

U.S. Food and Nutrition Programs

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Abstract

The U.S. government operates a wide variety of food and nutrition programs (FANPs), which reach an estimated one out of every five Americans every day. Most FANPs were developed with the primary goal of assuring adequate nutrient intakes in populations deemed to be at risk of under-nutrition. However, the nature of nutritional risk has changed from a situation in which significant numbers of Americans suffered food shortages to one in which obesity is prevalent. This observation raises the question of whether supplying food is the most effective way to address the nutritional needs of FANP recipients? A secondary goal of many FANPs is to improve the nutritional choices of recipients, through nutrition education. This goal has received increasing attention in recent years, in response to the finding that many FANP recipients consumed diets sufficient in calories but of poor quality. A third goal of federal FANPs is to provide a uniform, minimum, nation-wide threshold below which assistance cannot fall. This safety-net role of FANPs is likely to become increasingly important in this era of welfare reform as states cut back on cash assistance. The vast majority of the research on FANPs focuses on the three largest programs: The Food Stamp Program (FSP), The Special Supplemental Nutrition Program for Women, Infants and Children (WIC), and the National School Lunch Program. Accordingly, this chapter focuses on evidence regarding the way that these three programs have met the goals of federal FANPs.

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I. Introduction

The U.S. government operates a wide variety of food and nutrition programs (FANPs), which reach an estimated one out of every five Americans every day.¹ Most FANPs were developed with the primary goal of assuring adequate nutrient intakes in populations deemed to be at risk of under-nutrition. However, the nature of nutritional risk has changed over time from a situation in which significant numbers of Americans suffered food shortages to one in which obesity is prevalent even among the homeless. For example, Luder *et al.* (1990) examined a sample of homeless shelter users in New York City and found that 39% were obese. This observation raises the question of whether supplying food is the most effective way to address the nutritional needs of the majority of FANP recipients?

A secondary goal of many FANPs is to improve the nutritional choices of recipients, through nutrition education. This goal has received increasing attention in recent years, in response to the finding that many FANP recipients consumed diets sufficient in calories but of poor quality. But the research reviewed in this chapter suggests that we still know little about the best ways to improve the quality rather than the quantity of food consumed.

In a country in which much of the social safety net is implemented at a state or even at a local level, an important third goal of federal FANPs is to provide a uniform, minimum, nation-wide threshold below which assistance cannot fall. The safety-net role of FANPs is likely to become increasingly important in this era of welfare reform as states cut back on cash assistance and FANP benefits form an increasing proportion of the total aid provided to low-income families.

The vast majority of the research on FANPs focuses on the three largest programs: The Food Stamp Program (FSP), The Special Supplemental Nutrition Program for Women,

¹ See "Food and Nutrition Service Program Data", fns1.usda.gov/fns/MENU/ABOUT/PROGRAMS/PROGDATA.HTM.

Infants and Children (WIC), and the National School Lunch Program. Accordingly, this review will focus primarily on these three programs. The rest of this chapter is laid out as follows: Section 1 provides a brief overview of the history, rules and program statistics of these three programs. The rest of the paper offers an evaluation of the evidence from these three programs regarding: The overall effectiveness of FANPs (Section II); factors affecting takeup (Section III); the efficacy of in-kind vs. cash programs (Section IV); work disincentives created by the programs (Section V); and the role of nutrition education as compared to simple changes in budget constraints (Section VI). Section VII concludes with a discussion of current policy issues and suggestions for future research.

I. Program History, Rules, and Statistics

Table 1 offers a brief overview of the history, costs, participation, eligibility requirements, and benefits associated with the 12 most important FANPs. The table indicates that in addition to being the most studied, the FSP, WIC, and NSLP are by far the largest and most widely available FANPs. However, as Table 1 makes clear, there are many other programs serving smaller subsets of the population. For example, the School Breakfast Program (SBP) serves 7.4 million children per day compared to the NSLP's 27 million. One reason for the lower participation rate is that 25% of schools that offer NSLP do not participate in the SBP. Although income cutoffs for the two programs are the same, the SBP also serves a poorer population on average, which is reflected in the fact that more of the children qualify for a free meal in SBP (77% of participating children receive free breakfasts compared to 48% who receive free lunches). The Child and Adult Care Food Program serves 2.5 million children in day care, and 57,000 adults daily. Together these two programs cost \$2.8 billion per year, which is about half the cost of the NSLP. The other 7 smaller programs together cost only \$623 million annually, which is suggestive of their much smaller scale and scope.

The FSP, WIC, and NSLP have adopted very different approaches to meeting the goals discussed in the introduction. As shown in Table 1, the NSLP (and the smaller School Breakfast program) provide free or reduced price meals conforming to certain nutritional guidelines directly to their target population. The FSP provides coupons (or more recently, electronic debit cards) that can be redeemed for food with few restrictions on the types of foods which can be purchased. WIC offers coupons which may be redeemed only for specific types of food, to women, infants, and children certified to be at nutritional risk. WIC also involves a nutrition education component, something that is absent from the other two programs. The remainder of this section offers further details about these programs.

I. a) History and Evolution of Program Rules: The FSP²

The FSP began as a small pilot program in 1961, and gradually expanded over the next 13 years: In 1971, national eligibility standards were established, and all states were required to inform eligible households about the program. In 1974, states were required to extend the program statewide if any areas of the state participated. FSP program benefits have traditionally been provided in the form of coupons that can be exchanged for food at participating stores. These coupons may be used to purchase a wide range of foods, the most significant exception being hot foods that are for immediate consumption.

In contrast to the rules for cash welfare receipt under the old AFDC (Aid to Families with Dependent Children) program and the new TANF (Temporary Aid for Needy Families) programs, most rules for the FSP are set at the federal level. This is because the FSP is designed to offset state variation in welfare programs to some extent, as shown in Table 2. For example, food stamp benefits amount to less than a third of the combined AFDC/TANF and food stamp benefits in states such as California or Wisconsin that have high cash

² Much of the information in this section comes from U.S. Committee on Ways and Means (1999) or from Castner and Anderson (1999).

welfare benefit levels, while in low welfare benefit level states such as Texas, FSP income constitutes over half of the household's combined benefits (U.S. Committee on Ways and Means, 2000). As Table 2 shows, there is much more uniformity in the combined benefit levels than in AFDC/TANF benefits alone. Moreover, unlike AFDC/TANF, the FSP is available regardless of family structure, which makes it a particularly important part of the social safety-net for low-income households. Congress deliberately retained the centralized nature of the FSP when it further decentralized the welfare system via the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) in 1996, which underlines the importance many policy makers attach to providing a minimum federal safety net.

Although most program rules are set at a federal level, the FSP is usually operated through the same state welfare agencies and staff that run the TANF and Medicaid programs. States do have a say about some administrative features such as the length of eligibility certification periods, the design of outreach programs (which may receive 50% federal cost-sharing), and about any "workfare" requirements for participation in the program.

In the early years of the program, households had to pay cash for their food coupons, with the amount depending on the household's income. This purchase requirement was eliminated in 1977 (Kuhn *et al.*, 1996). In the early 80s, Congress enacted revisions to the FSP which were designed to hold down costs and tighten eligibility. In 1985, rules were liberalized--AFDC and SSI (Supplemental Security Income) recipients became automatically eligible; sales taxes on FSP purchases were prohibited; benefits were increased for the disabled and those with earnings; and deductions for child care and shelter were increased. Legislation passed in 1988, 1989, and 1993, has also liberalized eligibility rules for some specific groups.

Eligibility

Currently, the Food Stamp Program operates as follows: The FSP household is defined as either a person living alone or a group of people who live together and customarily purchase food and prepare meals together. Generally, people who live together will receive higher benefits if they can be counted as separate food stamp households; however married couples, and parents with children under 21 are excluded from doing this, although elderly people living with others because of disability may qualify as separate "households". The rationale for this last rule is that elderly people who are constrained to live with others by disability should not be penalized by the loss of their food stamp benefits.

Households made up entirely of TANF, SSI, or general assistance recipients are automatically eligible for food stamps. For other households, monthly cash income is the main determinant of eligibility. The FSP uses both the households "gross" monthly income and it's counted (or "net") monthly income, except for elderly or disabled households for whom only the net monthly income is counted. This procedure has the effect of creating a more lenient eligibility test for these households. Gross income includes all of the household's cash income, including income from welfare programs, but excluding several smaller sources of income including: 1) any payments made to third parties rather than directly to members of the household; 2) unanticipated, irregular, or infrequent income, up to \$30. per quarter; 3) loans; 4) income received for the care of someone outside the household; 5) nonrecurring lump-sum payments such as income tax refunds; 6) federal energy assistance; 7) expense reimbursements; 8) income earned by school children 17 or younger; 9) the cost of producing self-employment income; 10) federal post-secondary student aid (such as Pell grants and loans); 11) advance payments of federal Earned Income Tax Credits; 12) "on-the-job" training earnings of children under 19 who are in Job Training

and Partnership Act programs; 13) income set aside by disabled SSI recipients as part of an approved plan to achieve self-sufficiency; and 14) some other Federal payments such as payments under laws relating to Native Americans.

To derive net income in households without an elderly or disabled member, the following amounts are subtracted from gross income: 1) A standard deduction of \$134 per month (standard deductions in Alaska, Hawaii, Guam, and the Virgin Islands are \$229, \$189, \$269, and \$118, respectively); 2) Any amounts paid as legally obligated child support; 3) Twenty percent of any earned income; 4) Dependent care expenses related to work or training up to \$175 a month per dependent and \$200 a month for children under age 2; 5) shelter expenses that exceed 50% of counted income after all other deductions have been applied, up to a periodically adjusted ceiling of \$250 per month (different ceilings apply in Alaska, Hawaii, Guam, and the Virgin Islands).

For households with an elderly or disabled member, net monthly income is equal to gross monthly income less the same standard child support, earned income and dependent care deductions; any shelter expenses that exceed 50 % of counted income after all other deductions, without any limit; and out of pocket medical expenses (other than those for special diets) that are incurred by the elderly or disabled household members to the extent that they exceed a threshold of \$35 per month.

All households must have net monthly income that does not exceed the Federal poverty line. Households without an elderly or disabled member must also have gross income that does not exceed 130 % of the Federal guidelines. Finally, household assets must be less than \$2000 in households without elderly members, and less than \$3000 in households with elderly members. The family home and one car are excluded from the asset limits, as long as the car's value does not exceed \$4,500. These asset limits apply regardless of the household's size. The net and gross monthly income eligibility limits and maximum benefit levels for families of different sizes are summarized in Table 4a.

FSP Program Benefits and Marginal Tax Rates

Benefit levels are based on the cost of the USDA's Thrifty Food Plan (TFP) for a family of four, adjusted for household size. It is interesting to note that nutritional needs could actually be satisfied at a far lower cost than that given by the TFP. However the foods included in the TFP are chosen to approximate the food consumption patterns of low-income Americans (Ohls and Beebout, 1993).

Table 4b offers an example of the benefit calculation for a single mother with 2 children, and her own mother (the grandmother). This table illustrates a situation in which this family would get substantially more in food stamp benefits if the grandmother lives apart from her daughter than they would receive if they live together. Thus, the program appears to be designed (in part) to support the independence of elderly people.

The discussion so far highlights some of the ways in which the FSP program rules tend to favor households containing elderly members. We can compare the 4 person household in Table 4b with one in which there is a father earning \$1500, a stay-at-home mother, and 2 children, with rental payments of \$650. This household would receive a monthly benefit of \$268.20 compared to the benefit of \$370.80 for the household with the elderly member, even though this household has the same income and rental payments.

Note that households participating in the FSP are taxed at a rate of 30% for each additional dollar of earnings. Under certain circumstances, households may face even larger tax rates. For example, in 1998, the gross income limit for a family of 3 was \$1,445 while the maximum food stamp allotment was \$321 per month. If the household earned \$1,446 they would be ineligible for food stamps because of the gross income limit. If they earned \$1,444 then they would be eligible. If they took the deduction for one child, and had excess shelter expenses of \$200 then they would qualify for a benefit of \$127 per month. Thus, by earning \$2 more per month, the household would lose \$127, for a net loss of \$125!

The FSP's 30% tax rate on other income can also be regarded as a tax on state efforts

to transfer income to poor families. For every dollar that a state transfers in the form of TANF benefits, the federal government reduces FSP transfers by \$.30. This tax may serve as a disincentive for states to increase the generosity of their own cash transfer programs. Conversely, the fact that in-kind benefits are not counted as income for the purposes of eligibility determination in most federal means-tested programs, may give states an incentive to provide aid in-kind rather than in cash.

Electronic Benefit Transfer

Food stamp benefits are usually issued monthly by welfare agencies. In the past this was generally done either by mailing recipients an authorization-to-participate card which could be redeemed for coupons at specified places (such as a post office) or by directly mailing food stamp coupons to recipients. The introduction of Electronic Benefit Transfer (EBT) represents the first major shift in the way the program has been administered since 1977. Maryland pioneered EBT in 1993 and 20 other states had adopted EBT by 2000. The 1996 PRWORA legislation mandated that all states switch to EBT by October 2002.

Most EBT systems work much like bank debit cards. Recipients are given EBT cards with a magnetic stripe. At the check-out, the recipient enters a personal identification number in a terminal to authorize EBT payment of the food stamp purchase. The terminal connects to the EBT system's central computer, which maintains an account for the recipient. If the PIN is verified, and the recipient has enough funds to cover the transaction, then the purchase is authorized, and the amount is deducted from the recipient's balance. The retailer is reimbursed at the end of the day via an electronic transfer of funds from an EBT account maintained by the U.S. Treasury to the store's financial institution.

Welfare Reform and the FSP

In addition to the requirement that states switch to EBT, PRWORA required able-

bodied adults without dependents (ABAWDs) to meet stiff work-requirements, and limited their participation in the program to only three to six months in any 36 month period, unless the person is enrolled in a work or training activity. However, most states have waived these requirements for at least some fraction of their ABAWD caseloads (Gabor and Botsko, 1998).

PRWORA also disqualified legal immigrants and allowed states to alter FSP eligibility rules in order to make the program more compatible with other state welfare programs. In principle, states can use this latter provision to sanction FSP recipients who do not comply with the work requirements of other welfare programs, fail to cooperate with child support enforcement, or fail to ensure that minors attend school. However, enforcement of these types of sanctions has been relatively lax--in 1996, 40% of the 5.5 million people technically subject to work and training requirements were exempted (U.S. Committee on Ways and Means, 1998). Finally, the PRWORA beefed up the nutrition education component of the FSP considerably. Between fiscal year 1997 and 1999, nutrition education spending increased from \$32.7 million to a projected \$75 million in fiscal year 1999.

FSP Participation

Trends in program participation and expenditures from 1975 to the present are shown in Table 3. Participation in the FSP hovered around 20 million persons per year during the 1980s, but rose sharply in the early 1990s to a peak of approximately 27 million persons in 1994. Participation then began to fall again, declining back to 20.8 million participants by 1998. The passage of PRWORA coincided with the decline in FSP enrollment, which has provoked a debate about the extent to which changes in FSP participation can be attributed to PRWORA.

An alternative hypothesis is that the decline in FSP participation is due to the

booming economy of the 1990s. However, if one examines the FSP caseload as a percentage of the population that is in poverty, one also sees an increase followed by a decline. For example, as Table 3 shows, 40.9, 48.6 and 38.9% of the population with incomes less than 130% of poverty participated in the FSP in 1990, 1995, and 1998 respectively (U.S. Committee on Ways and Means, 1998). This suggests that the increase in the caseload was not driven by business cycle effects alone since downturns would be expected to increase the fraction poor, but not necessarily to increase the fraction of the poor who participated in the program. Estimates of the extent of the decline in FSP that can be attributed to good economic conditions range from 28 to 44%, suggesting that some of the remainder may be due to welfare reform, as is discussed further below (Dion and Pavetti, 2000; Wilde, 2002).

Composition of the FSP Caseload

Table 5 shows that the recent changes in the FSP caseload were also accompanied by changes in its composition. After remaining remarkably stable during the 1980s and early 90s, the fraction of the food stamp caseload with any earnings rose from 21% in 1995 to 26.3% in 1998. Over the same time interval, the fraction with AFDC (TANF) income fell from 38% to 31.4%, while the fraction with SSI income rose from 23% to 28.1%. It is possible that some of this change in the FSP caseload reflects households who took up SSI when they become ineligible for TANF, although the beginnings of the increase in the fraction of households receiving SSI appears to predate the onset of welfare reform. The fraction of households with children and single heads also fell dramatically from 50% to 39.6% between 1995 and 1998. However, the fraction of FSP households with children fell only slightly, to 58.3% from 60% (U.S. Committee on Ways and Means, 1998; USDA, July 1999).

Finally, McConnell and Ohls (2000) show that decline in the caseload has been much

more dramatic in urban than in rural areas, where about one quarter of the FSP caseload is located. In fact, the decline that did occur in rural areas can be entirely accounted for by a reduction in the number of eligible households. McConnell and Ohls also show that rural households are somewhat less likely to know that they are eligible for the FSP, or to know where and how to sign up. Nonetheless, rural households have higher takeup conditional on eligibility than urban households, and their level of satisfaction with the program is higher. For example, they are more likely to feel that they are treated respectfully by their caseworkers. Because of this difference in perceptions about treatment, McConnell and Ohls speculate that the sharper decline in FSP takeup in cities may be attributable to unhelpful caseworkers who, for example, do not inform people who lose TANF benefits that they remain eligible for the FSP.

1. b) History and Evolution of Program Rules: WIC³

As Table 1 shows, WIC differs from FSP along a number of key dimensions. First, it is not an entitlement program, which means that when the funds Congress allocates to the program run out, eligible participants can no longer be served.⁴ Second, WIC is targeted only to pregnant, postpartum, or lactating women, infants, and children less than 5. Third, WIC provides only nutritious foods, in contrast to food stamps which can be used to purchase virtually anything edible other than alcohol, tobacco, hot foods intended for immediate consumption, and (paradoxically) vitamins. The WIC program also has more specific nutritional goals than the FSP: it seeks to improve fetal development and reduce the incidence of low birthweight, short gestation, and anemia. Recently, WIC has also

³ Most of the following information about the WIC program comes from these sources: Bitler, Currie, and Scholz (2002); U.S. Congress (1996); Randall, Boast, and Holst (1995); U.S. Committee on Ways and Means (1999); and Hamilton and Fox (2000). Other sources are noted, where appropriate.

⁴ Technically, FSP is not an entitlement program either, but Congress has always appropriated sufficient monies to fully fund the program.

recognized that the reduction of overweight is also a goal of the program.

The 1969 White House Conference on Food, Nutrition and Health documented nutritional deficiencies among low-income pregnant women, infants, and children, and was one of the major factors leading to the establishment of WIC in 1972 (by amendment to the Child Nutrition Act of 1966). In 1975, the age limit was changed to allow children to participate up until their 5th birthdays, and amendments in 1978 established income eligibility standards, defined "nutritional risk", required that one-sixth of administrative funds be allocated to nutrition education, and directed the Secretary of Agriculture to regulate the types of foods provided to WIC participants. Legislation in 1989 required states to seek rebates on purchases from infant formula manufacturers.

WIC is administered by the Food and Consumer Service (FCS) of the USDA, and by state WIC agencies (in 1994 there were 84 "state" agencies covering the 50 states, District of Columbia, Guam, Puerto Rico, the Virgin Islands, and 30 Indian Tribal Organizations). In turn, these state organizations operated 2,129 local WIC agencies which operated at about 10,000 sites. Most local agencies are state, county, or municipal health departments, but other organizations such as hospitals or maternal and child health programs can also serve as WIC agencies.

WIC Benefits

The program provides a combination of food supplements, nutrition education, and access to health services. The food packages are tailored to provide the specific nutrients which are most likely to be lacking in the diets of the target populations. The included foods are good sources of protein, iron, calcium, and vitamins A and C. Food packages are usually provided in the form of vouchers or checks that are redeemable only for certain types of food at participating grocers, although in a few areas participants receive deliveries of food items, or pick them up from a central location. The monthly value of the food package

provided in 1994 varied from \$40.49 in the Southeast to \$52.68 in the West. With rebates for infant formula, the cost to state agencies for these packages were \$29.08 and \$43.34, respectively. Food retailers enter into annual contracts with state or local WIC agencies, in which they agree to accept WIC coupons; to charge less than or equal to the going price; to accept training; and to submit to reviews by WIC agencies.

WIC agencies are required to offer participants at least two nutrition education sessions during each certification period. These may include one-on-one counseling, group classes, or films and videos, for example. Participants are usually required to pick up WIC vouchers during scheduled nutrition education sessions (though the sessions themselves are not compulsory), although at times when such sessions are not scheduled vouchers may be mailed. WIC agencies are also required to assist WIC participants in obtaining preventive health care services either through the provision of services on-site, or through referrals to other agencies. In fact, state WIC agencies are required to give priority for funding to local agencies that provide "ongoing, routine pediatric and obstetric care" (U.S. Congress, 1996).

WIC Eligibility

A person must be categorically eligible in order to receive WIC benefits. That is, the individual must be a pregnant, breastfeeding, or postpartum woman; an infant up to the age of one year; or a child aged one through four years. In addition to falling into one of these categories, the individual must be income eligible. Income cutoffs are set by the states, but must be between 100% and 185% of the federal poverty line. In fact, all states have adopted 185% of poverty as the income cutoff. When determining income eligibility, cash income from Social Security, welfare or other public assistance is counted, while in-kind transfers in the form of NSLP and FSP benefits are excluded. Some small sources of income such as income from Home Energy Assistance, youth employment demonstration programs, and payments made to volunteers are also excluded.

In addition, individuals may qualify because they are “adjunctively eligible”. That is, people who participate in AFDC/TANF, Food Stamps, or Medicaid are eligible for WIC even if their incomes exceed the 185% cutoff. Some states also have adjunctive eligibility for other programs, such as Head Start and SSI. Recent expansions of the Medicaid income cutoffs for pregnant women, infants, and children mean that many people with incomes above 185% of poverty are now eligible for WIC. In some states, children with incomes up to 300% of poverty may be eligible. Some commentators feel that these largely unintended expansions of the WIC program to people of higher income are inappropriate and should be reversed (c.f. Besharov and Germanis, 2001).

Participants must also be "at nutritional risk". Among women, inadequate or inappropriate nutrient intakes, general obstetrical risks, hemoglobin or hematocrit measures below specified state cutoffs, and high weight for height are commonly reported risks. Among children, common risks include: inappropriate or inadequate nutrient intake, and low hemoglobin or hematocrit levels. Over two-thirds of WIC infants are classified as "at risk" either because their mothers are currently at risk or because the mothers were at risk during pregnancy. In practice, it seems that virtually all income-eligible individuals are certified as “at risk”, usually on the basis of inappropriate nutrient intakes if they do not meet any other risk criteria (Institute of Medicine, 2002). This fact becomes less surprising when one considers that current nutritional guidelines state that everyone should have five servings of fruits and vegetables per day.

Participants are certified "WIC eligible" for fixed periods. For example, pregnant women are certified for the duration of their pregnancies and up to six weeks postpartum. Postpartum women are certified for up to six months. Breastfeeding women and infants may be recertified at intervals of six months, up to the infant's first birthday, and children are certified every six months up to the month in which the child reaches the fifth birthday. States may also establish shorter certification periods for applicants deemed to present a risk

of fraud or abuse.

Areas of State Discretion: WIC

As discussed above, the number of participants served is limited by each year's Congressional appropriation. In each state, a maximum caseload is set for each local agency. When the agency reaches this ceiling, a priority system is used to allocate scarce places and other eligible applicants go on a waiting list. These priorities are intended to give preference to medically based nutritional risks, rather than to those that are based only on inadequate diets. The priority system is illustrated in Chart 2, which shows that states have some latitude in assigning priority rankings. In practice, no states have had waiting lists for the program in recent years.

Chart 3 describes other dimensions of state discretion, including the tailoring of food packages, the frequency with which food instruments are issued, whether or not participants in other programs are automatically eligible, income documentation and verification policy, policies for obtaining dietary information, documentation of nutritional risk, and standards for determining nutritional risk. For example, while most states specify brands that can be purchased using WIC coupons, some large and important states such as Texas do not. Also, while most states issue WIC coupons monthly, there is a sizeable number that issue them bimonthly, quarterly, or at intervals determined at the discretion of the local office. In 10 states, family members of NSLP participants are automatically eligible for WIC. A surprising number of states (26) did not require documentation of income, until the federal government ordered states to begin requiring such documentation in April 1999. Standards for nutritional risk have also varied considerably from state to state. For example, in New Hampshire, infants below the 25th percentile of height-for-age are considered to be at risk, while in neighboring Massachusetts, infants must be below the 11th percentile to be deemed at risk.

WIC Participation

In the quarter century since it was authorized as a permanent program, WIC has shown virtually continuous growth from fewer than 1 million participants in 1977 to approximately 7.4 million participants per month in 1998, as shown in Table 3. The caseload in 1999 was composed of 23% women and 20% infants, while the rest were children (U.S. Ways and Means, 2000). However, Burstein et al. (2000) show that child WIC participation tends to fall off greatly after the child's first birthday, presumably because the value of the WIC food package is much reduced once the child stops using infant formula.

Table 3 shows our estimate of the WIC population as a fraction of infants and children meeting the categorical and income eligibility standards (but not including the adjunctively eligible). We ignore the nutritional risk criteria, since most people who are income-eligible seem to satisfy them in practice. The figures show that by 1998, approximately 60% of the low income population of infants and children less than 5 participated in WIC.⁵ A 1996 study indicated that 60% of those participating in WIC were poor, 25% were on AFDC, 36% received Food Stamps, and 55% were on Medicaid.

Bitler, Currie and Scholz (2002) present a more detailed analysis of participation using data from the Survey of Income and Program Participation, which allows them both to identify monthly income and to identify pregnant and post-partum women more accurately than the CPS data allows. They include those that were adjunctively eligible through participation in other programs and calculate that 58 % of all infants in any given month in 1998 were eligible for WIC! Roughly 45 % received WIC benefits so that the takeup rate among eligible infants was 73.2 %. Among children 1 to 4, 57 % were eligible for WIC and 38 % of eligible children

⁵ Concern has recently been expressed about participation among infants that exceeds USDA estimates of the number of eligibles. However, there are several problems with the way that USDA calculates the number of eligibles. For example, they do not include those who are adjunctively eligible (National Research Council, 2002).

received benefits. The difference between this estimate and that in Table 3 reflects the low takeup among relatively high income children who are adjunctively eligible. Estimates for pregnant and post-partum women are less accurate, since it is not possible to observe infant feeding practices, but they estimate that 54 % of all pregnant and post-partum women are eligible for WIC and that 66.5 % of these women received benefits.

1. c) History and Evolution of Program Rules: NSLP

The NSLP is in some respects, an intermediate program between the FSP and WIC. Like the FSP, it is an entitlement program, and most schools with eligible children participate. Like WIC, it is targeted to children. Unlike FSP, benefits include only meals that follow U.S. Department of Agriculture (USDA) approved meal plans. However, until recently, these meal plans did not have to follow the Dietary Guidelines for Americans (USDHHS and USDA, 1995), and school meals were often criticized for being high in fat and sodium and low in carbohydrate, fruits, and vegetables (c.f. Gordon, Devaney, and Burghardt, 1995).

The NSLP was established in 1946 in response to nutrition deficiency-related health problems identified among young men being drafted during World War II. Perhaps this is why the legislation governing the program states that "It is declared to be the policy of Congress, as a measure of national security, to safeguard the health and well-being of the Nation's children and to encourage the domestic consumption of nutritious agricultural commodities and other food... [through] school lunch programs" (U.S. Congress, 2000). As this language suggests, a primary goal of the program is to provide meals that include minimum daily requirements of key nutrients. A secondary purpose is the disposal of agricultural surplus.

Changes to the program over the past 20 years include attempts to alter meal guidelines in order provide healthier meals and reduce waste, as well as a decreasing

emphasis on the use of surplus commodities. These changes include the development of the "Offer vs. Serve" option, which allowed schools to be reimbursed for lunches in which students were offered all 5 components of the school lunch meal pattern, as long as students chose at least three components.⁶

The Food and Nutrition Service of USDA oversees administration of the program through local state agencies (usually departments of education). In turn, the state agencies provide technical assistance to local school food authorities, who provide assistance to individual schools.

NSLP Benefits

The program provides a flat per meal subsidy to participating schools, as long as the meals served conform to program guidelines. The subsidy depends on the income of the students served, as shown in Table 7. Note that the NSLP subsidizes school lunches served to children at all income levels, so that in principle, even schools without poor students can participate. The subsidies can be compared to the average "full price" charged to children with incomes above 185% of poverty which are also shown in the table. Additionally, schools receive commodities for use in school lunches. These commodity subsidies are available regardless of the incomes of the students served. Schools can ask for cash instead of actual food products, and they can ask for additional bonus commodity aid, if it can be used without waste.

In 1994, Congress passed the Healthy Meals for Healthy Americans Act which required the Department of Agriculture to develop a new menu planning system that schools can use to meet the specific nutrient standards set out in the Dietary Guidelines for Americans. Now, rather than choosing a specific number of items from a list, schools can

⁶ The 5 elements were: 1 serving of a meat or meat alternate, 2 servings of vegetables, fruit and/or juice, 1 serving of bread or bread alternate, and 1 serving of milk.

use whatever portions and combinations of food they wish in order to meet these guidelines. Chart 1 shows the guidelines that school lunches are currently required to meet. In response to the Act, USDA has also implemented the School Meals Initiative for Healthy Children to provide nutrition education to both children and food service staff (Hamilton and Fox, 2000).

USDA is also working to improve the nutritional quality of commodities distributed to NSLP schools by, for example, reducing the sodium in canned vegetables and offering low fat beef patties. It is worth noting that a historical goal of the NSLP has been to provide an outlet for surplus agricultural commodities. In the past, there was less conflict between this goal, and that of guaranteeing minimum daily intakes of important nutrients. However, in a world where obesity is an increasing problem, the disposal of large amounts of foods such as full-fat milk, cheese, and peanut butter can pose problems for program staff who are attempting to provide a healthy diet to program recipients.

NSLP Eligibility

Determination of income eligibility for the program is left to the schools. For example, in the Los Angeles Unified School District, parents are asked to fill in a form at the beginning of the year, and children who are certified eligible on the basis of these self-reports receive coupons that can be redeemed for meals.⁷ The standard form parents fill out requires them to give the names and social security numbers of all adult household members, as well as the household's current income (i.e. income last month) and its sources. Some subsample of parents is chosen for verification of income eligibility. In principle, parents are required to report changes in income which would make their children ineligible for the program. In practice, it appears that this provision is not enforced and so

⁷ This description came from a graduate student whose children participate in the program.

certifications are generally for the duration of the school year.

NSLP Participation

Ninety-nine percent of public schools and 83% all (public and private) schools participate. Nationally, 92% of students have the program available at their schools (Burghardt and Devaney, 1995). In 1996, 57% of the 45.3 million children enrolled in participating institutions (i.e. almost all schools) participated in the NSLP. Eighty-six percent of these participants received free lunches, indicating that they came from households with incomes less than 1.3 times the federal poverty line (U.S. Committee on Ways and Means, 1998).

As Table 3 shows, participation in the NSLP fell in the mid 1980s but has recovered steadily since 1985, and is now at historically high levels. In 1998, 27 million children received meals under the program. An increasingly large fraction of the total meals served are free, that is, they are served to children from households with incomes less than 130% of poverty. This increase in the numbers of poor children participating in the NSLP is particularly remarkable given the economic expansion of the 1990s, and the fact that much of the recent decline in the FSP caseload has been attributed to buoyant economic conditions. The bottom panel of Table 3 shows that while NSLP participation as a fraction of the 5 to 17 year old child population has remained roughly constant over the past 15 years, participation in the free meals part of the program as a fraction of the 5 to 17 year old population with incomes less than 130% of poverty has increased steadily.

1. d) Interactions of FANPs with Other Programs

Many participants in FANPs also qualify for other types of social assistance. As discussed above, those on AFDC and SSI qualify automatically for the FSP, children in TANF and FSP are qualified to receive free school meals, and in most states, income criteria

for WIC are automatically deemed to have been met by participants in Medicaid, FSP, and TANF. In-kind benefits such as those provided by FANPs are not included as income for the purposes of calculating eligibility for other FANPs. Participation in one social program may also increase knowledge about other programs. For example, staff in WIC agencies often provide information to those eligible for other programs, which may contribute to multiple program use among WIC participants (Randall, Boast, and Holst, 1995).

Table 5 indicates that in 1998, 31% of food stamp households received AFDC while 28% received SSI. Food Stamp households also received assistance from General Assistance (6%), Social Security (23%) and Unemployment Insurance (1.6%) (U.S. Committee on Ways and Means, 1998). In all, 79% of FSP households received some other form of cash assistance. Table 6 shows the fraction of AFDC and SSI households who also received assistance from FANPs over the period 1984 to 1998.

Households participating in WIC and in NSLP face "notches" in their budget constraints which are similar to that described above for the FSP. If households participate in more than one program, then the notches can be even bigger. For example, both the FSP and NSLP have income cutoffs of 130% of poverty. Thus, in the example above, if the household had participated in both programs, then it would lose \$125 in FSP benefits, and would also have to start paying for school lunches (at the "reduced price" rate). If we assume that a student attends school 22 days a month then the move from free to reduced price status would cost the household a further \$8.36 per month.

Currie and Grogger (2001) show that among single heads, a quarter of the reduction in Food Stamp participation rates may be attributable to increases in the generosity of the Earned Income Tax Credit program, which moved many of these households above the income threshold for the program. Thus, this study suggests that it is important to consider other programmatic changes that may have had effects on Food Stamp participation.

Finally, an interesting feature of the FSP is that it subsidizes rents and so to some

extent is actually a housing program.⁸ For example, suppose that the 4 person household depicted in Table 4b moved from a \$650. apartment to a \$800. per month apartment. The deduction that they could claim for rent would rise from \$342 to \$492 per month, and the value of their food stamp benefit would increase from \$325.80 per month to \$370.80 per month. Thus, the increase of \$150 in rental payments would be offset by an increase in \$45 in food stamp benefits. On the other hand, if this household did not contain an elderly member, rental deductions would be capped at \$250 and there would be no offset. Similarly, for the elderly, the FSP subsidizes out of pocket medical expenditures, and thus can be viewed as a medical insurance policy that "wraps around" coverages provided by the Medicare and Medicaid programs.

1. e) Financing and Quality Control Issues

The Food Stamp Program

Funding for the FSP is overwhelmingly federal. In addition to funding the benefits, the federal government pays its own administrative costs, and at least 50% of the state's administrative costs. The USDA Food and Consumer Service retains responsibility for approving and overseeing participation by retail food stores and other outlets that may accept food stamps. The FNS is responsible for monitoring stores that participate in the FSP, while states are responsible for monitoring individuals.

It is difficult to come up with any reliable estimate of the extent of fraud in the FSP. Various types of abuse are possible. For example, recipients may sell coupons at a discount to other individuals or to stores. Or stores may allow recipients to keep most of the change from a small food purchase or to purchase non-food items. Or ineligible individuals may attempt to qualify for benefits.

The federal quality control system is directed at reducing erroneous determinations

⁸ I am grateful to Edward Olson for pointing out this feature of the FSP.

about individual's eligibility for benefits. Under this system, state welfare agencies continuously sample their active food stamp caseloads as well as decisions to end or deny benefits. Over 90,000 cases are reviewed each year. These reviews yield a picture of the extent to which states erroneously award or deny benefits, as well as estimates of the dollar amounts of benefits involved. In 1996, the national weighted average overpayment rate was estimated at 6.9%, and the underpayment rate was estimated at 2.3%. The rate of improper denial of benefits was 3.8% (U.S. Committee on Ways and Means, 1998).

States are subject to sanctions if their combined over and underpayment dollar rates exceed the national average error rate for the year in question. In most cases these sanction amounts can be used by states to improve the administration of FSP benefits. The Food and Nutrition Service of USDA is also active in matching FSP data bases to other data bases in order to track down households that are receiving benefits for deceased individuals and prisoners. Four states have developed systems for using finger prints to verify FSP recipient's identities.

However, a series of General Accounting Office (GAO) reports documents the fact that these efforts to monitor individual eligibility are not always successful. The GAO has found that millions of dollars in overpayments were accounted for by payments to households including inmates, deceased individuals, households that were receiving benefits in more than one state, and individuals who had already been disqualified for program violations. For example, a four state audit study found that \$500,000 had been collected by 3,000 previously disqualified individuals. However, while this is a substantial dollar amount, it is very small relative to the \$5.6 billion in food stamps that was paid to 6.4 million individuals over the period of the study in these four states (U.S. GAO, Sept. 1999).

A second type of abuse involves individuals who illegally sell their food stamp benefits. The extent of this type of trafficking is unknown, but one interesting study of the issue found that it was not uncommon for the same individual to both buy and sell food

stamp benefits within the month, usually to other individuals (Ciemnecki *et al.*, 1998). For example, a recipient might receive their cash TANF benefit at the beginning of the month, and use this cash to buy needed food. Their monthly FSP benefit might be received some days later, and be exchanged (at a 30 to 50% discount) for cash. Then, if cash is received at some later point in the month, it might be used to purchase FSP benefits (again at a discount), which would then be exchanged for food.

In this scenario, severe liquidity constraints drive the trafficking. The value of the FSP benefit may be less than the household's monthly food budget, but the household is forced to budget on a day-to-day basis, and the monthly FSP allotment is likely to exceed the amount the household plans to spend on food in the next few days. The study authors note that EBT technology *per se* is not likely to be a particularly effective deterrent to this type of trafficking, since the buyer and the seller can simply go to the store together. However, the study results suggest that crediting the FSP benefits to the recipients card at smaller time intervals might prevent this type of trafficking.

A second form of trafficking occurs when individuals sell their benefits at a discount to stores, who then redeem them at full value. This form may be viewed as more pernicious, in that it reduces the total amount of food that is purchased using the FSP benefits. The USDA estimates that about 2% of FSP benefits are lost due to this type of fraudulent claim, and that a further 3.7% are illegally trafficked in this way (U.S. Committee on Ways and Means, 1998). These estimates appear to be based on extrapolations of verified instances of fraud to the population of food stamp retailers. For example, Macaluso (1995) found that although 9.4% of stores investigated by FNS were trafficking, only a small percentage of the large, publicly owned grocery stores that were investigated engaged in trafficking. Since these stores account for most of the redemptions of food stamp coupons, he infers that the total amount of trafficking is small. On the other hand, he finds that more than 1 in every 7 dollars of benefits is trafficked in those small, privately-owned stores not

stocking a full line of food which were investigated by FNS. Similarly, in neighborhoods where the poverty rate exceeds 30%, one in five stores investigated by FNS were trafficking.

The problem with extrapolations from estimates based on FNS investigations to the national level is that first, FNS is more likely to investigate stores where abuses are suspected than those in which abuses are not suspected. Second, FNS is unlikely to catch all of the offending stores. The first factor means that extrapolation tend to produce over-estimates of trafficking, while the second factor means that extrapolations tend to produce an under-estimate.

Although trafficking in food stamps is illegal, penalties do not appear to be particularly harsh. Individuals are typically disqualified from the program for one year for a first offence, two years for a second offense, and permanently for a third offense or for trafficking an amount that exceeds \$500 (U.S. GAO, March 2000). Stores are generally assessed a fine, but these fines are apparently seldom collected. The General Accounting Office reports that between 1993 and 1999, the FNS levied \$78 million in fines, but collected only \$11.5 million (U.S. GAO, May 1999). The GAO suggests that FNS would have more success if it referred the delinquent debt to the Dept. of the Treasury, which could deduct the debt from any future federal payments made to the store owners.

The Special Supplemental Nutrition Program for Women, Infants, and Children

The seven regional offices of the U.S. Food and Nutrition Service issue regulations and provide cash grants to state WIC agencies. In turn, the state agencies provide funds to local agencies, monitor local compliance with regulations, and provide technical assistance to local staff. State WIC agencies are required to report to the FCS a "Minimum Data Set" of 18 items from their client and management information systems. These items may be reported either for all clients, or for a representative sample. They include: State agency

identification; local agency identification; service site identification; case identification; date of birth; race/ethnicity; certification category (i.e. pregnant woman, breastfeeding woman, postpartum woman, infant, child); expected date of delivery or weeks gestation; date of certification; sex; priority level; participation in TANF, Medicaid, or food stamps; migrant farmworker status; number in family; family income; nutritional risks present at certification; hemoglobin, hematocrit or "EP Value"; weight; height; and date of height and weight measure. However, despite these requirements, in 1994 data on income was submitted for only 86% of the caseload, while data on other program participation was submitted for only 92% of the caseload (Randall, Boast and Holst, 1995). In addition to this minimum data set, some states also report information on birthweight, birth length, source of prenatal care, duration of breastfeeding, and food package codes.

State agencies are also required to conduct on-site reviews of at least 10 % of their vendors each year, and to submit the results of this monitoring to FCS annually. Methods of on-site monitoring may include reviews of check-out procedures, inventory records, and prices charged to WIC recipients. In the two year period between October 1, 1996 and September 30, 1998, about 9% of WIC vendors were identified as having committed fraud or abuse (U.S. GAO, August 1999). This estimate is remarkably close to Macaluso's (1995) findings for the FSP. Presumably the fraud takes much the same form (e.g. vendors purchasing WIC coupons at a discount). However, no estimate of the dollar losses associated with WIC coupon trafficking is available. It is also unclear whether these vendors are sanctioned any more effectively than those defrauding the FSP.

In contrast to the FSP, where an extensive effort is made to monitor individual compliance with eligibility standards through the federally-mandated quality control system, there does not appear to be any federally coordinated attempt to eliminate fraud at the individual level. Bitler, Currie and Scholz (2002) estimate using data from the SIPP that of the infants receiving WIC in any given month in 1998, 5.9 % were ineligible for the benefits.

Similarly, of the 3.7 million children receiving benefits, 5.4 % did not meet the income or adjunctive eligibility criteria (and had not done so for the past six months). These error rates are consistent with those reported in the National Survey of WIC Participants (2001). The GAO recently recommended FCS to direct state agencies to require participants to provide evidence that they reside in the states in which they receive WIC benefits and to provide identification when their eligibility is certified and when they receive food or food vouchers (U.S. GAO, March 2000).

One type of fraud that may occur with WIC is the trafficking of infant formula obtained free under the program. Given the high cost of formula, it might be tempting for a low-income mother to sell the formula she receives from WIC and give her older infant either solid food or cow's milk as a replacement. It is not known whether many mothers engage in this practice, but there is anecdotal evidence of a substantial market in WIC formula.

National School Lunch Program

Table 7 indicates that the federal subsidies for lunches served to those below 185% of the federal poverty line exceed the "full price" of lunch charged to wealthier students. Glantz *et al.* (1994) conducted a more detailed analysis of the costs of the lunch program and found that federal subsidies for the free or reduced price meals often produce a "surplus". Because the program is required to be non-profit, these subsidies are generally used to subsidize either the cost of full-price meals and "a la carte" food items consumed by wealthier students, or kitchen equipment (Rossi, 1998). In addition to the federal funds represented by these subsidies, states are required to match 30% of the federal expenditures on the program, less the percentage by which the state per capita income is below the per capita income of the U.S.

Quality control procedures in the NSLP are aimed primarily at insuring that

participating schools comply with program regulations (U.S. Congress, 2000). The first set of requirements cover the "lunch counting and claiming system". Schools submit monthly claims to the responsible state agency (usually the Dept. of Education) for reimbursement. School food authorities are required to conduct annual, on-site reviews of each school's procedures for establishing the "counts" of free, reduced price, and full price lunches that are claimed, and to compare these counts to data regarding the number of eligible children in each school and attendance records.

Schools are further required to maintain files of approved and denied applications for free and reduced price lunches which include the children's names, and documentation certifying that the child is in an eligible household. In households that are selected for income verification, parents are asked to either send papers that show that they get food stamps or TANF, or papers that show the household's current income. The latter may include pay stubs for each job, social security retirement benefit letters, unemployment or disability compensation check stubs, benefit letters from welfare agencies for those receiving General Assistance, child support checks, or a brief note explaining how food, clothing and housing are obtained by those who report "no income". Parents who do not reply to this request for income verification have their benefits cut off. All records pertaining to income eligibility must be maintained for a period of 3 years.

School food authorities are required to provide a list of all schools in which 50% or more of the children are certified eligible for free or reduced-price lunches to state authorities, and states are required to check that these schools are indeed in high-poverty areas. Finally, schools are required to keep production and menu records sufficient to demonstrate that the nutritional content of lunches served meets federal requirements when the lunches are averaged over the course of a week.

II. Evidence About the Overall Efficacy of FANPs

The apparent decline in the extent of hunger in America (as measured by the prevalence of nutritional deficiencies such as anemia or vitamin deficiencies rather than by food insecurity) begs the question of the extent to which FANPs can be credited with bringing about the decline. For example, an alternative hypothesis is that the reduction in hunger reflects steady decreases in the real price of food as well as increases in its availability over time. The fraction of income that a typical American family spends on food has declined from one-third to less than one-sixth since the mid-1960s (Citro and Michael, 1995), and as we will see below, even among FSP households, the typical family spends less than 15 cents out of every dollar of cash income received on food. On the other hand, Bhattacharya et al. (2001) find evidence of a “heat or eat” effect in which the food consumption of poor families suffers when cold weather strains the family budget. This suggests that FANPs do not provide complete insurance against this type of shock.

This section discusses evidence regarding the overall effectiveness of FANPs. Tables 8, 9 and 10 provide an overview of the large number of studies that have been devoted to identifying effects of the FSP, WIC, and NSLP on a long list of outcomes. Before proceeding with a discussion of selected studies, I offer some comments regarding what types of effects one might expect, the different types of outcomes that can be measured, the identification of program effects, and other methodological issues.

Theory

Economic theory suggests that if the value of the FANP benefit is less than the amount the family would have expended on food in any case, then it will have no more effect on consumption of food than an equivalent cash transfer. Hence, if the family spent only 15 cents of every dollar of income on food, a dollar’s worth of FANP benefits would also be expected to increase spending on food by only 15 cents. The rest of the dollar would

presumably be spent on other goods. FANPs like WIC and NSLP which provide specific food items may also impact the type of goods that are consumed, to the extent that they supply goods that would not otherwise have been chosen by the family. For example, a child may drink more milk and fewer soft drinks if milk is supplied in the school lunch or subsidized through WIC.

On the other hand, the impact of programs that target benefits to a specific individual in the household may be mitigated by compensatory actions taken in the household. For example, if a child is participating in school breakfast and lunch, a parent may feed that child less at dinner and might feed another non-participating child more. Thus, it is not obvious that increasing the consumption of certain nutrients at some meals will increase overall consumption of those nutrients. The first thing evaluators of FANPs typically examine is whether participation in the FANP increases food expenditures and/or changes nutrient intakes.

If the FANP does change nutrient intakes, then it may or may not have a measurable impact on other aspects of child well-being. For example, if a FANP encourages a child to consume more of a nutrient which is already consumed in adequate amounts, then this is unlikely to have any beneficial effect, and could in fact be harmful if it encouraged over-eating. Only FANPs which help children to overcome nutritional deficiencies, improve their diets, or stabilize their consumption patterns (in the case of households that are food insecure, but consuming an adequate number of calories) are likely to have a positive impact.

Measurement Issues

Whether or not FANPs are judged to be effective depends in part on what outcome measure is chosen. There are three broad classes of nutritional outcome measures that have been examined. The first group measures "food insecurity". For example, people may be

asked how often they missed a meal because there was no food in the house, or whether they worried about running out of money to buy food. A recent USDA report (Nord, Jemison, and Bickel, 1999) found that 1 in 10 U.S. children suffered from food insecurity.⁹ Food insecurity has been linked to higher levels of hyperactivity, absenteeism, aggression and tardiness as well as impaired academic functioning among children (Murphy *et al.*, 1998).

A second set of measures indicate whether or not a person suffers from an identifiable nutritional deficiency. For example, even mild iron anemia has been linked to cognitive shortfalls and inability to pay attention in children. These deficiency measures may be assessed using actual blood or urine tests, but due to the cost of collecting these measures, most studies rely on self-reported food diaries that keep track of either household nutrient availability or individual nutrient intakes over a specified period of time. One problem with all of these deficiency measures is that many contemporary threats to health are linked to over-consumption rather than under-consumption of nutrients.

The third set of nutritional measures are anthropometric indices such as birthweight, body mass index, height-for-age, or weight-for-height. These measures have the advantage of being objective and accurate (when taken by trained technicians). Birthweight is the single most important indicator of a newborn's health. Infants weighing less than 5.5 pounds at birth are considered to be low birthweight, while those who weight less than 2.5 pounds are very low birthweight. Low or very low birthweights are linked to higher than average risks of infant mortality, chronic conditions, and delayed development.

Body mass index (BMI) is defined as weight in grams divided by the square of height in meters. Adults with a BMI over 30 are considered to be obese and are at higher risk of mortality from a range of illnesses. Height-for-age is considered to be a long-term measure

⁹ The definition used in this study included those who answered yes to questions ranging from: "We worried whether our food would run out before we got money to buy more" to "In the last 12 months did any of the children ever not eat for a whole day because there wasn't enough money for food?"

of nutritional status. However, in developed countries, few individuals are stunted (i.e. far below normal height-for-age). Weight-for-height can be viewed as a shorter run measure of nutritional status, though again, in developed countries individuals are more likely to suffer from excessive weight than from wasting (i.e. low weight-for-height).

The link between food insecurity and other measures of nutritional outcomes is quite weak. In the USDA study, only 3.5% of households had food insecurity severe enough that one or more household members ever went hungry. Bhattacharya, Currie and Haider (2001) show that among children, standard poverty measures are more highly correlated with actual nutrient intakes than food insecurity, and that among teens, neither measure correlates well with objectively measured nutritional deficiencies. It is possible that in many cases food insecurity reflects social problems such as dysfunctional families, homelessness, alcohol and drug abuse, or (especially in the elderly) inability to shop for and prepare food more than it reflects actual food shortages.

Finally, many studies of FANPs examine the effects of the programs on food expenditures. The implicit assumption seems to be that families with higher food expenditures will be better nourished, though as discussed above, this assumption is suspect in a world in which many people both consume excessive calories and have nutrient deficiencies.

Identification of Program Effects and Other Econometric Issues

As Table 8 illustrates, the modal study of the FSP, for example, compares eligible participants to eligible non-participants using a multiple regression model. The main problem with drawing inferences about the efficacy of the FSP from this exercise is that participants are likely to differ from eligible non-participants in ways that are not observed by the researcher. Thus, for example, Basiotis *et al.* (1998) and Butler *et al.* (1996) both find that participation in the FSP *reduces* consumption of some important nutrients. Since it is

hard to imagine how giving people food coupons could do this, one suspects that these results are driven by negative selection into the FSP program. That is, those who participate may be less likely to eat a healthy diet for reasons that have not been controlled for in the regression models estimated by these researchers. Since participation of eligibles is not complete in any of these programs, the selection problem is ubiquitous in this literature and applies to all studies that attempt to examine impacts of the programs.

The standard approach to this problem is to find an instrument, that is, a variable which affects program determination but has no independent effect on outcomes. For example, if there was a lot of variation in the rules determining eligibility, and the variation in these rules was not related to variation in the outcomes of interest, then program rules could be used as instruments for predicting participation, and the outcome of interest would then be linked to predicted participation. However, if states were less likely to require income verification for WIC applicants in states with a high incidence of low birthweight, then variation in this program rule might not be a valid instrument for WIC participation.

Unfortunately, at least from the point of view of researchers, most FSP and NSLP rules are set at the federal level and have shown little change over time which means that these rules are not good candidate instrumental variables. However, some rules, such as those setting recertification periods for the FSP are set at the state level, though this potential source of identification has not been exploited in any extant study of child outcomes. In contrast to FSP and NSLP, there is a great deal of variation in WIC program rules across states, and also some variation over time. Thus, WIC program rules offer an apparently more promising source of instrumental variables, though to date only one study (Brien and Swann, 1999) has taken advantage of this source of identification to examine effects on child outcomes. Bitler, Currie and Scholz (2002) show that these differences in state program rules are correlated with WIC participation in the ways that one might expect.

One promising identification strategy is to exploit interactions between programs.

For example, as discussed above, households receiving cash welfare are generally categorically eligible for FANPs. Thus, it could be argued that factors which encourage participation in welfare programs, also affect participation in FANPs by reducing the transactions costs associated with enrolling in the program. If these factors have no direct impact on outcomes, then they will be valid instruments. For example, recent expansions of eligibility for the Medicaid program may have had the effect of bringing people into welfare offices, where they also signed up for the FSP. If Medicaid has no direct effect on food expenditures, then changes in Medicaid rules may be valid instruments for FSP participation in models of food expenditures. Welfare reform may be having the opposite effect, driving people out of welfare offices and increasing the transactions costs associated with claiming and maintaining FSP eligibility. Thus welfare reform offers a potential source of identifying variation in program rules, though one would have to be cautious about assuming that, for example, termination of cash benefits had no independent effect on the outcomes of interest.

In the absence of strong instruments, many studies have either simply punted on the issue of identification, or have used a weaker design. For example, many studies reviewed in Tables 8, 9, and 10 use what might be termed a "dose-response" methodology in which it is argued that other things being equal, the effect of a program ought to be greater, the greater the size of the benefits. There is some variation in the benefit levels received, for instance, by FSP households of similar size, because these households may have differing levels of earned and unearned income (e.g. different TANF payments), pay different amounts of rent, and have different demographic structures. However, since all of these sources of variation (with the possible exception of state differences in TANF payments) reflect choices made by households, it is not clear that they are a legitimate source of identification of program effects. These identification problems should be kept in mind in the following discussion of estimated program effects.

Other econometric issues which are sometimes noted in studies of FANPs include:

discussions about functional form; controls for household size and composition; controls for the number of meals consumed away from home; and weighting issues. All of these issues raise thorny questions for which there are no obvious answers. In terms of functional form, there is little evidence to suggest that any particular form is "correct". However, a general rule of thumb might be to estimate as flexible a functional form as the data will permit.

Controlling for household size and composition is also tricky. The reason why one would want to control for these factors is that children are presumed to need less food than adults, and women to need less food than men on average. Researchers often use "equivalence scales" which seek to convert all household members into the equivalent number of adult males. However, given that the equivalence is unlikely to be exact, this practice undoubtedly introduces measurement error. For example, female-headed households might be more likely to meet their Recommended Daily Allowances (RDAs) of nutrients just because the targets levels are set lower for these households. A cleaner solution to the problem of heterogeneity in household composition may be to include a full set of controls for household composition in the model.

There is no usual practice regarding the treatment of the number of meals consumed away from home. Many studies ignore the issue entirely, while others use an *ad hoc* adjustment. These adjustments may also introduce biases. If for example, the nutritional content of food consumed away from home is assumed to be too low, then household that eat out less will be more likely to meet their RDAs. Clearly, what can be done is limited by the data available in any particular survey.

Finally, many studies are based on surveys with complex sampling designs, and the use of sampling weights may have a considerable impact on the estimates. However, it is often unclear which weights should be used, particularly in studies in which subsets of participants are examined.

The Efficacy of the FSP

The National FSP Survey of 1996 found that 50% of FSP participants experience some level of food insecurity. While on average the levels of nutrients available to respondents exceeded RDAs, substantial numbers of FSP recipients failed to meet the RDAs for some nutrients. For example, 31% of FSP households did not meet the RDA for iron, while 21% did not meet the RDA for folate (Cohen *et al.*, 1999). Simple comparisons of FSP participants with non-participants also typically find that the former are more likely than the latter to report food insecurity, are more likely to suffer vitamin deficiencies, and, at the same time, have higher BMI (Bhattacharya and Currie, 2000). Clearly participation in the FSP does not eliminate nutrition-related problems. Still, it is possible that the FSP makes households significantly better off nutritionally than they otherwise would have been. There has been a great deal of research devoted to investigating this question, though much of it is now dated. As Table 8 indicates, most researchers have focused on three measures: Household food expenditures, household "nutrient availability", and individual nutrient intakes.

The studies reviewed in Table 8 suggest that participation in the FSP has generally positive effects on household food expenditures. However, even the most recent of these studies are based on data from over 20 years ago. Fraker (1990) provides a synthesis of virtually all of the pre-1989 studies reviewed in Table 8 which examine the marginal propensity to spend on food (MPS_f) out of FSP income. He concludes that the most reasonable estimates range between \$.17 to \$.47. That is, a \$1 increase in FSP benefits would lead to an additional \$.17 to \$.47 being spent on food. More recent estimates, such as those of Kramer-LeBlanc (1997) also appear to fall in this range.

Note that this finding implies that while the FSP does increase food expenditures, there is a lot of leakage in this "bucket" of aid, since most of the money is spent on other goods. Most of these studies are based on comparisons of FSP households with eligible

non-participants. If FSP households have higher MPS_f than non-participant households even in the absence of the program, then selection effects may cause the effects of the FSP to be overstated.

A second question is whether higher expenditures on food are translated into increased "nutrient availability" at the household level. In order to determine household nutrient availability, researchers keep track of the food purchased for consumption in the household, and compare the nutrient content of this food with household RDAs. Judging by Table 8, the evidence on this question is mixed. However, one of the better studies of this issue is Devaney and Moffitt (1991) which uses data from the 1979-80 National Survey of Food Consumption. This survey collected a 7 day record of household food use. Devaney and Moffitt compare FSP participants with eligible non-participants and attempt to control for selection into the FSP. They find a significant positive impact of the FSP on the consumption of food energy, protein, vitamin A, vitamin B6, vitamin C, thiamin, riboflavin, calcium, iron, magnesium, and phosphorus.

All of these studies start from a presumption of scarcity. That is, if people are short of nutrients, then moving them towards the U.S. RDA is an achievement. However, if most people are meeting or exceeding the U.S. RDA, as they certainly are for calories, protein, and some vitamins, then encouraging them to consume even more is wasteful, if not actually harmful. What we would like to know is whether the FSP increases the consumption of households who are not meeting their RDAs for specific nutrients, and how it affects the composition of the diet (e.g. the percentage of total calories derived from fat) in all the participating households. However, little evidence is available on these questions.

Increases in household nutrient availabilities may or may not lead to increases in individual nutrient intakes. Nutrients may be lost during food preparation or wasted. Some individuals may not consume some items, and individuals may consume food outside the home (e.g. school lunches). Studies of individual nutrient intakes typically find much

weaker effects than studies of the effects of the FSP on household nutrient availabilities, as Table 8 shows.

However, Fraker *et al.* (1990) found a significant difference in the consumption of calories between preschool children in FSP and non-FSP households. Rose *et al.* (1995) and Cook *et al.* (1995) also find positive effects on intakes of some nutrients among preschool children. There is little evidence of significant positive effects on intakes for other groups, though Basiotis *et al.* (1998) find that FSP participants have healthier diets than nonparticipants. It is likely, as Fraker (1990) suggests, that individual nutrient intakes are measured with more error than household nutrient availabilities, so that it is more difficult to find statistically significant effects for nutrient intakes.

A few studies have examined the effects of FSP participation on anthropometric outcomes. For example, Currie and Cole (1991) use data from the National Longitudinal Survey of Youth to examine the effect of participation in both AFDC and the FSP during pregnancy. They find that while there is a negative correlation in Ordinary Least Squares (OLS) models, this correlation disappears in instrumental variables models, or when fixed effects for the mother are employed. Korenman and Miller (1992) use the same data and find a statistically significant effect of FSP participation during pregnancy on the birthweight of first-born children in OLS models. However, they find no effect on children of higher birthorder, or when they attempt to control for selection into the FSP using models with mother fixed effects.

Finally, a few recent studies have also examined the effect of the FSP on food insecurity. Bhattacharya and Currie (2000) show that controlling for standard demographic factors such as age, education, race, and household structure, the standard positive correlation between food insecurity and FSP participation is reversed. Conditional on these factors, their sample of adolescents was 6% less likely to report food insecurity if the household participated in the FSP. Similarly, Rose *et al.* (1998) found that among FSP

participants in the Survey of Income and Program Participation, the incidence of food insecurity decreased with the size of the FSP benefit.

The Efficacy of WIC

WIC is the most studied FANP, but significant gaps remain in our knowledge. As Table 9 illustrates, most of the existing studies focus on the effects of participation by pregnant women on the health of newborns, even though infants and children make up 75% of the caseload. In addition, there are few studies of post-partum women.

Possible selection biases also pose a significant problem for the interpretation of most studies of WIC. These selection biases could take several forms. For example, since many women are referred to WIC when they seek prenatal care, it may be only women who are highly motivated to bear a healthy child who enroll. Conversely, given limited funds, program administrators may pick the most at risk individuals to participate. In the first case, one might expect over-estimates of the true program effects, while in the second, one would expect under-estimates.

A 1992 General Accounting Office study (U.S. GAO, 1992) reviewed 17 studies of the effects of prenatal WIC participation on newborns that it judged to be adequate in terms of sample size and design. The 17 studies found that WIC participation reduced the incidence of low birthweight by between 10 and 43%, and that it reduced the incidence of very low birthweight between 21 and 53%. The GAO conducted a meta-analysis of these studies and concluded that providing WIC services to mothers of babies born in 1990 will ultimately prove to have saved federal tax payers more than \$337 million. Their estimates suggest that a dollar invested in WIC saves at least \$3.50 in other costs. However, it should be kept in mind that these studies covered only prenatal WIC recipients, and that most WIC recipients are infants, post-partum women, and children.

Moreover, these conclusions are subject to several caveats. First, the GAO study

placed a lot of weight on a series of studies that were conducted by matching information about WIC recipients to Medicaid records (such as Buesher *et al.*, 1993 and Schramm, 1985, 1986). Since the income cutoff for Medicaid was well below the income cutoff for WIC over the period covered by the study, the estimates may apply to the poorest WIC recipients rather than to the average WIC recipient. Moreover, none of the studies included by the GAO was able to adequately deal with the problem of potential selection bias.

Additional studies of the effects of WIC on pregnant women have been completed since the GAO study, most of which come to similar positive conclusions. These include Ahluwalia *et al.* (1998), Brown, Watkins and Hiatt (1996), Covington (1995), Gordon and Nelson (1995), Devaney (1992), and Kowaleski-Jones and Duncan (2000). Some of these studies attempt to deal with the selection problem using statistical methods, but as Gordon and Nelson point out, in most data sets it is difficult to find variables that affect WIC participation, that will not also affect birth outcomes.

Brien and Swann (1999) address this problem by merging data about the characteristics of state WIC programs to their individual-level data from the National Maternal and Infant Health Survey. They find that characteristics of state WIC programs affect the probability of enrollments among blacks, though they have little impact on whites. In particular, whether or not the state required that applicants provide documentation of their income affected black enrollments. Using these instruments in two-stage least squares regression models, they find that WIC participation lowers the probability of low birthweight by 8% among blacks.

Brien and Swann also estimate models with mother fixed effects (for mothers with two or more births) as an alternative way of controlling for the possible unobserved differences between WIC participants and non-participants. The findings of these models are consistent with the instrumental variables results for blacks. Among whites, they find no effect of WIC. However, it is important to keep in mind that fixed effects models are likely

to understate the true effect of WIC if WIC participation is measured with error, or if there are positive spillovers of WIC participation from one child to another, as one might expect as a result of educational interventions. Kowaleski-Jones and Duncan (2000) also use sibling fixed effects methods, and find that participation in WIC increases birthweight by 7 ounces.

Table 9 lists three studies that have found positive results of WIC participation on the nutritional status of pregnant women, something that one would expect to lead to higher birthweights. Moreover, the pattern of increases in nutrient intakes is consistent with the tailoring of food packages by WIC, suggesting that it is related to the consumption of WIC foods. However, the most recent study of this issue (Rush, 1988b) uses data collected in 1983-1984.

A few studies have examined the effects of WIC participation on breastfeeding and infant feeding practices. Although breast milk is universally acknowledged to be the best food for infants, WIC gives free formula to mothers who choose not to breastfeed. In fact, it is estimated that 40% of the infant formula sold in the U.S. is sold (at a negotiated discount) to WIC agencies (Randall, Boast, and Holst, 1995). Since formula is expensive, this feature of the program removes a powerful incentive to breastfeed. Even in the absence of this incentive however, one would expect WIC mothers to be less likely to breastfeed than other mothers because women who are poor, young, minority, or less educated are less likely to breastfeed. One countervailing influence may be the nutrition education that WIC is mandated to provide. WIC centers are required to teach pregnant women that "breast is best".

Table 9 provides an overview of studies of the effects of WIC on breastfeeding. These studies suggest that WIC does discourage breast-feeding unless strong attempts are made to counter-balance this effect through education, and that even with education, the net effect of WIC on breastfeeding is negative. It is likely however, that WIC has a positive

impact on infant feeding practices among women who choose not to breastfeed. The provision of free formula appears to encourage women to delay the introduction of cow's milk (which is not recommended before 1 year), and of solid foods (which are not recommended before 4 months) (Burstein, Fox, and Puma, 1991). The use of iron-fortified formula rather than cow's milk would also be expected to reduce the risk of anemia among infants.

Table 9 indicates that the estimated effects of WIC on infants and children tend to be much more variable than the estimated effects on birth outcomes. Some studies actually report reductions in anthropometric measures such as head circumference, which presumably reflects selection bias. A consistent finding is that WIC does raise consumption of target nutrients. For example, a recent study by Rose, Habicht, and Devaney (1998) uses 1989-1991 data from the Continuing Survey of Food Intakes to examine the effects of WIC on non-breastfeeding preschool children in FSP eligible households. They found that WIC had positive effects on the consumption of protein, vitamin B6, vitamin E, folate, thiamin, riboflavin, niacin, iron, magnesium, and zinc. However, the mean intakes of most of these nutrients exceeded 100% for both the participants and non-participants. Rose *et al.* find no significant effect of WIC on the fraction of calories from fat, and a recent Centers for Disease control study finds no effect of WIC on the incidence of overweight. Thus, one might conclude that too little attention is being paid to reducing intakes of the wrong types of foods among children at risk of obesity.

Burstein et al. (2000) report similar findings using the NHANES.

Although these studies do not control for selection into WIC, the Burstein et al. study provides some insight into the question of how children who participate in WIC differ from eligible non-participants. They find that the WIC children are more likely to have been born to women who smoked or drank during pregnancy, and are more likely to be low birthweight. They have a poorer home environment along a number of dimensions, and

their mother's score more poorly on tests of "locus of control", financial skills, and coping skills. These comparisons suggest that fears that WIC studies are biased by the selection of the most capable mothers into the program are misplaced. More research into the question of exactly how mothers are selected into WIC (and other FANPs) offers one possible resolution to the problem of non-random selection.

WIC has also been found to lower the incidence of anemia. Yip *et al.* (1987) look at the prevalence of anemia from 1975 to 1985, a period when WIC was growing rapidly. They find that over this period the incidence of anemia fell from 7.8% to 2.9%. It is highly plausible that this decrease is due to WIC given that a) WIC mandates that iron-fortified formulas and cereals be included in its food packages, b) half of all infants born in the United States during the 1980s participated in WIC, and c) three quarters of these children were formula fed since birth (Schwartz *et al.*, 1985).

Improvements in the consumption of micro-nutrients such as iron may be responsible for differences in cognitive performance that have been observed in two studies. Rush (1988c) found that infants and children whose mothers participated in WIC prenatally had significantly higher scores on the Peabody Picture Vocabulary Test than other infants. Hicks, Langham, and Taneka (1985) studied 21 sibling pairs in Louisiana. Because of the way that WIC was introduced in Louisiana, one sibling had received WIC benefits starting prenatally, while the other had received benefits only after one year of age. The sibling with greater WIC exposure fared better on virtually all of the measures assessed including IQ and school grade-point averages. This study has been criticized however because the measured effects are greater than those reported in many studies of food supplementation in severely malnourished populations (Pollitt and Lorimor, 1983). Also, the siblings with the greater WIC exposure were more likely to be first born, which might conceivably account for the fact that they were also found to be shorter than their sibs. Kowaleski-Jones and Duncan (2000) use data from the National Longitudinal Survey of Youth to examine the effect of

maternal participation in WIC on motor and social skills and temperament in addition to birthweight. They used sibling fixed-effects models to control for unobservables and found some evidence of a positive effect of WIC on temperament, though not on motor or social skills.

The Efficacy of NSLP

Two large national studies of the impact of school lunch have been conducted: The National Evaluation of School Nutrition Programs (NESNP) conducted in 1980 to 1981 and the School Nutrition Dietary Assessment Study (SNDA) conducted in 1991 to 1992 (Devaney *et al.*, 1993; Gordon *et al.*, 1995). The SNDA was also the first study to attempt to account for selection into the program, and to evaluate the effects of NSLP on the quality of the diet as well as the probability that RDAs were met. The SNDA found that controlling for selection overturned some of the findings of the NESNP, hence I focus on the SNDA here.

Both studies predate the latest changes to the NSLP, so it is not possible to assess the effects of these changes. By allowing students to drink non-fat rather than whole milk, for example, the recent changes may reduce the amount of fat provided by meals without affecting their nutrient densities. The fourth National Health and Nutrition Examination Survey, which is currently in the field, may shed some light on these issues.

As Table 10 shows, most studies of the NSLP have focused on individual nutrient intakes. Studies conducted as part of the SNDA found that the number of calories consumed at lunch was similar for NSLP participants and non-participants but that the NSLP lunches were higher in fat and sodium. On the other hand, the NSLP had a positive impact on the consumption of some important nutrients such as vitamin A and calcium, which are found in the mandatory milk component of the lunch meal pattern. Younger NSLP participants also had higher lunch time intakes of B12, phosphorus, magnesium and zinc. NSLP lunches

generally met or exceeded the goal of providing one-third of the RDA for all vitamins and minerals. Non-participants were more likely to be short of vitamin A, vitamin B6, calcium, iron, and zinc (Devaney *et al.*, 1993). Together with the results for total calories, these results suggest that the NSLP influences consumption of these nutrients by providing foods rich in specific nutrients, rather than by increasing total food intake. In particular, NSLP participants consume more milk, meat or meat substitutes, and vegetables at lunch than non-participants.

Changes in nutrient intakes at lunch may be offset by other changes in eating patterns over the course of the day. The SNDA asked about nutrient intakes over a 24 hour period and concluded that the positive effects of the NSLP on lunchtime nutrient intakes were somewhat offset. This finding is analogous to the conclusion from the FSP literature that much of the value of the benefit is spent on goods other than food. On the other hand, the NSLP did not have any statistically significant impact on 24 hour intakes of cholesterol or sodium, indicating that the negative effects of the NSLP on diet also tend to be offset over a 24 hour period. Thus, findings that NSLP participants are more likely to be over-weight than non-participants (c.f. Wolfe *et al.*, 1994; Bhattacharya and Currie, 2000) may reflect selection into the program.

There has been virtually no research on the question of whether the NSLP has positive effects on the schooling attainments of participating students. This omission is curious given the fact that one of the rationales for school nutrition programs is that hungry children are likely to have difficulty learning.

Similarly, there has been little research on the question of whether participation in the NSLP improves food security. One would think that the availability of at least one nutritious meal per day might have a major impact on the food security of children in some households. Bhattacharya and Currie (2000) address this issue using data from the National Health and Nutrition Examination Surveys. They estimate a difference-in-difference model

where adolescents are either eligible or ineligible for the NSLP, and schools are either in session, or out of session. They do not find any statistically significant effect of NSLP participation on the degree of food insecurity reported by households of adolescents, though they do find that the NSLP is linked to reductions in the fraction of adolescents with high blood cholesterol and improvements in the quality of the diet as measured by the Healthy Eating Index.

Although the School Breakfast Program (SBP) is not a focus of this review, it is useful to discuss some of the evaluations of SBP alongside those of the NSLP because the SBP evaluations address a somewhat different set of questions. One of the major goals of the SBP is to promote breakfast consumption among children who would not otherwise eat breakfast. Devaney and Stuart's (1998) recent re-examination of the SNDA data indicates that the SBP does encourage poor children to eat more than a nominal breakfast. Some smaller scale studies (c.f. Myers, 1989) have found positive effects of SBP on school attendance and test scores. This study followed children before and after the SBP was introduced into their school.¹⁰

This research suggests that school nutrition programs can have positive effects on nutrient intakes and perhaps on scholastic achievement, though more research is needed on this question. It will be interesting to see whether the recent sweeping changes to the programs will enhance these effects.

III. Evidence about Takeup

In order for programs to be effective, eligible families must take up their benefits. Non-participation by eligibles is a significant problem. For example, only 69% of households eligible for the FSP participated in 1994. The 40% increase in enrollments

¹⁰ Unfortunately, this study suffered from many missing observations which undermines its credibility somewhat. However, one would not want to draw sweeping conclusions about the effects of school meal programs on the basis of one study in any case.

between 1988 and 1993 was due mainly to a higher participation rate among eligibles rather than to an increase in the number of eligibles (U.S. Committee on Ways and Means, 1998), suggesting that changes in takeup have important impacts on participation rates. Possible reasons for non-participation include: Lack of knowledge about eligibility; transactions costs associated with enrolling in the program; and stigma associated with participation (c.f. Moffitt, 1983). Welfare reform has the potential to impact participation via all three channels as is discussed further below.

Takeup of the Food Stamp Program

Takeup of FSP benefits is high among some sub-groups of eligibles, but low among others. For example, in 1994, 86% of eligible children participated, but only one-third of eligible elderly persons. Virtually all eligible single-parent households were enrolled compared to only 78% of eligible households with children and two or more adults (U.S. Committee on Ways and Means, 1998).

Participation rates for FSP also varied by ethnicity--with 92% of eligible African-Americans participating compared to 61% of eligible Hispanics and 59% of eligible white non-Hispanics. Participation rates were higher in some state than others, ranging from 38% in Alaska to virtually 100% in Vermont and Maine. Participation rates also tended to fall as income rose (U.S. Committee on Ways and Means, 1998; Schirm, 1998).

The available evidence suggests that all three of the explanations for non-participation that have been suggested (lack of information, transactions costs, and stigma) may be important in explaining these patterns. A recent USDA study of FSP eligibles found that three-quarters of non-participating households said that they were not aware that they were eligible. Only 7% of households gave stigma as their main reason for non-participation, but half answered affirmatively to at least one of the survey questions about stigma. Haider, Schoeni, and Jackowitz (2002) investigate low participation rates among

the elderly using information from the Health and Retirement Survey, and conclude that many elderly people who are eligible for Food Stamps say that do not need benefits, which may indicate that there is stigma associated with using the program unless one is very needy.

Turning to transactions costs, the average FSP application took nearly 5 hours of time to complete, including at least two trips to a FSP office. Recertification for benefits took 2.5 hours and at least one trip. Out-of-pocket application costs averaged about \$10.31 or 6% of the average monthly benefit (Ponza *et al.*, 1999). Blank and Ruggles (1996) found that participation in the FSP increased with the size of the benefit, suggesting that households trade off the costs and benefits when deciding whether or not to participate.

Daponte, Sanders, and Taylor (1999) investigate these issues further using a sample of 405 households in Allegheny County, Pennsylvania. They found that many households that satisfy the gross income requirement for the FSP (i.e. they have incomes less than 130% of poverty) are ineligible for other reasons. Many of them have liquid assets in excess of the asset limits. This means that it is treacherous to try to impute eligibility for social programs using the limited asset information usually available in general surveys. The authors also conducted a randomized experiment. The treatment group was informed about their eligibility status, and about the size of any benefits they were eligible for. The control group was not. Information had a significant effect in that people informed about their eligibility status were much more likely to subsequently apply for the FSP. In keeping with Blank and Ruggles, those entitled to the largest benefits were most likely to apply when given this information: the takeup rate was over 90% for those eligible for over \$202 in benefits, compared to only 40% among those eligible for less than \$41. This finding demonstrates that transactions costs are a significant barrier to take up.

Yelowitz (2000) also provides evidence which suggests that lack of information and/or transactions costs associated with enrollment in the FSP have important effects. He

studies increases in income cutoffs for Medicaid over the late 1980s and early 1990s. Newly eligible families who applied for Medicaid may have learned of their eligibility for the FSP at the same time. Alternatively, families who did not find it worthwhile to incur the transactions costs associated with applying for food stamps, may have found it worthwhile to apply for both Medicaid and food stamps. In any case, Yelowitz finds that for every 10 newly eligible families who took up Medicaid benefits, 4 also took up food stamps. The fact that only 40% took up suggests either that those who applied for Medicaid were not all informed about eligibility for Food Stamps, or that transactions costs are important in addition to lack of information. These changes in Medicaid eligibility may have accounted for as much as half of the runup in the FSP caseload in the early 1990s.

Takeup in WIC and the NSLP

Estimating takeup of the WIC program is complicated by the fact that one must be at nutritional risk in order to qualify. Hence, estimates of takeup are sensitive to assumptions about the fraction of the population that is at risk. The USDA estimated that 9.2 million persons were eligible for WIC in 1995, and that 75% participated in the program. Among some sub-groups of the eligible population, such as infants, takeup has been closer to 100% (Rossi, 1998), and in recent years concern has been expressed about takeup rates greater than 100% of those infants the USDA deems to be eligible for the program (National Research Council, 2001).

Perhaps the best potential sources of evidence about the factors that affect participation in WIC are studies that have tried to control for selection into the program. Unfortunately, these studies seldom report the "first stage" estimates from their selection correction models. As discussed above, Brien and Swann do report these estimates and show that several characteristics of state programs influence WIC participation. Their results suggest that administrative barriers (such as procedures to verify income) may

discourage people from applying for WIC. Chatterji et al. (2002) show that in addition, restrictions on the types of foods that can be purchased (such as restrictions that mothers buy low-fat milk) discourage participation. Bitler, Currie, and Scholz (2002) find that requiring more frequent visits to WIC offices also have negative effects on participation. Some of their models use administrative state-level data, so that they are not contaminated by under-reporting of WIC participation, which is a significant problem in survey data. Poor and minority women are also more likely to be enrolled, as were high-school dropouts and single mothers.

Similarly, participation in the NSLP is higher among children from the poorest families. This may be due in part to the fact that these children are eligible for free meals, while other children have to pay at least part of the cost of the meals. In his analysis of the SNDA data, Gleason (1995) finds that girls are less likely to eat school meals than boys, and that older girls are less likely than younger ones to eat these meals.

Gleason also shows that the characteristics of the meals are important determinants of participation. The most common reason given for not eating school lunch was that students didn't like the food. His results suggest that implementation of the Dietary Guideline's recommendation that fat make up no more than 30% of the calories in a meal would lead to a substantial drop in participation. However, this dropoff could be counter-balanced by reducing the price of meals, restricting the ability of students to go off campus, eliminating vending machines, or reducing the number of a la carte menu items offered in addition to the school lunch.

Approximately a quarter of children eligible for free or reduced price meals do not become certified. In a study of the parents of eligible non-participants, Burghardt *et al.* (1993) found that over half believed that they were ineligible, 10% thought the certification process was onerous, and 20% cited stigma. In contrast, Glantz *et al.* (1994) find that children's preferences are the largest single factor affecting the parent's decision to apply for

certification. If children indicate that they will not eat the meals, then parents do not apply.

Gordon, Devaney, and Burghardt (1995) compare OLS and selection-corrected models of participation in school meals programs. They find that the OLS estimates indicate that NSLP increases the number of calories consumed, while the selection-corrected models do not. In other words, the students who choose to participate in NSLP are those who would eat bigger lunches in any case. This is especially true for adolescent girls, indicating that those girls who do choose to participate are those who are big eaters. These findings suggest that implementation of the Dietary Guidelines may reduce the number of participants in school meal programs, particularly among adolescent girls, unless special care is taken to serve meals that appeal to these students.

Welfare Reform and Takeup

There is a good deal of debate about the mechanism through which PRWORA may have affected takeup of FSP caseloads. Welfare reform can affect FSP participation in many ways. First, households that leave the welfare rolls either because they find work, or run into time limits, may not know that they remain eligible for FSP. In some instances, their caseworkers may not even know that they remain eligible, since under the prior regime, welfare recipients were automatically eligible for food stamps.

Second, state "diversion programs" intended to discourage people from applying for welfare benefits by, for example, requiring them to engage in job search before applying for benefits, may also discourage them from applying for food stamps. In these two scenarios, people who are eligible for FSP benefits are not receiving them because of administrative barriers created by welfare reform.

A third possibility is that welfare reform has been successful in terms of encouraging people to leave the welfare rolls for jobs that pay more than the income limit for the FSP. However, the available evidence is that most of those who transition from welfare to work

continue to have incomes low enough to qualify for the FSP, so this is not a likely explanation for the decline in FSP caseloads (Dion and Pavetti, 2000). For example, Zedlewski and Brauner (1999) examine data on households with children who had participated in the FSP between January 1995 and the survey date. When surveyed between February and October 1997, one third of these families had left the program. Zedlewski and Brauner find that families who had been on welfare were more likely than other families to have exited, and that the difference was greatest at the lowest levels of income. If families were choosing not to participate because of improvements in their financial positions, then one might expect differences in participation to be greatest at the highest levels of income.

Fourth, the publicity surrounding welfare reform may have increased the stigma surrounding all means tested programs. For example, there is some evidence that the degree of under-reporting of means-tested program participation in the Current Population Survey has increased in recent years.

Fifth, some categories of persons, such as resident aliens and adults without dependents who do not meet work requirements, have become ineligible as a result of PWRORA. However, since these groups did not make up much of the FSP caseload before PWRORA, it is unlikely that their exclusion is responsible for much of the decline in caseloads. Temporary sanctions of TANF recipients who fail to comply with work requirements may also lead to a loss of food stamp benefits.

Sixth, even if eligible households are aware of their entitlements, losing automatic eligibility for food stamps increases transactions costs greatly, as families are typically required to be recertified for FSP benefits four times a year. Many states have shorter recertification intervals for working families than for families entirely on cash assistance, because working families have more variable incomes, and hence may be more likely to receive food stamps in error. Currie and Grogger (2001) and Kabbani and Wilde (2002) both show that reductions in recertification intervals reduce participation. Thus, by reducing

the fraction of the low income population that relies solely on welfare, welfare reform has resulted in an increase in the transactions costs associated with staying on the Food Stamp program for many families and decreases in participation.

Loprest (1999) found that two years after leaving AFDC/TANF, less than a third of former welfare recipients were receiving food stamps. This study was based on a national survey of former recipients, but similar findings have reported using state-level administrative data (Dion and Pavetti, 2000). It is evidently important to distinguish between the possible reasons for non-participation, but most of the available evidence regarding effects of welfare reform on participation in the FSP is anecdotal. Still, enough evidence of negative effects of welfare reform is available that the GAO recently recommended that the FNS require states to inform welfare applicants of their eligibility for food stamps during the first meeting; to publicize eligibility requirements for the FSP and distinguish them from the eligibility requirements for TANF; and to aggressively evaluate access to food stamp benefits when reviewing state's FSP operations (U.S. GAO, July 1999).

Little information is available about the effects of welfare reform on participation in other FANPs. However in a study using SIPP data from 1993 to 1995, Burstein et al (2000) finds that 22 percent of child exits from the WIC program were associated with parents leaving AFDC (holding income constant). This suggests that declines in welfare participation due to welfare reform may also lead to the loss of WIC benefits.

IV. Evidence Regarding the Efficacy of Cash vs. In-Kind Transfers

What do evaluations of food and nutrition programs have to say about whether the provision of services in-kind makes economic sense? Economic theory suggests that if the goal of nutrition programs is to improve the utility of the household decision maker, then this could be done more efficiently by replacing in-kind benefits with cash. Moreover,

having a large number of in-kind programs is more expensive administratively than simply mailing a check, and in-kind programs are more subject to some types of fraud (e.g. recipients attempting to trade food stamps for cash). Viewed from this perspective, the growth in the proportion of assistance to low-income households that is delivered in-kind over the past 30 years (c.f. Currie, 1995) is hard to explain.

On the other hand, in-kind programs have several features that are attractive to at least some constituencies. First, the benefits may be more targeted on the truly needy. On the other hand, provision of benefits in-kind is stigmatizing, and those who suffer most from stigma are not necessarily those least in need of aid. Second, the fact that the benefits are in-kind may deter some types of fraud. For example, people may be less likely to falsely claim eligibility for food stamps than they are to falsely claim eligibility for cash assistance. Of course, to the extent that food stamps can be converted easily to cash, this argument for the provision of in-kind benefits will be undermined.

A third, and perhaps more compelling argument, is that advocacy groups, the agricultural industry, and the general public all support the idea of giving food aid in kind. It is this political support that allowed the FSP to survive the latest round of welfare reform unscathed. Public support for the in-kind nature of food aid may indicate that the general public is not particularly interested in increasing the utility of aid recipients. Rather, the goal of nutrition programs is to alter the behavior and consumption bundles of recipient households in specific ways.

Administrative Costs

Supplying benefits in kind increases the transactions costs associated with running safety-net programs. For example, one study found that in the case of a FSP program operated using paper coupons, these costs amounted to \$13.39 per case month for the program, \$24.73 per \$1000 redeemed for participating retailers, and \$3.50 per \$1000

redeemed for financial institutions (who eventually receive deposits of FSP coupons).

These costs may be substantially reduced by EBT. One demonstration found that the corresponding costs in an EBT system were \$2.52 per case month, \$15.21 per \$1000 for retailers, and \$.23 per \$1000 for financial institutions (USDA, 1994).¹¹ Notwithstanding these cost savings, EBT may result in lower participation by vendors who may need to install special equipment in order to participate.

Total administrative costs associated with the FSP vary considerably from state-to-state. For example, in 1988, the annual administrative cost per case varied from \$238 in the highest quintile of states (excluding Alaska, which had very high costs of \$522 per case) to \$108 in the lowest quintile of states (Ohls and Beebout, 1993). A comparison of the difference in these figures to the direct costs of operating a coupon program (given above) suggests that the administrative cost savings that would be obtained by cashing out the FSP are dwarfed by regional differences in administrative costs that are driven by other factors.

Fraud and Stigma

It is possible that the provision of benefits in-kind reduces the number of households that fraudulently claim eligibility for FANPs, relative to the number that would claim equivalent cash benefits. However, little evidence is available on this question. What is clear from the discussion above is that the provision of in-kind benefits opens the door to another type of abuse, which is the illegal trafficking of benefits for cash. It is also clear that some fraction of the potential FANP caseload is deterred from using these programs by stigma, though again, there is little evidence available regarding whether these same households would find a cash program less stigmatizing.

¹¹ In a single month in 1997, retailers deposited 1.7 million worth of food stamp coupons in more than 26,000 banks. Banks in turn made 27,00 deposits to Federal Reserve District Banks. At each step, coupons had to be counted (see fns1.usda.gov/fsp/menu/admin/ebt/ebt.htm).

A major goal of the EBT program is to reduce fraud in the FSP. In studies of this issue, FNS has found that FSP recipients reported by a 3-to-1 margin that it was harder to sell benefits with EBT cards. Sixty-nine % of retailers surveyed also perceived FSP fraud to be decreased under EBT (USDA, 1994). However, while in principle EBT data could be used to identify fraudulent use of FSP benefits by both individuals and stores, a recent GAO report found that most state agencies were not yet equipped to effectively analyze these data (U.S. GAO, March 2000). EBT could also increase the participation of eligibles by reducing stigma: The use of an electronic card may be less likely to draw attention than the use of coupons.

Are In-Kind Benefits Treated Differently Than Cash?¹²

The FSP typically provides benefits which are less than a household's monthly food budget. Thus, in principle, the benefits should be equivalent to a cash transfer since households can use the FSP benefits to buy food which they would have purchased in any case, and use the money released to buy other goods. On the other hand, the fact that some people sell their food stamps suggests that at least these people are receiving more in the form of stamps than they wish to consume in the form of food purchases. Studies of this issue have found that approximately 11% of the caseload receive food stamp benefits larger than their food budgets (Ohls and Beebout, 1993).

In contrast to the FSP, WIC and the NSLP provide food "packages" which are likely to differ from those that would be chosen by households in the absence of the programs. Other things being equal then, one might expect these programs to have larger effects on the composition of the diet than the FSP.

¹² A related question is whether we can learn anything from the FSP about running welfare programs using a voucher system. However, Moffitt (1999) argues that there are several features about the market for food that may make it difficult to draw inferences from the FSP about the general question of whether it is advantageous to provide benefits in the form of vouchers.

As Table 8 shows, many studies have attempted to estimate the MPS_f (marginal propensity to spend on food) out of FSP benefits, and to compare it to the MPS_f out of cash income. Surprisingly, these studies have typically found that the former is greater than the latter. For example, in his review of the literature Fraker finds that estimates of the MPS_f out of FSP benefits center around \$.25 whereas the MPS_f out of cash income is estimated to be less than \$.15. As discussed above, given the fungibility of FSP benefits, one might expect the two quantities to be the same for most households. It is possible that the small fraction of households that receive food stamp benefits greater than or equal to their preferred food budgets have a very high MPS_f out of FSP benefits, and that this high value is largely offset by the many other households who are not "constrained" by the FSP.

More recent evidence on this question is provided by several food stamp "cashout" demonstrations, which are also summarized in Table 8. In these cashouts, households were issued checks instead of the usual FSP coupons. The study with perhaps the cleanest design was carried out in San Diego. This demonstration randomly assigned households receiving welfare payments and FSP benefits to a treatment group that received a check combining the two benefits, and a control group that continued to receive FSP coupons separately. The treatment group spent an average of \$22. per month less on food.

However, Whitmore (2002) has reexamined these data and finds that only households that were constrained in the sense that the initial value of their food stamps was greater than or equal to their food budgets spent less on food after the cashout. She further finds that households reduced spending on relatively non-nutritious items such as soda and juice, and that the reductions in expenditure did not have any negative effect on nutritional status. Whitmore also provides some direct evidence regarding trafficking of food stamps from a survey of food stamp recipients. She finds that food stamps sell for about 65% of their face value.

The results from several other cashout demonstrations show little evidence of effects

on expenditures. For example, studies of the cashout of the Puerto Rican FSP system¹³ did not show any change in the MPS_f out of program benefits (Beebout *et al.*, 1985; Devaney and Fraker, 1986; Moffitt, 1989). However, in Puerto Rico, FSP coupons were widely circulated as currency even before the cashout. A demonstration in Alabama also failed to find a significant effect of "cashout" but in this demonstration, the FSP benefit was issued as a separate rather than a combined check, and the demonstration was introduced with little publicity as an explicitly short-term demonstration (Fraker *et al.*, 1992) Lastly, a cashout demonstration that dealt with elderly households found little impact on food expenditures (Butler *et al.*, 1995).

Whitmore's findings cast doubt on the hypothesis that, on average, households with children treat FSP benefits differently than cash. However, it is possible that some subset of these households does benefit from receiving benefits in kind. It is thought that female heads of household may have more control over the use of FSP coupons than they have over the cash income they receive from other sources, and that they have higher marginal propensities to spend on food. Welch (1999) documents the fact that many prime age men live in households where other members are receiving some form of public assistance. And Moffitt, Reville, and Winkler (1998) point out that many unmarried welfare mothers are in fact cohabiting with a partner. In these households, the fact that FSP benefits are issued in the woman's name and ear-marked for food purchases may increase her ability to spend the income on food. The fact that elderly recipients are more likely to live alone might then explain the finding that their MPS_f s out of FSP benefits and cash are equal. It would be very interesting to test this hypothesis using detailed information about the composition of FSP households.

Further evidence about the efficacy of in-kind transfers comes from WIC and the

¹³ In 1982 the FSP program in Puerto Rico was changed to a cash program called the Nutrition Assistance Program.

NSLP. As discussed above, these programs appear to increase the consumption of targeted nutrients, not by increasing the total amount of food consumed (as any kind of transfer would be expected to do), but by changing the composition of foods consumed.

V. Evidence regarding Work Disincentives

As discussed above, social programs with fixed income cutoffs create a "notch" in the budget constraint facing households. Households located near these notch points may face very high marginal tax rates on additional earnings, which are likely to discourage them from increasing their hours of work. Moreover, some household that were initially located above the notch may find it in their interests to cut back work hours to the notch point. On the other hand, removing the notch (for example, by eliminating a program like WIC) would not necessarily increase work effort.

The bulk of the research on the effects of cash welfare programs such as AFDC has been directed at measuring the work disincentives created by these programs. These studies often consider the combined effect of AFDC and FSP benefits on the behavior of female-headed households, since as discussed above, most households that receive AFDC (now TANF) also receive FSP benefits. The combined data offers some purchase on the problem because FSP benefits are reduced .30 for every dollar of AFDC benefits. Hence, the variation in AFDC benefits across states creates some variation in FSP benefits. Fraker and Moffitt (1988) use data on female heads participating in AFDC and FSP in 1979 to estimate that the FSP reduces labor supply by 9%. However, they also found that small changes in guarantee levels and benefit reduction rates would have little impact on hours of work. Moffitt and Keane (1998) estimate a structural model of participation in multiple welfare programs, and again conclude that high welfare tax rates have relatively little effect on work effort.

Hagstrom (1996) examines the effects of FSP participation on the labor supply of

married couples, and finds that the labor supply effects are even smaller than those found in studies focusing on single persons. These findings are consistent with the literature on cash welfare programs, which also finds small labor supply effects (c.f. Moffitt, 1992; Moffitt, 1998). Hagstrom identifies his model using variation in FSP benefits stemming from differences in non-labor income and deductions (such as shelter deductions) across households with identical labor incomes.

Although they are now very dated, it is worth mentioning the results of several randomized experiments involving work programs for FSP recipients which were conducted in the early 1980s. Ohls and Beebout (1993) discuss several different models including: 1) An applicant job search model which required participants to contact a specified number of employers; 2) A job club model which required participation in a 2 to 4 week training session designed to improve job search skills; 3) A group job search assistance model which required participation in a two-day employability skills training workshop followed by eight weeks of job search with bi-weekly group meetings; and a job club/workfare model which required participation in a three week job club followed by assignment to workfare jobs for those who were unsuccessful in finding employment on their own. All of these treatments increased earnings among treatment groups relative to controls, although the effects were not always statistically significant. Treatment effects tended to be larger for women than men. The treatments were also successful in reducing food stamp benefit amounts to the extent that the experimental programs produced modest cost savings.

Another notable finding however, was that approximately two-thirds of the FSP recipients in the experimental sites were exempt from FSP work requirements due to age, the presence of young children in the household, disability, participation in other programs, or other factors. In principal, those who participate in programs such as AFDC/TANF are responsible for meeting the work requirements of those programs, and so are exempted from compliance with FSP work requirements. Thus, it seems fair to conclude that although FSP

recipients have technically been subject to work requirements for a long time, efforts to actually force most recipients to work have not been vigorously pursued.

VI. Evidence About The Importance of Production Functions vs. Budget Constraints

Is the typical FANP's emphasis on changing household budget constraints the best way to improve the nutritional status of the population or should more attention be paid to altering household "production functions"? For the average American, obesity, a poor quality diet, and lack of exercise are much greater threats to health than food scarcity. An extensive body of evidence links diets high in fat and low in fiber to coronary artery disease, stroke, diabetes, and some forms of cancer (USDHHS, 1991). Moreover, individuals in poor households are both more likely to be obese and more likely to purchase foods with little nutritional value (e.g. soft drinks) compared to those in higher income households, and the concentration of obesity among households of lower income has become more pronounced over time (Bhattacharya and Currie, 2000).

FANPs differ in their implicit answers to this budget constraints vs. production functions question. The FSP allows households to use their benefits to purchase a very wide range of foods. The underlying assumption then, is that households need larger food budgets, but that they do not need direction in terms of what foods to purchase. On the other hand, the NSLP offers meals that conform to specific nutritional guidelines. WIC not only tailors its food packages to meet specific nutritional needs, but also offers nutrition education. Thus, the FSP program is directed primarily at loosening household budget constraints, whereas the NSLP and WIC also attempt to alter household "health production functions" by changing the composition of the foods that are eaten. Evaluations of these programs reflect these differences in goals since most evaluations of the FSP focus on whether household food expenditures are increased, while evaluations of the NSLP and WIC generally focus on individual nutrient intakes and (at least in the case of WIC) health

outcomes.

It is possible then that a comparison of the effects of these programs can shed light on the issue of whether FANPs should be directed primarily at loosening budget constraints or at altering household production functions (or both). But it is difficult to compare the effectiveness of FANPs given that evaluations tend to focus on different sets of outcomes. Still, a perusal of the results in Tables 8, 9 and 10 suggests that the NSLP and especially WIC, have greater positive effects on the composition of the diet than the FSP. This comparison suggests then that efforts to change household production functions may be productive.

However, the fact that programs like WIC improve diets may reflect the effects of nutrition education, but it may also simply reflect the constraints of the program; that is, the fact that only nutritious foods are provided. There is little evidence about whether the nutrition education component of WIC is effective (though as discussed above, there is some evidence of positive effects on infant feeding practices). Thus, for evidence of the effects of nutrition education, we must look elsewhere.

Evaluations of government-sponsored educational interventions show that intervention can be successful in improving young children's eating patterns. For example, Harrell *et al.* (1998) find that both classroom and individual nutritional education had positive effects on 3rd and 4th grade children in terms of reducing blood cholesterol levels. Glenny *et al.* (1997) report similar results for family therapy and other interventions aimed at lifestyle modification.

Evaluations of the federal Nutrition Education and Training Program (NET), which provides grants to states that implement nutrition education programs in their schools, have found that it is much easier to improve nutrition knowledge than it is to affect behavior. However, some evaluations of school based programs have shown that children's willingness to try new foods offered in school lunch and the quality of snacks chosen away

from home improved, and that children were more likely to consume fruits, vegetables, protein foods and foods with vitamin A. Poor children have been shown to be more likely to consume dairy products and foods with vitamin C in response to NET programming. Not surprisingly, longer programs (e.g. 50 classroom hours or more) have been found to have larger effects on behavior (Contento *et al.*, 1992).

An important point with respect to nutrition education programs is that since many of them are still at the demonstration stage, the opportunity exists to conduct sensible, randomized evaluations of the efficacy of different types of programs. If it is not possible to randomize within schools, it may be possible to randomize across schools as was done in the Child and Adolescent Trial for Cardiovascular Health (CATCH) study (Luepker *et al.*, 1996). In this study, 96 elementary schools located in 4 states were randomly chosen to be intervention or control sites. Five thousand third to fifth grade children took part over a three year period from 1991 to 1993. The intervention involved training for food service staff and teachers, a nutrition curriculum for students, and outreach to parents. By 1993, the number of calories provided in school meals, and the number of calories provided in the form of fat and saturated fat, had fallen significantly in intervention schools relative to controls.

Kenkel (2000) summarizes a number of studies by Pauline Ippolito and Alan Mathios (1990, 1995, 1996) that have examined the effects of attempts by both government and the private sector to inform the public about the health benefits of diets low in fat and high in fiber. Government efforts to get this message out during the 1970s were relatively unsuccessful. But in the mid-1980s, the Federal Trade Commission and the Food and Drug Administration relaxed rules that had prevented food manufacturers from making health claims for their products. Ippolito and Mathios show that after declining very slowly between 1977 and 1985, the consumption of fats and cholesterol fell dramatically between 1985 and 1990, while the consumption of cereals rich in fiber increased. The Nutrition

Labeling and Education Act of 1990 is apparently also influencing consumer choices (Ippolito and Mathios, 1993).

In summary, the available evidence indicates that many households have imperfect information about diet and nutrition, and that both government and private programs can be effective in providing nutrition education, particularly to young children. Further research into these questions would be very useful.

VII. Current Policy and Research Questions

In conclusion, I would like to offer five broad areas that merit future research. First, it would be useful to know more about the links between FANPs and changes to cash welfare programs such as TANF and the EITC. The policy debate leading up to the passage of the PRWORA, included a good deal of discussion about overhauling the FSP. Congress considered cashing out the program and greatly reducing federal oversight by distributing the funds as block grants to the states. Yet, the program survived the most recent round of welfare reform intact. Still, because of the links between FANPs and participation in other welfare programs, welfare reform is likely to have an important impact on the effectiveness of these programs. Households that were once automatically eligible for participation in FANPs because of their status as welfare recipients may not be aware that they remain eligible for FANPs even after their cash assistance has been cut off. Or, they may find it difficult to go through the process of applying and reapplying for these benefits. The stigma associated with participation in any welfare program may also be increasing over time. Assessing the extent to which welfare reform affects participation in FANPs, and the channels through which participation is affected, is an important area for future research. We need a better understanding of the determinants of participation in the program if we are to effectively combat decreases in participation that may be linked to welfare reform.

A second important question for FANP research is the extent to which these

programs should focus on improving the quality of diets rather than the quantity of foods consumed. As discussed above, some FANPs such as WIC, already place some emphasis on diet quality, while programs like FSP are designed to promote overall food consumption. In addition, the NSLP and SBP have recently been overhauled in order to place a greater emphasis on diet quality. In principal, the adoption of EBT could make it easy to place restrictions on the foods that could be purchased using FSP benefits (Kirlin and Adam, 1998) if this proved to be an effective way to improve nutritional choices and health outcomes.

A third area for research concerns the extent to which any new monies allocated to FANPs should be allocated to nutrition education rather than to the provision of food to low-income Americans. As discussed above, some of the NSLP funds have been earmarked for nutrition education under the Healthy Meals for Healthy Americans Act. Funding for NET has also increased in recent years. The available evidence suggests that educational initiatives of this kind can have a positive effect on the diets of young children. Still, funding for this type of program is a drop in the bucket compared to overall spending on traditional food subsidies. As policy makers consider whether this funding should be increased further, it would be useful to have more information about the effects of nutrition education (as conducted by the WIC program, for example) on the behavior of adults as well as children.

Fourth, it would be useful for researchers and policy makers to think about FANPs in a more integrated manner. At present, it is difficult to compare the effectiveness of these programs, since each is evaluated in terms of a separate and largely non-overlapping set of outcomes. It would be useful for example, to have more studies of the effects of the FSP and WIC on outcomes such as the cognitive attainments of young children and the food security of their households, and it would be useful to know more about the effects of the NSLP on household food expenditures. It would be of great interest to have a better sense of

the way in which FANPs as a group contribute to the food security, nutritional outcomes, and the general well-being of American households.

Finally, it is encouraging that more attention is being paid in recent studies to the ubiquitous issue of sample selection. It is particularly difficult to evaluate the impact of programs like FANPs which are implemented on a national basis and often show little change over time. Some researchers have shown considerable ingenuity identifying and exploiting the limited amount of variation in programs that exists across jurisdictions, and in using designs such as sibling comparisons to control for the background characteristics of families who choose to participate in these programs. Yet many questions remain about the effects of these programs. For programs and populations for whom coverage is not yet complete (such as WIC participation among children), and in cases where changes to programs are contemplated, well designed social experiments could provide great insight into program effects.

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Chart 1: Current Dietary Standards for School Lunches

1. Provision of one-third of the Recommended Dietary Allowances of protein, calcium, iron, vitamin A and vitamin C for the applicable age or grade group.
2. Provision of the lunchtime energy allowances for children based on the appropriate age or grade group.
3. The applicable recommendations of the 1990 Dietary Guidelines for Americans which are:
 - i) Eat a variety of foods.
 - ii) Limit total fat to 30% of calories.
 - iii) Limit saturated fat to less than 10% of calories.
 - iv) Choose a diet low in cholesterol.
 - v) Choose a diet with plenty of vegetables, fruits, and grains.
 - vi) Use salt and sodium in moderation.
4. The following measures of compliance with the applicable recommendations of the 1990 Dietary Guidelines for Americans:
 - i) A limit on the percent of calories from total fat to 30% based on the actual number of calories offered.
 - ii) A limit on the percent of calories from saturated fat to less than 10% based on the actual number of calories offered.
 - iii) A reduction of the levels of sodium and cholesterol.
 - iv) An increase in the level of dietary fiber.

Source: U.S. Congress, 7 Consolidated Federal Regulations, Chapter II (1-1-00 Edition), page 22.

Chart 2: Priority System for WIC

Priority	Description
1	Pregnant and breastfeeding women and infants demonstrated to be at nutritional risk via anthropometric or hematological assessment or by other documented nutritionally-related medical condition.
2	Infants up to 6 months of mothers who participated in WIC during pregnancy, or who would have been eligible to participate during pregnancy under Priority 1. Breastfeeding mothers of priority 2 infants, may also be assigned priority 2.
3	Children at demonstrated to be at nutritional risk via anthropometric or hematological assessment or by other documented nutritionally-related medical condition. States have the option of including high-risk postpartum women at this priority level.
4	Pregnant and breastfeeding women and infants, at nutritional risk because of inadequate dietary pattern. States have the option of including high-risk postpartum women at this priority level.
5	Children at nutritional risk due to inadequate dietary pattern. States may also include high-risk postpartum women in this priority level.
6	Postpartum women, not breastfeeding, at nutritional risk on either medical or dietary criteria.
7	Previously certified participants who are likely to regress in nutritional status without continuation of supplemental foods.

Chart 3: WIC Regulations Which Have Varied at the State Level

1. Food Package Adjustment Practices

- * Designation or disallowance of food brands.
- * Specification of size of food container.
- * Elimination or reduction of specified food types.
- * Specified form of food within food types.
- * Specify type of milk, cheese, or formula.

2. Frequency of WIC Food Instrument Issuance

- * May be every month, every two months, every three months, or other. Some states have different standard frequencies for different types of recipients, and others do not have a standard frequency of issuance.

3. Interactions with Other Programs

- * In all states except Georgia and Illinois, AFDC participants are automatically eligible. In all states but Georgia and Hawaii, FSP participants are automatically eligible.
- * Participants in Medicaid, the NSLP, SSI and other programs may also be automatically eligible for WIC.

4. Income Documentation and Verification Policy

- * Many states did not require income documentation, allow applicant self-declarations, or demanded documentation at local agency discretion. As of April, 1999, all states were required to demand such documentation.

5. Policies for obtaining dietary information

- * Dietary information may be obtained from all participants, or only those who are at risk because of dietary patterns (rather than for example, because of anemia).
- * Data may be collected using 24 hour dietary recalls, food frequency checklists, food diaries, or other methods.

6. Documentation of nutritional risk factors

- * In some states, only the most important risk factor is reported, while in others, all risk factors, or a set number of risk factors are reported.

7. Standards for determining nutritional risk.

- * Standards are set separately for each category of recipient (infants, children, pregnant, breast-feeding, and postpartum women).
- * Anthropometric standards may be set for weight-for-age, height-for-age, and weight-for-height.
- * Standards are also set for hemoglobin and hematocrit values. These may vary with the trimester of pregnancy. The federal government has been standardizing these cutoffs across states.

8. Priority System (see Chart 2).

Source: Randall, Boast and Holst (1995).

Table 8: Studies of the Food Stamp Program

Study	Data ¹	Design	Results
<i>Studies of Multiple Outcomes</i>			
Allen & Gadson (1983)	1977-78 NFCS-LI Aided recall for food use from household supply (7 days) FSP eligible households (n=3,850)	Multivariate regression including benefit amount	MPS _F ² from food stamps: 0.30 Increases the availability of food energy, protein, carbohydrate, vitamin A B ₆ B ₁₂ C, thiamin, riboflavin, niacin, calcium, iron, magnesium, phosphorus Also increases fat availability
Basiotis <i>et al.</i> (1983)	1977-78 NFCS-LI Aided recall for food use from household supply (7 days) FSP eligible households (n=3,562)	Multivariate regression including participation dummy	Impact on at-home food cost per household per week : \$3.7(20.4%) Increases the availability of food energy, vitamin C, thiamin
Basiotis <i>et al.</i> (1987)	1977-78 NFCS-LI Aided recall for food use from household supply (7-days) 24-hour recall followed by two days of food records FSP eligible households (n~3,000)	Simultaneous equations for food cost/ nutrient availability/ nutrient intake relationship, including participation dummy and benefit amount	MPS _F from food stamps: 0.17 No significant impact on calcium availability
Hama & Chern (1988)	1977-78 NFCS-Elderly Supplement Aided recall for food use from household supply (7 days) FSP eligible households with elderly members (n=1,454)	Simultaneous food expenditure/ nutrient availability equation including participation dummy	Impact on per capita at-home food expenditure per week: \$0.64(3.7%) Increases the availability of vitamin B ₆ , calcium, iron, magnesium
Johnson <i>et al.</i> (1981)	1977-78 NFCS-LI Aided recall for food use from household supply (7 days) Low-income households (n=4,535)	Multivariate regression including participation dummy and benefit amount, weights used to deal with missing data	MPS _F from food stamps: 0.17 Increases the availability of food energy, and Modified Diet Score ³

Study	Data	Design	Results
Kisker & Devaney (1988)	1979-80 NFCS-LI Record of household food use(7 days) FSP eligible households (n~2,900)	Bivariate t-tests of participation dummy	Impact on money value of food used at-home per “equivalent nutrition unit” per week : \$2.49(10.8%) Increases the proportion of households with household nutrient availability above 100% or 80% of RDA for energy and 10 nutrients FSP participants more likely to experience food insecurity
Kramer-LeBlanc <i>et al.</i> (1997)	1989-91 CSFII 24-hour recall followed by two days of food records FSP eligible individuals(n=793)	Multivariate regression including benefit amount	MPS _F from food stamps: 0.35 Increases Healthy Eating Index(HEI) ⁴
<i>Studies of Impact on Food Expenditures</i>			
Brown <i>et al.</i> (1982)	1977-78 NFCS-LI FSP participant households(n=911)	Multivariate regression including benefit amount	MPS _F from food stamps: 0.45
Chavas & Yeung (1982)	1972-73 BLS-CES FSP eligible households, Southern region(n=659)	Seemingly unrelated regression model, interactions between benefit amount and demographic variables	MPS _F from food stamps: 0.37
Chen(1983)	1977-78 NFCS-LI FSP participant households (n=1,809)	Multivariate regression including participation dummy and benefit amount	MPS _F from food stamps: 0.20(Pre-EPR ⁵) 0.23(Post-EPR)
Devaney & Fraker (1983)	1977-78 NFCS-LI FSP eligible households (n=4,473)	Multivariate regression including participation dummy and benefit amount	MPS _F from food stamps: 0.42(weighted) 0.21(unweighted)
Levedahl(1991)	1979-80 NFCS-LI FSP participants who used all their food stamps(n=1,210)	Multivariate regression including benefit amount	MPS _F from food stamps: 0.69

Study	Data	Design	Results
Price(1983)	1973-74 BLS-CES All households(n=10,359)	Multivariate regression including participation dummy and benefit amount	Impact on at-home food expenditure per week per adult male equivalent (AME): \$2.01(18.2%) MPS _F from food stamps: 0.42
Ranney & Kushman(1987)	1979-89 Counties and county groups in CA, IN, OH, VA FSP eligible households (n=896)	Multivariate regression including participation dummy and benefit amount	MPS _F from food stamps: 0.4
Salathe(1980)	1973-74 BLS-CES FSP eligible households (n=2,254)	Multivariate regression including participation dummy and benefit amount	Impact on per capita food purchase per week : at-home \$1.45(18.8%), total \$0.88(9.4%) MPS _F from food stamps: 0.36
Senauer & Young (1986)	1978 PSID FSP participant households(n=573)	Multivariate regression including benefit amount	MPS _F from food stamps: 0.3(Pre-EPR) 0.26(Post-EPR)
Smallwood & Blaylock(1985)	1977-78 NFCS-LI FSP eligible households (n=3,582)	Two equation selection bias model including participation dummy and expected weekly benefit amount	MPS _F from food stamps: 0.23
West(1984)	1973-74 BLS-CES FSP eligible households (n=2,407)	Multivariate regression including participation dummy and benefit amount	MPS _F from food stamps: 0.17(Participants) 0.47(Eligibles)
<i>Studies of Impact of Cashout</i>			
Beebout <i>et al.</i> (1985)	1977 Puerto Rico Supplement to the NFCS and 1984 Puerto Rico Household Food Consumption Survey 7-day food use from records and recall Participant and FSP eligible nonparticipant households using 1977 eligibility criteria (n=3,995)	Pre-cashout compared to cashout (1977 vs. 1984) 2-equation selection bias models including group membership dummy, participation dummy, and benefit amount	Impact of Cashout(NAP ⁶) on at-home food expenditure per AME per month : -\$2.95(-2.4%) Impact of Cashout(NAP) on MPS _F from food stamps: -0.06

Study	Data	Design	Results
Cohen(1993)	1990 Washington State Cashout Demonstration 7-day food use from records and recall Households participating in AFDC and who applied after FIP ⁷ implementation(n=780)	Comparison of treatment and matched comparison counties Multivariate regression including group membership dummy and benefit amount	Impact of Cashout(FIP) on at-home food expenditure per household per month : -\$28.08(-12.1%) On total food expenditure per AME per month: -\$22.12(-17.2%) Increases the availability of food energy, protein, vitamin C, calcium, iron, zinc
Davis & Werner (1993)	1990 Alabama ASSETS ⁸ Demonstration ASSETS and FSP Participants(n=1,371)	Comparison of treatment and matched comparison counties Multivariate regression including group membership dummy and benefit amount	Impact of Cashout(ASSETS) on at-home food expenditure per household per month : -\$56.44(-21.9%) On total food expenditure per AME per month : -\$25.43(-21.9)
Fraker <i>et al.</i> (1992)	1990 Alabama Cashout Demonstration 7-day food use from records and recall FSP participants (n=2,386)	Random assignment of participants to check or coupon Multivariate regression including group membership dummy and benefit amount	Impact of Cashout on at-home food expenditure per household per month : +\$2.66(+1.1%) On total food expenditure per AME per month : -\$0.34(-0.3%) Impact of Cashout on MPS _F from food stamps: +0.01
Levedahl(1995)	1990 San Diego Cashout Demonstration FSP participant Households receiving Coupons(n=494)	Multivariate regression including benefit amount	MPS _F from food stamps: 0.26
McCracken(1995)	1990 Washington State Cashout Demonstration FIP targeted pregnant and parenting teens (n=1,172)	Comparison of treatment and matched comparison counties Two step endogenous switching model for self-selection bias including group membership dummy and benefit amount	Impact of Cashout(FIP) on at-home food expenditure per household per month : -\$36.00

Study	Data	Design	Results
Ohls <i>et al.</i> (1992)	1990 San Diego Cashout Demonstration 7-day food use from records and recall FSP participants (n=1,143)	Random assignment of participants to check or coupon Multivariate regression including group membership dummy and benefit amount	Impact of Cashout on at- home food expenditure per household per month: -\$22.25(-7.5%) On total food expenditure per AME per month: -\$9.39(-6.9%) Impact of Cashout on MPS _F from food stamps: -0.17 Increases the availability of food energy, protein
Whitmore (2002)	1990 San Diego and Alabama Cashout (see above)	Divide households into those who spent more than the value of food stamps on food and those that did not. Supplementary phone survey of food stamp recipients.	Only HH where value of food stamps exceeded desired food purchases reduced spending. Reductions in spending had no nutritional consequence. Food stamps trafficked at \$.65 on the dollar.
<i>Studies of Impact on Nutrient Availability and Nutrient Intake</i>			
Basiotis <i>et al.</i> (1998)	1989-90 CSFII 24-hour recall followed by two days of food records Low-income households (n=1,379)	Multivariate regression(survey weights) including participation dummy and benefit amount	Reduces Healthy Eating Index
Bishop <i>et al.</i> (1992)	1977-78 NFCS-LI 24-hour recall followed by two days of food records FSP eligible individuals (n=2,590)	Stochastic dominance methods using participation dummy	Increases the intake of calcium
Butler <i>et al.</i> (1985)	1980-81 FNS SSI/ECD 24-hour recall via telephone Low-income elderly individuals	Multivariate regression including participation dummy, with selection bias adjustment	Increases the intake of calcium

Butler <i>et al.</i> (1996)	<p>1980-81 FNS SSI/ECD and 1969-73 Rural Income Maintenance Experiment</p> <p>24-hour recall via telephone and in person</p> <p>Low-income elderly individuals(n=1,542) Low-income individuals in rural areas(n=1,093)</p>	Multivariate endogenous switching model including participation dummy and benefit amount, with selection bias adjustment	<p>Increases the intake of food energy(for those living in rural areas), calcium</p> <p>Reduces the intake of food energy(for the elderly), protein, riboflavin, niacin, iron</p>
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Study	Data	Design	Results
Cook <i>et al.</i> (1995)	1986 CSFII-LI 24-hour recall followed by two days of food records Children aged 1-5 in households under 125% of poverty	Bivariate chi-squared tests using participation dummy	Increases the intake of vitamin B ₁₂ , folate, calcium, magnesium, zinc
Devaney & Moffitt(1991)	1979-80 NFCS-LI Record of household food use(7-days) FSP eligible households (n=2,925)	Multivariate OLS and selection bias models including benefit amount	Increases the availability of food energy, protein, vitamin A B ₆ C, thiamin, riboflavin, calcium, iron, magnesium, phosphorus
Fraker <i>et al.</i> (1990)	1985 CSFII 4 non-consecutive 24-hour recalls Women aged 19-50 (n=381) and their children aged 1-5 (n=818)	Participation dummy Multivariate regression including participation dummy, with selection bias adjustment	Increases the intake of food energy, protein and zinc Reduces the intake of vitamin A and E
Gregorio & Marshall(1984)	1971-74 HANES-I 24-hour recall Preschool children (n=2,774), School aged children(n=3,509)	Bivariate and multivariate regression using participation dummy and participation interacted with poverty index ratio	No significant impact estimated
Lopez(1984)	1971-73 HANES-I and 1976-80 NHANES-II 24-hour recall Low-income elderly (n=1,684 and n=1,388)	Multivariate ANOVA using participation dummy	Reduces the intake of iron
Posner <i>et al.</i> (1987)	1980-81 FNS SSI/ECD 24-hour recall via telephone Elderly(n=1,900)	Multivariate regression including participation dummy	Increases the intake of calcium

Study	Data	Design	Results
Rose <i>et al.</i> (1995)	1989-91 CSFII 24-hour recall followed by two days of food records Children aged 1-5 (n=800)	Multivariate regression (weight not used) including participation dummy	Increases the intake of iron
Rose, Habicht and Devaney(1998)	1989-90 CSFII 24-hour recall followed by two days of food records Non-breastfeeding preschoolers(n=499)	Multivariate regression (unweighted) including benefit amount	Increases the intake of vitamin A, thiamin, niacin, iron, zinc
Weimer(1998)	1989-91 CSFII 24-hour recall followed by two days of food records Elderly individuals (n=1,566)	Multivariate regression including participation dummy	No significant impact estimated
Whitfield(1982)	1978 Tulsa Oklahoma 24-hour call FSP eligible individuals (n=195)	Multivariate regression including participation dummy and benefit amount	Increases the intake of iron Reduces the intake of vitamin A and C
<i>Studies of Impact on Other Nutrition and Health Outcomes</i>			
Alaimo <i>et al.</i> (1998)	1988-94 NHANES-III Low-income(n=5,285)	Logistic regression(survey weights) using participation dummy	FSP participants more likely to experience food insecurity
Bhattacharya and Currie(2000)	1988-94 NHANES-III Youths aged 12 to 16 (n=1,358)	Multivariate regression including participation dummy	FSP participants less likely to experience food insecurity
Currie and Cole (1993)	1979-87 NLSY Young, poor women (n~4,900)	Multivariate two-stage least squares using participation dummy(participation endogenous) and fixed effects model	No significant effect of mother's food stamp receipt on the likelihood of low-weight birth
Hamilton <i>et al.</i> (1997)	1995 CPS Low-income households (n=21,810)	Comparison of means using participation dummy	Only 4.4% of food stamp households were food secure, compared with 68.1% of all households under 130% of poverty

Study	Data	Design	Results
Lopez(1987b)	1971-73 HANES-I and 1976-80 NHANES-II Low income elderly (n=1,684 and n=1,388)	Multivariate ANOVA using participation dummy	No systemic effect of FSP participation on participants' iron status
Rose, Gunderson and Oliveira (1982)	1989-91 CSFII and 1992 SIPP All households(n=6,620 and n=30,303)	Logistic regression using annual dollar amount of food stamps	Food insufficiency was inversely related to the size of food stamp benefit, and this relationship was stronger with food stamp than with other income

Source: The tables are based largely on research reviewed in Hamilton and Fox *et al.*(2000).

1. Data source, data collection method and population(sample size)

BLS-CES = Bureau of Labor Statistics Consumer Expenditure Survey

CPS = Current Population Survey

CSFII = Continuing Survey of Food Intake by Individuals

FNS SSI/ECD = Food and Nutrition Service Supplementary Security Income/Elderly Cashout Demonstration

HANES = Health and Nutrition Examination Survey

NHANES = National Health and Nutrition Examination Survey

NFCS-LI = Nationwide Food Consumption Survey(Low Income Supplement)

NLSY = National Longitudinal Survey of Youth

PSID = Panel Study of Income Dynamics

2. MPS_F = Marginal Propensity to Spend on Food

3. Modified Diet Score is defined as the sum of ratios of actual nutrient values to RDA standards for seven nutrients(protein, vitamin A C, thiamin, riboflavin, calcium and iron)

4. Healthy Eating Index(HEI) measures the extent to which individual intake, in terms of 10 food groups and these nutrients-sodium, fat and saturated fat- conform to the Dietary Guidelines for Americans and the USDA Food Guide Pyramid.

5. EPR = Elimination of the Purchase Requirement

6. NAP = Nutrition Assistance Program in Puerto Rico

7. FIP = Family Independence Program

8. ASSETS = Avenue to Self-Sufficiency through Employment and Training Services

Table 9: Studies of the WIC Program

Study	Data ¹	Design	Results
<i>Studies of Impact on Birth Outcomes</i>			
Ahluwalia <i>et al.</i> (1998)	Linked WIC and birth record files for 1992 births in Michigan WIC and non-WIC Medicaid recipients with full-term births(n=53,782)	Multivariate regression including length of prenatal WIC 'exposure'	Reduces the likelihood of low birthweight
Bailey <i>et al.</i> (1983)	Primary data collection at one WIC site and one non-WIC site in Florida(Dates not reported) WIC and income-eligible nonparticipants who were 30 weeks pregnant at time of recruitment and receiving identical prenatal care(n=101)	Multivariate regression and analysis of variance using participation dummy	Increases mean birthweight Participating pregnant women consume more of vitamin B ₆ and iron
Brien and Swann (1999)	NMIHS-live births file(1988) (a) WIC and income-eligible non-Hispanic women who are at nutritional risk(n=7,778) (b) WIC and income-eligible non-Hispanic women with at least one live birth prior to 1988 (n=6,254 pairs of births)	(a) Multivariate regression using participation dummies(one for ever participated and one for participated during first trimester), with several selection bias adjustment models (b) Fixed effects model using participation status for each pregnancy, separate for blacks and whites	Increases mean birthweight (for blacks)
Brown <i>et al.</i> (1996)	Medical records, birth and death certificates for births in one Indiana hospital between Jan 1988 and June 1989 Non-Hispanic women who delivered at the area's primary hospital for the 'underserved' (n=4,707)	Multivariate regression including participation dummy	No significant impact estimated on birthweight, the likelihood of low/very low birthweight and infant mortality rate

Study	Data ¹	Design	Results
Buescher <i>et al.</i> (1993)	Linked WIC, Medicaid and birth record files for 1988 births in North Carolina WIC and non-WIC Medicaid recipients who were enrolled in prenatal care(n=21,900)	Multivariate regression including participation dummy and months on WIC and percent of pregnancy on WIC	Reduces the likelihood of low/very low birthweight
Covington(1995)	NMIHS-live births file (1988) WIC and non-WIC African American women who received some prenatal care(n=3,905)	Multivariate regression including participation dummy. Separate models for LBW vs. normal weight and VLBW vs. normal weight for each of four subgroups based on combinations of income and receipt of Medicaid and/or AFDC	Reduces the likelihood of low/very low birthweight(except the subgroup with annual income>12000 and no public aid, which showed negative impact)
Devaney and Schim(1993)	FNS WIC/Medicaid (1987-1988) WIC and non-WIC Medicaid recipients (n=111,958)	Probit analysis using participation dummy: enrolled by 30 weeks gestation	Reduces neonatal and infant mortality rate
Devaney(1992)	FNS WIC/Medicaid (1987-1988) WIC and non-WIC Medicaid recipients (n=111,958)	Probit analysis using participation dummy: (a) participated; (b) participated during first trimester	Increases mean birthweight, and reduces the likelihood of very low birthweight
Devaney <i>et al.</i> (1990/91)	FNS WIC/Medicaid (1987-1988) WIC and non-WIC Medicaid recipients (n=111,958)	Multivariate regression and probit analysis using participation dummy: (a) participated; (b) participated during first trimester. Attempted but rejected selection bias adjustment	Increases mean birthweight, mean gestational age/length of gestation, and reduces the likelihood of low birthweight and premature birth, Medicaid/ health care costs
Frisbie <i>et al.</i> (1997)	NMIHS-live births file (1988) WIC and non-WIC women(n=8,424)	Multivariate regression including participation dummy	Reduces the likelihood of small-for gestational-age birth/ intrauterine growth retardation

Study	Data ¹	Design	Results
Gordon and Nelson(1995)	NMIHS-live births file (1988) WIC and income-eligible women(n=6,170)	Multivariate regression and logit analysis using participation dummy. Birthweight analysis included separate models for blacks and whites, as well as several alternative models to control for simultaneity. Attempted, but rejected selection bias adjustment (using per capita state-level WIC food expenditures, an indicator of whether the family had income from wages and an indicator of WIC participation during previous pregnancies as identifying variables)	Increases mean birthweight, mean gestational age/length of gestation, and reduces the likelihood of low/very low birthweight and premature birth
Heimendinger <i>et al.</i> (1984)	WIC and medical records in three WIC clinics and four non-WIC clinics in the same Boston neighborhoods(1979-81) WIC and Medicaid-eligible infants and toddlers up to 20 months of age with at least two height and weight measurements(n=1,907)	Multivariate regression of value-added measures by age group(3-month intervals), using participation dummy based on mother's participation in WIC during pregnancy	Increases mean birthweight
Joyce <i>et al.</i> (1988)	Census data for large counties in the U.S. in 1997 Data for 677 counties with 50,000+ residents for white analysis and 357 counties with 5,000+ blacks for black analysis	Cost-effectiveness study using aggregate data Multivariate regression using state-specific number of pregnant women enrolled in WIC per 1,000 state-specific eligible women, with selection bias adjustment. Separate models for blacks and whites.	Reduces neonatal mortality rate(for blacks)
Kennedy and Kotelchuck (1984)	WIC and medical records in WIC sites and non-WIC health facilities in 4 geographic areas of Massachusetts(1973-78) (Reanalysis of data from Kennedy <i>et al.</i> 1982) Matched WIC and non-WIC pairs of pregnant women(n=418 pairs)	t-tests and chi square tests using participation dummy and number of months vouchers received	Increases mean birthweight, mean gestational age/length of gestation, and reduces neonatal mortality rate

Study	Data ¹	Design	Results
Kennedy <i>et al.</i> (1982)	WIC and medical records in WIC sites and non-WIC health facilities in 4 geographic areas of Massachusetts(1973-78) WIC and WIC-eligible women(n=1,297)	Multivariate regression including participation dummy and number of vouchers received, months on WIC	Increases mean birthweight, and reduces the likelihood of low birthweight
Kotelchuck <i>et al.</i> (1984)	Linked WIC, birth and death records for 1978 births in Massachusetts Matched WIC and non-WIC pairs of pregnant women with singleton births(n=4,126 pairs)	t-test and chi-square tests using participation dummy and months on WIC and percent of pregnancy on WIC	Increases mean gestational age/length of gestation, and reduces the likelihood of low birthweight, neonatal mortality rate
Kowaleski-Jones and Duncan (2002)	NLSY Mother-Child data. 2,000 children 1990-96. 104 sibling pairs, 71 pairs in which one child participated and one didn't.	Sibling fixed Effects	Increase of 7 ounces in mean birthweight. Positive effect on temperament score. No effect on social or motor skills test scores.
Mays-Scott(1991)	WIC records in one county health department in Texas(1987-89) Prenatal WIC participants who were ≤17 years and had at least one previous pregnancy(n=217)	Analysis of variance using number of months enrolled, nutrition education contacts, and voucher pick-ups	Increases mean birthweight
Metcoff <i>et al.</i> (1985)	Primary data collection at a prenatal clinic in one hospital in Oklahoma (1983-84) Income-eligible pregnant women selected at mid-pregnancy based on predicted birthweight; roughly equivalent numbers were predicted to have average-size babies vs. small or large babies(n=410)	Randomized experiment Multivariate regression using participation dummy	Increases mean birthweight (in the case of smoking mothers) Also estimated the impact on the nutritional biochemistries of pregnant women, but no significant result obtained
Moss and Carver (1998)	NMIHS-live birth and infant death files(1988) WIC and income-eligible non-Hispanic women (n=7,796)	Logit analysis using participation dummy with and without Medicaid	Reduces neonatal mortality rate

Study	Data ¹	Design	Results
New York State (1990)	Linked WIC, birth record and hospital discharge files for births in last six months of 1988 Singleton births to WIC and non-WIC women (n=132,994)	Multivariate regression including participation dummy defined on the basis of insurance coverage (Medicaid, private, none)	Increases mean birthweight, mean gestational age/length of gestation, and reduces the likelihood of low/very low birthweight and premature birth, Medicaid/health care costs
Rush <i>et al.</i> (1988)	Vital statistics records for 1,392 counties in 19 states and DC (1972-80)	Multivariate regression for trend analysis relating WIC program penetration over time to birth outcomes	Increases mean birthweight, mean gestational age/length of gestation, and reduces the likelihood of premature birth
Schramm (1986)	Linked WIC, Medicaid, birth record, hospital care, and death record files for 1982 births in Missouri WIC and non-WIC Medicaid recipients (n=8,546)	Multivariate regression including participation dummy and WIC food costs adjusted for length of pregnancy	Increases mean birthweight, and reduces the likelihood of low birthweight, Medicaid/health care costs
Schramm (1985)	Linked WIC, Medicaid, birth and hospital care records for 1980 births in Missouri WIC and non-WIC Medicaid recipients (n=7,628)	Analysis of covariance using participation dummy and WIC food costs adjusted for length of pregnancy	Reduces the likelihood of low birthweight, Medicaid/health care costs
Silverman (1982)	Medical records for random sample of women enrolled in Maternity and Infant Care Project (MIC) in Allegheny Co., Pennsylvania before (1971-74) and after (1974-1977) initiation of WIC WIC and income-eligible non-participants (n=2,514)	Multivariate regression using participation dummy	No significant impact estimated on birthweight and the likelihood of low birthweight

Study	Data ¹	Design	Results
Simpson(1988)	<p>Aggregate county-level data for North Carolina, including vital statistics, demographic and service infrastructure characteristics, and program penetration and expenditures(1980-1985)</p> <p>Data for 75(out of 100) counties, all of which provided WIC and other prenatal care services for all county residents (rather than sharing responsibility with another county)</p>	<p>Trend analysis relating WIC penetration over time to birth outcomes</p> <p>Multivariate regression using program 'intensity' variable based on county-level WIC expenditure</p>	No significant impact estimated on the likelihood of low birthweight
Stockbauer(1987)	<p>Linked WIC, birth and death record files for 1982 births in Missouri</p> <p>Matched WIC and non-WIC women with singleton births(n=9,411 pairs)</p>	<p>Analysis of covariance using participation dummy and dollar value of redeemed vouchers</p>	<p>Increases mean birthweight (for blacks), mean gestational age/length of gestation, and reduces the likelihood of low/very low birthweight (for blacks) and premature birth</p> <p>Increases the likelihood of small-for gestational-age birth/ intrauterine growth retardation(for whites)</p>
Stockbauer(1986)	<p>Linked WIC, birth and death record files for 1980 births in Missouri</p> <p>WIC and non-WIC Missouri residents with singleton births(n=6,732 for WIC, sample for non-WIC not given)</p>	<p>Analysis of covariance for WIC participant vs. three different comparison groups: (a)all non-WIC births; (b)random sample of non-WIC births; (c)matched group of non-WIC births, using participation dummy, duration of participation and dollar value of redeemed WIC coupons</p> <p>Separate analyses for white, non-white and total group</p>	<p>Increases mean birthweight (for non-white), mean gestational age/length of gestation, and reduces the likelihood of low birthweight(for non-white) and small-for gestational-age birth/ intrauterine growth retardation, neonatal mortality rate(for non-white)</p> <p>Increases neonatal mortality rate(for whites)</p>

Study	Data ¹	Design	Results
<i>Impact on Breastfeeding and Infant Feeding Practices</i>			
Blacazar <i>et al.</i> (1995)	NMIHS-live births file (1988) Mexican-American and non-Hispanic white women who were not undecided about infant feeding plans prior to the infant's birth (n=4,089)	Multivariate regression including participation dummy	Increases the intention to breastfeed(with advice) Reduces the intention to breastfeed(overall)
Chatterji <i>et al.</i> (2002)	NLSY Mother-Child file. 1,282 children born 1991-95. 970 siblings born 1989-95.	IV with WIC state program characteristics as instruments. Sibling fixed effects.	OLS and IV indicate WIC reduces breastfeeding initiation, but no effect on duration. Fixed effect suggests reductions in length breastfeeding.
GAO(1993)	RLMS(1989-92) Nationally representative sample of mothers of 6 month olds. Analysis included all respondents with complete data for questions of interest (n=79,428)	Multivariate regression including participation dummy based on prenatal or postpartum participation	Reduces the incidence of breastfeeding initiation
Ryan <i>et al.</i> (1991)	RLMS(1984 and 1989) Respondents in 1984 and 1989(n=120,334)	Multivariate regression including participation dummy	Reduces the incidence of breastfeeding initiation and the duration of breast-feeding
Schwartz(1992)	NMIHS-live births file (1988) WIC participants and income-eligible nonparticipants (n=6,170)	Three-stage regression with selection bias adjustment, using participation dummy and advice(to breastfeed) dummy	Increases the incidence of breastfeeding initiation(if given advice) Reduces the incidence of breastfeeding initiation (otherwise)
Tuttle and Dewey (1994)	Primary data collection in WIC clinics and neighborhoods in one northern California community Hmong and Vietnamese WIC participants whose youngest child was less than 1 year(n=122)	Multivariate regression including the number of times previously participated in WIC	Increases the incidence of breastfeeding initiation

Study	Data ¹	Design	Results
<i>Impact on Nutrition and Health Outcomes of Pregnant Women</i>			
Endres <i>et al.</i> (1981)	Dietary recalls for sample of pregnant WIC participants in 22 counties in Illinois (1978-79) Newly enrolling pregnant WIC participants and participants who were on the program for six months or more(n=766)	t-tests for participant before vs. after, separate groups	Participants consume more of food energy, protein, vitamin A, B ₆ , B ₁₂ , C, D, folate, thiamin, niacin, riboflavin, calcium, iron magnesium, zinc
Kennedy and Gershoff(1982)	WIC and medical records in WIC sites and non-WIC health facilities in 4 geographic areas of Massachusetts(1973-78) WIC and WIC-eligible women(n=232)	Multivariate regression including the number of WIC vouchers received	Increases final hemoglobin levels (measured at 34 weeks gestation or later)
Rush <i>et al.</i> (1988b)	Primary data collection, laboratory measurements, and record abstractions (data on nutritional and health status of mothers were collected at the time of enrollment in WIC or prenatal care and again at about 8 th month of gestation) Nationally representative sample of pregnant WIC participants and income-eligible nonparticipants receiving prenatal care in surrounding public health clinics or hospitals (n=3,935)	Multivariate regression including participation dummy	Participants consume more of food energy, protein, fat, carbohydrate, vitamin B ₆ , B ₁₂ , C, thiamin, niacin, riboflavin, calcium, iron magnesium, phosphorus Also estimated the impact on breastfeeding practices, but no significant result obtained

Study	Data ¹	Design	Results
<i>Impact on Nutrition and Health Outcomes of Infants and Children</i>			
Burstein <i>et al.</i> (1991)	Primary data collection (24 hour recall; body measurements; blood samples) in Florida and North Carolina (1990-91) Random sample of WIC and income-eligible non-WIC infants(6 month old) stratified by birthweight(n=807)	Multivariate regression including participation dummy Both single equation and instrumental variable models are used to control for selection bias. But findings from single equation models are stressed because selection-bias-adjusted models yielded some implausible findings	Participants consume more iron Reduces head circumference Also estimated the impact on mother's breastfeeding practices, and found that WIC improves infant feeding practices among non-breast feeding mothers
Burstein et al (2000)	NHANES-III(1988-91) SIPP 1993 panel (1993-95) Comprehensive Child Development Program. Nonrepresentative sample of 2-year olds from 10 sites, 1994-97.	Charts and cross-tabulations.	Sharp falloff in WIC participation after child's 1 st birthday, and with exit from AFDC, even with no change in HH income. WIC children worse off in many dimensions than eligible non-participants, but have higher consumption of calcium and folate.
Center for Disease Control(1996)	NHANES-III (1988-91) WIC and income-eligible infants and children of 2-59 months(n=3,488)	Multivariate regression including participation dummy	No significant impact estimated on the incidence of overweight
Fraker <i>et al.</i> (1990)	CSFII(1985) WIC and WIC-eligible children(1-4 years) (n=445)	Multivariate regression with selection bias adjustment, using proportion of four recall days on which child was enrolled in WIC; also tested for combined WIC and FSP participation	Participants consume more vitamin B ₆
Hicks and Langham(1985)	Blind interviewer-administered tests and record retrieval for school grades Siblings WIC pairs, one who 'participated' in WIC prenatally and one who enrolled after one year of age(n=19 sibling pairs)	Multivariate regression including participation dummy	Increases IQ, attention span, visual-motor synthesis and school GPA

Hicks <i>et al.</i> (1982)	Blind interviewer-administered tests and record abstractions for sample members in three rural counties in Louisiana Siblings WIC pairs, one who 'participated' in WIC prenatally and one who enrolled after one year of age(n=21 sibling pairs)	Multivariate regression including participation dummy	Reduces height/length
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Study	Data ¹	Design	Results
James(1998)	Medical records for one health care center in Mt. Vernon, NY Randomly selected sample(matched on age and gender) of children who were up-to-date on immunizations at 12 months of age; equal size groups (n=150; total)	Chi-square tests of the difference in percentage up-to-date at 24 months, using participation dummy	No significant impact estimated on the immunization status
Oliviera and Gundersen(2000)	CSFII(1994-96) WIC and income-eligible children(1-4 years) in households where at least one other person also participates in WIC(n=180)	Multivariate regression including participation dummy Authors also ran regression for full sample of WIC and income-eligible children. That model resulted in more significant effects.	Participants consume more of vitamin B ₆ , folate, iron
Rose <i>et al.</i> (1998)	CSFII(1989-91) Nonbreastfeeding preschool children(1-4 years) in FSP-eligible households(n=499)	Multivariate regression including value of monthly household per capita WIC benefit. Investigated selection bias but reportedly 'found no evidence of it'.	Participants consume more of protein, vitamin B ₆ , E, folate, thiamin, niacin, riboflavin, iron, magnesium, zinc
Rose <i>et al.</i> (1995)	CSFII(1989-91) Nonbreastfeeding preschool children(1-5 years) (n=800)	Multivariate regression including participation dummy	Participants consume more iron
Rush <i>et al.</i> (1988d)	Primary data collection, 24-hour recall, physical and laboratory measurements(1983-84) Random sample of infants and children of women included in the longitudinal study of women(n=2,370)	Multivariate regression including participation dummy, defined on the basis of age of 'inception' into WIC, including prenatally	Participants consume more of vitamin B ₆ , C, iron, but less of protein, calcium, magnesium, phosphorus Reduces height/ length Improves receptive vocabulary scores and digit memory at age Improves the immunization status Also estimated the impact on mother's breastfeeding practices, but no significant result obtained

Study	Data ¹	Design	Results
Sherry <i>et al.</i> (1997)	PedNSS data for Vermont(1981-94) 12,000 to 19,500 records per year	Prevalence estimates for each year for overall sample and for 6-23 months and 24-59 months Trend analysis and Chi-square tests	Reduces the prevalence of anemia
Smith <i>et al.</i> (1986)	Medical records for children in one health center in Los Angeles; initial and 6-month followup measures Subset of random sample of WIC and non-WIC children under the age of 5 who were diagnosed with anemia; matched on age, gender and ethnicity (n=25 each group)	Analysis of variance using participation dummy	Increases mean hematocrit, hemoglobin
Vasquez-Seone <i>et al.</i> (1985)	Medical records for children in an inner-city health center in New Haven, CT before and after initiation of WIC(1971 vs. 1984) Infants and children between 9 and 36 months of age(n=583)	t-tests for pre-WIC vs. post-WIC group level comparison over time	Increases mean hematocrit, hemoglobin and reduces the prevalence of anemia
Yip <i>et al.</i> (1987)	(a) PedNSS data for Arizona, Kentucky, Louisiana, and Tennessee(1975-85) (Most data provided by WIC programs) (b) Linked PedNSS and birth records for WIC participants in Tennessee PedNSS database(1975-84) Infants and children between 6 and 60 months of age (a) (n=499,759) (b) (n=72,983)	Multivariate regression and angular Chi-square tests for overall and age-specific prevalence estimates for each year: initial measures vs. followup measures	Reduces the prevalence of anemia

Source: The tables are based largely on research reviewed in Hamilton and Fox *et al.*(2000).

1. Data source and population(sample size)

CSFII = Continuing Survey of Food Intake by Individuals

FNS WIC/Medicaid = FNS' WIC/Medicaid database

NHANES-III = Third National Health and Nutrition Examination Survey

NMIHS = National Maternal and Infant Health Survey

PedNSS = Pediatric Nutrition Surveillance System

RLMS = Ross Laboratories Mother's Survey

Table 10: Studies of the National School Lunch Program

Study	Data ¹	Design	Results
<i>Studies of Impact on Food Energy and Nutrient Intake(at Lunch or Daily)</i>			
Akin, Guilkey, Hanes and Popkin(1983)	NFCS (1977-78) 24-hr recall; food record for 2 days Children/adolescents aged 6-18 (n=1,554)	Multivariate regression(GLS) including the ratio of the number of days when the respondent ate school lunch to total number of days of dietary data	Increases daily intake of food energy, protein, vitamin A B ₆ B ₁₂ C, thiamin, niacin, calcium, iron, phosphorus, magnesium
Akin, Guilkey, and Popkin (1983)	NFCS (1977-78) 24-hr recall; food record for 2 days Children/adolescents aged 6-18 (n=1,554)	Switching regression and Chow tests, including the ratio of the number of days when the respondent ate school lunch to the number of days when he/she ate any lunch	Increases daily intake of food energy, vitamin A B ₆ C, iron
Devaney, Gordon and Burghardt (1993)	Nationally representative sample of students from 329 public and private schools 24-hour recall and questionnaire (parent) Children/adolescents of grades 1-12, families (n=3,350)	Multivariate regression(OLS) with selection bias adjustment, including participation dummy of whether the respondent ate NSLP lunch on recall day	Increases at-lunch intake of protein, vitamin A B ₁₂ , riboflavin, calcium, phosphorus, magnesium, zinc, and in case of some subgroup(s) of the sample, fat, saturated fat, cholesterol Reduces at-lunch intake of carbohydrate and vitamin C ⇒ Also increases daily intake of vitamin A C, carbohydrate, fat, saturated fat Increases the consumption of milk(products), meat and fish, grain products, fruits(juices), vegetables Reduces the consumption of dry beans and peas, sugar and sweets
Hoagland(1980)	HANES-I (1978-79) 24-hr recall and biochemical tests Children/adolescents, aged 6-21 (n=3,155)	Comparison of means; linear regression, where participants are defined as those who ate school lunch on recall day	Increases daily intake of vitamin C

Study	Data ¹	Design	Results
Howe and Vaden(1980)	Sample of randomly-selected students in selected grades from one public city high school in KS 24-hr recall Adolescents of grades 10-11 (n=104)	2-way ANOVA, where participants are defined as those who ate school lunch on recall day	Increases at-lunch intake of protein, vitamin A C, thiamin, riboflavin, calcium, iron
Perry, Shannon, Stitt and Bonner (1984)	All 5 th grade classes from two schools and 4/30 6 th grade classes in a third school; one SFA in AL Food record for 3 days; observation(plate waste); questionnaire (student) Children of grades 5-6 (n=233)	Unmatched t-test, where participants are defined as those who ate NSLP lunch on data collection days	Increases at-lunch intake of vitamin A C, riboflavin, calcium, phosphorus
Wellisch et al. (1983)	Nationally representative sample of students and families from 276 public schools; included students in no-NSLP schools 24-hour recall; food expenditure recall for 1 week; anthropometrics; in-person interview (parents and children) Children/adolescents of grades 1-12, families(n=6,556)	Multivariate(OLS) and logistic regression , including participation variables on whether the student ate NSLP lunch on recall day or on past/current weekly participation	Increases at-lunch intake of food energy, protein, vitamin A B ₆ , thiamin, riboflavin, niacin, calcium, phosphorus, magnesium Reduces at-lunch intake of vitamin C ⇒ Same results with respect to daily intake, for all of the above nutrients except thiamin and vitamin C NSLP lunches are more dense in protein, vitamin A B ₆ , riboflavin, niacin, calcium, phosphorus, magnesium and iron (elementary school) NSLP lunches are less dense in vitamin C and iron (secondary school) Increases weight, percent body fat ³ , the probability of overweight/overfatness ⁴ of the older subgroup of the participants Increases household's food expenditure

Study	Data ¹	Design	Results
<i>Studies of Impact on Children's Nutrition and Health Status, Food Consumption and Household Food Expenditure²</i>			
Bhattacharya and Currie(2000)	1988-94 NHANES-III Youths aged 12 to 16 (n=1,358)	Multivariate regression including dummies for income eligibility and school being in session and an interaction term of the two, measuring 'exposure' to school meals, to address the endogeneity of program participation	Exposure to school meals improves the overall quality of the diet (measured by HEI) and reduces blood cholesterol and sweets consumption,
Gretzen and Vermeersch (1980)	All students from two intervention programs and two comparison programs in one semi-rural SFA in CA Review of school records Children of grades 1-8 (n=332)	Comparison of means, t-test and ANOVA for participant vs. matched control groups(two low-income and one mid-income group), where participants are defined as those who received school lunch regularly from grade 1 to 8	Male participants in NSLP are shorter in height compared to those in Head Start
Long(1991)	NESNP (1980-81) Food expenditure recall for 1 week; questionnaire(parent) Families of children/ adolescents of grades 1-12 (n=5,997)	Multivariate regression with selection bias adjustment, where participants are defined as the households of which any member participated in NSLP at least once during a week	Increases household food expenditure
Melnick, Rhoades, and Wales <i>et al.</i> (1998)	All children randomly selected classrooms from 25/50 NYC public and private schools 24-hr recall(non-quantitative) and questionnaire(parent) Children of grades 2 and 5 (n=1,397)	Gender-adjusted ANCOVA, where participants are defined as those who ate school lunch on recall day	Increases food and vegetables/5-A-Day Index Score, Food Guide Pyramid ⁵ Index Score

Study	Data ¹	Design	Results
Wolfe, Campbell, Frongillo et al. (1994)	All children in selected grades from 51/110 schools in 7 regions in NY state Anthropometric and questionnaire(parent) Children of grades 2 and 5 (n=1,797)	Multivariate(OLS) and logistic regression, where participants are defined as those whose parent report that the child eats school lunch	Increases the Body Mass Index ⁶ and percent body fat of the participants Reduces the probability of underweight ⁷

Source: The tables are based largely on research reviewed in Hamilton and Fox *et al.*(2000).

1. Data source, data collection method and population(sample size).

NESNP = National Evaluation of School Lunch Programs.

NFCS = Nationwide Food Consumption Survey.

HANES = (First) Health and Nutrition Examination Survey.

2. Devaney, Gordon and Burghardt(1993) and Wellisch et al.(1983) also did some relevant works. Their results are included in the section for ‘Studies of Impact on Food Energy and Nutrient Intake(at Lunch or Daily).

3. Based on measurements of triceps skinfold (Wellisch *et al.* 1983) or arm fat area (Wolfe *et al.* 1994).

4. Based on weight for age and triceps fatfold > 75th NCHS percentile.

5. Based on number of daily recommended servings for children:

Bread group 9 or more servings

Milk 2 or more servings

Meat group 2 or more servings

Vegetables 4 or more servings

Fruit 3 or more servings

6. Based on weight/(height)² above 90th percentile in NHANES I and II.

7. Based on arm fat area < 10th percentile.