive reviews. Because of space constraints, the tables in appendix A cite only the first author's name for papers or reports that have more than two authors.

Food Stamp Program

The FSP stands at the intersection of two sets of Federal programs: those with the primary goal of improving access to adequate diets and those with the primary goal of maintaining income. The FSP is particularly important because of its universality. It is an entitlement program with eligibility requirements based almost solely on financial need, while the other major FANPs are targeted toward certain types of individuals or households.

FSP benefits can be used only to purchase food for home consumption or seeds and plants used to produce food. Benefits are distributed as electronic transfers, which can be redeemed only at participating retail outlets. The Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA) mandated that all FSP benefits be distributed via electronic transfers. Nationwide changeover from coupons to electronic transfers was completed in June 2004 (USDA, 2004).

The FSP is the cornerstone of the Nation's nutrition safety net. In FY 2002, the total Federal expenditure for the FSP was \$20.7 billion, which accounted for about 54 percent of the \$38 billion Federal expenditure for all FANPs. The program served more than 19 million participants per month (table 1). In FY 2003, the maximum monthly food stamp allotment for a family of four was \$471 per month.

The FSP has been extensively researched, with much of the research based on secondary analysis of data from large national surveys, such as the Continuing Survey of Food Intakes by Individuals (CSFII). The bulk of the existing research concerns impacts on household food expenditures, household nutrient availability, and individual dietary intakes (app. tables 1-3, pp. 46-56). These three outcomes are logically sequential. The