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Medicaid at Birth, WIC Take-Up, and Children's Outcomes

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Abstract

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides food and nutritional advice to low-income women, and infants and children, who are income eligible and are nutritionally at risk. The effects of WIC on infants have been extensively studied, but children 1 to 4 are the most rapidly growing part of the WIC caseload, and little information is available about the effects of WIC on this group.

Using data from the 1996 and 2001 panels of the Survey of Income and Program Participation (SIPP), we show that Medicaid policies that affected take-up among infants had long-term effects on participation in the WIC program. By contrast, increases in the generosity of Medicaid toward older children increased WIC eligibility without having much impact on participation. Hence increases in WIC participation among children have not been driven by higher-income families made eligible as a result of State Children's Health Insurance Program, as some critics have argued.

Our most striking finding is that WIC participation at age 4 has large and significant effects on the probability that a child is at risk of being overweight (i.e., has BMI greater than the 85th percentile for sex and age). This suggests that either the nutrition education or the actual provision of healthy food is helping to prevent obesity among young children. This is an important measure of the success of the WIC program because of the importance of obesity as a public health threat, and because of the importance of establishing healthy eating habits early in life.

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I. INTRODUCTION

The Special Supplemental Nutrition Program for Women, Infants and Children (WIC) is a federally funded, state-run program that provides direct nutritional supplements and nutritional advice to infants and children, as well as to pregnant, postpartum, and lactating women. Although WIC was originally charged with preventing hunger, there is growing recognition that today many American children are at risk of obesity. The incidence of obesity is rising faster among children than among adults, and recent estimates suggest that obesity will cause as many future deaths as smoking (Mokdad, Marks, Stroup, and Gerberding, 2004). Moreover, since the poor are at higher risk of being overweight, the health consequences will fall disproportionately on those of low income, exacerbating health inequalities. The Surgeon General's report on obesity emphasizes the importance of early intervention to prevent obesity, since once formed, eating habits are hard to change (U.S. Department of Health and Human Services, 2001).

Hence, the prevention of overweight and obesity is now an important goal of WIC. WIC could reduce the risk of obesity either by providing nutritious foods that substitute for less nutritious foods that are high in calories, or through nutrition education. It is easy to imagine, for example, that having the WIC staff tell a mother that her child was overweight and at risk for future health problems could have an impact on the family's diet.

WIC serves a large share of eligible low-income pregnant women and infants, and the effects of WIC on this population have been extensively studied. However, the most rapid growth in participation in the WIC program is for children aged 1 to 4, and participation rates among children are relatively low—Bitler, Currie, and Scholz (2003) estimate that while 73 percent of eligible infants take up the program, only 38 percent of eligible 1- to 4-year-old children use WIC. Fifty-seven percent of all 1- to 4-year-old children are eligible for WIC, so future growth in the program will likely come from efforts to

enroll larger numbers of these children. It is important to see what effect such efforts might have on children's health and nutritional status.

This report focuses on the determinants of WIC take-up among 4-year-old children and on the effects of childhood WIC participation on children 4 to 6 years old. We use rich data on WIC participation, child anthropometrics, health, and health care utilization from the 1996 and 2001 panels of the Survey of Income and Program Participation (SIPP). We show that recent changes to the Medicaid program had significant effects on the take-up of WIC, and use these changes as instruments for identifying the effects of WIC on child outcomes.

Two types of changes to the Medicaid program may have increased WIC participation among 4-year-old children. First, higher Medicaid cutoffs for infants are likely to affect childhood WIC participation because most children who use WIC begin using the program as infants, and Medicaid confers automatic eligibility for WIC. Hence, it is possible that higher Medicaid cutoffs when children were infants induced their mothers to join both Medicaid and WIC, and that some fraction of these new child entrants remained on the program through early childhood.

The second type of Medicaid eligibility changes occurred through the State Children's Health Insurance Program (SCHIP). Under SCHIP, states were given the option of extending public health insurance to uninsured children either by expanding Medicaid or by creating a separate, stand-alone program (or some combination). Because categorically eligible Medicaid participants are eligible for WIC, states that used SCHIP to expand Medicaid also expanded eligibility for WIC among children. This expanded eligibility could have led to expanded WIC coverage among children of higher income levels than those of the typical WIC participant.

In fact, Besharov and Germanis (2001) argue that expansions of WIC eligibility to women and children of higher income levels has greatly increased WIC expenditures. Their argument implies that the increases in WIC participation among children have been largely driven by children from higher-income

families. However, we find that while Medicaid cutoffs for infants have a strong effect on children's WIC take-up, take-up among children who became eligible because of SCHIP was low, and so SCHIP had little impact on WIC caseloads.

To examine the impact of WIC on child outcomes, it is necessary to account for selection into the program. We show that WIC participants are negatively selected even relative to the population of eligibles so that failure to adequately control for selection into the program will lead to negative estimated effects of WIC. We draw on the results regarding take-up and use the Medicaid income cutoff when the child was an infant as an instrument for WIC participation at age 4.

However, it is possible that Medicaid coverage at the time of the birth has long-term effects on child health. Since, as we will show below, the vast majority of children on WIC at age 4 were on WIC as infants and had Medicaid coverage as infants (and conversely, take-up of WIC among eligible infant Medicaid recipients is high), it is likely to be difficult to disentangle the effects of Medicaid coverage at birth and WIC participation over the child's early life. We thus interpret our estimates as the combined effect of Medicaid at birth and continuous WIC coverage up to age 4.

Our main finding is that WIC participation at age 4 is associated with a large and statistically significant reduction in the probability that children are at risk of being overweight (defined as having a Body Mass Index or BMI above the 85th percentile for sex and age). Hence WIC is successfully preventing overweight in young children, which is likely to have implications for their future risk of contracting obesity-related diseases. We find no significant effect of WIC on measures of access to health care, which supports the interpretation that the effects on weight and obesity are due to the nutritional component of the WIC program rather than to any links between WIC and current access to medical care.

The rest of this report is laid out as follows. Section II provides necessary background information about WIC and the Medicaid expansions relevant to WIC participation. Section III discusses

the SIPP data and presents preliminary sample statistics. Section IV provides an overview of our statistical methods, and results appear in Section V. Section VI presents our conclusions.

II. BACKGROUND INFORMATION ABOUT WIC AND MEDICAID

A. The WIC Program

Entirely federally funded, WIC provides both nutritional education and food packages to eligible women, infants, and children. There are both categorical eligibility requirements and program eligibility requirements. Categorically eligible groups are infants; children aged 1 to 4; and pregnant, breast-feeding, and postpartum women. If categorically eligible, participants must also be at nutritional risk, though in practice this condition is rarely binding.

WIC has been expanding rapidly over time. Federal program expenditures increased from $256 million in FY 1977 ($765 million in 2001 dollars) to $4.1 billion in FY 2001, while participation went from 848,000 per month in FY 1977 to 7.3 million per month in FY 2001. Almost half of 2000 participants were children aged 1 to 4.

WIC participants receive vouchers that can be used to purchase specific foods that are selected because they contain protein, calcium, iron, and/or vitamins A and C. The list of approved foods includes milk, cheese, and peanut butter. Food packages are tailored to nutritional needs so that they differ for women, infants, and children. Participants receive nutritional counseling and are encouraged to breast-feed their children (though WIC's provision of free infant formula may undermine this advice). Many WIC programs are contracted out to nonprofit agencies and are connected to maternal and child health clinics.

To be eligible for the program, individuals must have income under 185 percent of the federal poverty level (FPL), be nutritionally at risk (definitions of this vary by state), and be in one of the categories (pregnant or postpartum women, infants, or children under 5). However, Medicaid, food

stamp, and AFDC/TANF participants are adjunctively eligible, regardless of their income. Since income cutoffs for food stamps and AFDC/TANF are much lower than 185 percent of the FPL, while cutoffs for Medicaid may exceed 185 percent of poverty, the major channel for adjunctive eligibility is through the Medicaid program. WIC providers refer mothers to other health care providers such as Medicaid and to immunization programs and, conversely, these other agencies also refer eligibles to WIC clinics. With the recent Medicaid eligibility expansions, nearly half of all infants born in the United States are eligible for WIC (Bitler, Currie, and Scholz, 2003).

WIC use among children is closely tied to WIC use during the first year of life, as we show below. At the same time, many children leave WIC at age 1, when the WIC package of food changes (to exclude infant formula) and families must have their WIC eligibility redetermined (Burstein et al., 2000). Infants whose mothers are not exclusively breast-feeding receive baby formula in their WIC package. The cost of infant formula makes the infant package valuable: A recent US Department of Agriculture report found that in 2000 a 13-ounce can of liquid concentrate cost between $2.59 and $3.11 (Oliveira, Prell, Smallwood, and Frazeo, 2001) so that the 403 fluid ounces permitted in an infant package would be worth $80 to $96. By contrast, the value of the package available to the average 4-year-old WIC participant in our data is $31. The value of the WIC infant package, along with the strong relationship between WIC use as an infant and WIC use later, suggests that the Medicaid eligibility threshold for infants may be a strong predictor of later WIC use.

Most previous evaluations of WIC focused on the effects on birth outcomes and infant mortality. These studies found that WIC is associated with a decrease in the risk of infant mortality, a lower probability of a small-for-gestational-age birth, and reductions in the cost of maternal and neonatal care, among other beneficial effects.[1]

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[1]Papers about the effect of WIC on birth outcomes and nutrition include Ahluwalia et al. (1998), Devaney (1992), Devaney et al. (1992), Devaney and Shirm (1993), and Moss and Carver (1998).

As noted above, to be eligible for WIC, women must be nutritionally at risk and either under 185 percent of the FPL or participating in the AFDC/TANF, Medicaid, or Food Stamp programs. If these women are less well-off along other dimensions than the population at large, ordinary least squares (OLS) estimates of the impact of WIC are likely to understate the program's true beneficial effects. Alternatively, if only the more skilled mothers among women eligible for WIC manage to obtain benefits, OLS estimates of the effects of WIC may be biased upward. Moreover, the literature points out that women who have longer pregnancies have longer to get onto the WIC program. This could result in a noncausal correlation between gestation (or other outcomes) and having been on the WIC program.

Most of the previous studies do not control carefully for potential biases due to selection into the WIC program, leading to a concern that their positive findings are driven by positive selection. Bitler and Currie (2004) provide evidence that compared to eligibles who do not participate, WIC participants are in fact negatively selected on a wide range of observable variables, and they confirm that WIC use during pregnancy has a positive effect on infants. Other recent papers that consider possible selection into the WIC program include Brien and Swann (2001), Kowaleski-Jones and Duncan (2000, 2002), and Chatterji et al. (2002).

A second weakness of the existing WIC literature is the virtually exclusive focus on pregnancy and infant health outcomes rather than the outcomes of older children. Kowaleski-Jones and Duncan (2000) is one of the few papers that looks at the impact of WIC on children rather than infants. Using data from the NLSY from 1990 to 1996, they find that in fixed-effect models which compare siblings who received WIC prenatally with other siblings, WIC had a positive impact on child temperament. However, this finding is not robust to the use of instrumental variables methods and relies on a small set of families where one child received WIC at a particular age while another did not.[2]

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[2]This is partially due to a data issue with the NLSY. The NLSY only asks about any WIC participation within the family. It is impossible to determine who is receiving WIC in the family using the NLSY, unlike the SIPP, which details WIC use by any eligible persons.

B. The Interaction between Medicaid and WIC

The Medicaid program provides public health insurance coverage for low-income women and children. Until the mid-1980s, most children became eligible for Medicaid because their mothers received cash welfare through the Aid to Families with Dependent Children (AFDC) program. Beginning in the mid-1980s, Congress enacted a series of laws expanding Medicaid eligibility to families who did not qualify for AFDC either because of their income or because of their family structure. By 1991, states were required to cover pregnant women with incomes less than 1.33 times the FPL, and states were eligible to receive federal matching funds to increase the cutoff to 1.85 times the FPL. Income cutoffs for infants under the Medicaid program are shown in Table 1 for 1996 and 2002.

While most state Medicaid eligibility thresholds did not rise above the WIC income cutoff of 1.85 times the PVL, Medicaid is a far more valuable program, and hospitals face strong incentives to enroll eligible pregnant women. Hospitals are required by law to treat women in active labor. Prior to the Medicaid expansions, uncompensated care for maternity patients was a significant burden to hospitals. Now, hospitals can get reimbursed for this care by the Medicaid program. In fact, since 1993, about 37 percent of deliveries have been paid for by the Medicaid program (National Governor's Association, 2003). These women and their infants were automatically eligible for WIC, and did not have to go through any further certification process.

The automatic link between Medicaid coverage and WIC eligibility suggests that changes in the Medicaid income cutoffs that fell below the WIC income cutoff could still have had an impact on WIC take-up. For example, increases in the Medicaid cutoff from 1.33 to 1.85 times the FPL brought many more pregnant women onto Medicaid. These women were always eligible for WIC but may not have been willing to undertake a separate WIC application. Once they gained Medicaid coverage, they automatically became eligible for WIC, which is likely to have increased WIC take-up. Bitler and Currie

TABLE 1
Variation in Medicaid and Separate SCHIP Thresholds and Medicaid Eligibility Threshold while an Infant for Children Aged 0–4

	Medicaid as an Infant		Medicaid SCHIP	Separate SCHIP
State/Year	1996	2002	2002	2002
Alabama	1.33	1.33	2.00	—
Alaska	1.33	1.91	2.00	—
Arizona	1.36	1.40	—	2.00
Arkansas	1.34	2.00	2.00	—
California	1.58	2.00	2.50	—
Colorado	1.33	1.33	—	1.85
Connecticut	1.74	1.85	3.00	—
Delaware	1.52	1.87	—	2.00
DC	1.52	1.99	2.00	—
Florida	1.52	1.97	1.99	—
Georgia	1.52	1.85	—	2.35
Hawaii	1.52	1.94	2.00	—
Idaho	1.33	1.50	1.50	—
Illinois	1.33	1.97	1.87	—
Indiana	1.39	1.50	2.00	—
Iowa	1.52	1.93	1.99	—
Kansas	1.39	1.50	—	2.00
Kentucky	1.52	1.85	2.00	—
Louisiana	1.33	1.70	2.00	—
Maryland	1.74	2.00	3.00	—
Massachusetts	1.53	2.00	1.99	—
Michigan	1.54	1.85	2.00	—
Minnesota	2.08	2.80	2.80	—
Mississippi	1.52	1.85	2.00	—
Missouri	1.52	2.94	3.00	—
Montana	1.33	1.33	—	1.50
Nebraska	1.39	1.85	1.85	—
Nevada	1.33	1.33	—	2.00
New Hampshire	1.72	2.94	2.98	—
New Jersey	1.85	1.85	3.50	—
New Mexico	1.85	2.33	2.35	—
New York	1.85	1.85	2.50	—
North Carolina	1.85	1.85	—	2.00
Ohio	1.33	1.80	2.00	—
Oklahoma	1.59	1.85	1.85	—
Oregon	1.33	1.33	—	1.70
Pennsylvania	1.79	1.85	—	2.35
Rhode Island	2.22	2.50	2.50	—
South Carolina	1.85	1.85	1.50	—
Tennessee	1.85	1.85	2.00	—

(table continues)

TABLE 1, continued

	Medicaid as an Infant		Medicaid SCHIP	Separate SCHIP
State/Year	1996	2002	2002	2002
Texas	1.85	1.85	2.00	—
Utah	1.33	1.33	—	2.00
Virginia	1.33	1.33	—	2.00
Washington	1.94	2.00	—	2.50
West Virginia	1.50	1.50	—	2.00
Wisconsin	1.66	1.95	2.00	—
Wyoming	1.33	1.33	—	—

Notes: Table shows means in eligibility thresholds for SCHIP and Medicaid for children aged 0–4 across states in the 1996 and 2002 SIPP. Thresholds expressed as percent of the FPL. Columns 1 and 2 show the state level Medicaid eligibility threshold for children 0–4 as infants. Column 3 shows the maximum Medicaid SCHIP eligibility threshold for 2002 conditional on the state having a Medicaid SCHIP program. Column 4 shows the maximum separate SCHIP eligibility threshold for 2002 conditional on the state having a separate SCHIP program. No states had SCHIP programs in 1996. Statistics are weighted by the population of children 0–4 in the state.

(2004) show that 81 percent of women whose deliveries were covered by Medicaid used WIC during their pregnancies.

The SCHIP program was established in the Balanced Budget Act of 1997. SCHIP allows states to expand public health insurance to children who were previously ineligible for Medicaid (and also to their parents in some states). Originally, states could extend eligibility to children in families with incomes up to twice the federal poverty level (or higher in some cases). Some states have now extended eligibility for public health insurance to children in families with incomes up to 3 or 3.5 times the FPL.

Table 1 shows the income cutoffs for SCHIP and whether the program was implemented as a Medicaid expansion or as a separate program.[3] This distinction is important because if a state implemented SCHIP by expanding Medicaid, then it also increased the income cutoff for the WIC program. For example, New Jersey, the state that has extended coverage to 3.5 times the FPL, implemented SCHIP by expanding its Medicaid program, so that children with incomes up to 3.5 times poverty are now eligible for WIC.

It is unlikely that states considered the likely impact on their WIC programs when they made the choice between stand-alone or Medicaid SCHIP programs. More important factors discussed by states included ease of implementation and the perception that stigma associated with Medicaid might lead to eligible children remaining uninsured. Thus, in principle, the implementation of SCHIP can be viewed as a "natural experiment" that is likely to affect WIC eligibility without having other effects on families, at least once the overall cutoff for public health insurance has been controlled. Whether SCHIP will have important effects hinges on the number of children in states whose SCHIP-Medicaid threshold exceeded 1.85 times poverty and on take-up rates among young children in families with higher income levels who did not use WIC as infants.

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[3]Some states chose to have completely separate SCHIP programs while others had separate programs for children of some ages but expanded Medicaid for other children (usually infants or children not covered by the Medicaid expansions of the late 1980s and early 1990s).

III. THE DATA

The SIPP has been conducted by the Census Bureau since 1984. It consists of a series of short panels that collect information on income, demographics, and national program participation. The 1996 panel follows a nationally representative sample of persons from early 1996 through early 2000, while the 2001 panel has followed another group of individuals from early 2001 to the present. Unlike some other data sets such as the Current Population Survey, the SIPP follows the original household members when they move. The SIPP identifies the individual's state of residence for all but a handful of small states (the states which are not identified and hence are excluded from our analysis include Maine, North Dakota, South Dakota, and Vermont).

Each panel re-interviews families once every 4 months. At each interview, a core questionnaire and various "topical modules" are administered. The core questionnaire asks about WIC use in each month for all individuals in households that have a woman aged 15 to 45 present. Questions about children's health were included in topical modules administered in waves 3, 6, 9, and 12 of the 1996 SIPP and in wave 3 of the 2001 SIPP; weight and height (which are used to create BMI) were only asked in waves 6 and 12 of the 1996 SIPP. The SIPP is well suited for this project because of the large sample, monthly WIC and other program participation measures, relatively high-quality income data, and the availability of a range of child outcome measures in the topical modules.

Table 2 provides an overview of the data on WIC participation from the 1996 and 2001 SIPP panels for the subsample of 4-year-old children whose family income is below 3.5 times the FPL.[4] We focus on this group in our analysis since children of higher income are unlikely to be affected by WIC.

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[4]One would not expect children at income levels higher than 3.5 times FPL to respond to WIC. For example, over the 1991–2001 period, the highest eligibility cutoff associated with Medicaid or Medicaid SCHIP was 3 times the FPL.

TABLE 2
Summary Statistics for WIC Use, 1996 and 2001 SIPP
(Average Family Income < 350% of FPL)

Number in sample at age 4	7310
Number on WIC while 4	1822
Conditional on being 4:	
Number in sample at 3	4731
Number in sample at 2	2659
Number in sample at 1	1270
Number in sample as infant	464
Number on WIC while 4 and in sample as infant	102
Conditional on being 4, on WIC at 4, and in the sample as an infant:	
On WIC as infant	0.84
On Medicaid as infant	0.62

Notes: Table contains either the number of observations or means for children with average family income < 3.5 times the FPL from the 1996 and 2001 SIPP. Statistics are weighted. Row 1 is the number of children who were 4 at some point in the sample. Row 2 is the number of 4-year-olds on WIC while 4. Rows 3-6 are the number of 4-year-olds who were in the sample at ages 3, 2, 1, or 0 respectively. Rows 7 is the number of 4-year-olds on WIC while 4 who were in the sample as infants. Row 8 is the share of children who were in the sample as infants and at 4, were on WIC at 4, and who got WIC while aged 0. Row 9 is the share of children who were in the sample as infants and at 4, were on WIC at 4, and who got Medicaid while aged 0.

Table 2 shows that of the 7,310 4-year-old children in this income range, a quarter were participating in WIC at age 4.

However, given the structure of the SIPP, only a few children are observed from infancy until age 4. Table 2 shows that of the 7,310 children using WIC at age 4, 4,731 were in the sample at age 3, but only 464 were also in the sample in infancy. What this means is that we cannot accurately reconstruct the history of WIC (or Medicaid) participation for the majority of 4-year-olds in our sample. Yet, some key outcomes of interest are not observed for younger children.

The final panel of Table 2 focuses on the small group of children for whom we know past WIC participation and asks how many of these children began participation as infants. The table shows that 84 percent of children on WIC at age 4 were on WIC as infants. Given under reporting of WIC participation in the SIPP, the true fraction may be even higher.[5] The final row of Table 2 shows that of the children on WIC at age 4 and in the sample of infants, 62 percent were on Medicaid as infants, illustrating the tight link between participation in the two programs.

Summary statistics for other variables used in our analysis are shown in Table 3 for children who were on WIC at age 4 and those who were not. As discussed above, one argument frequently raised about WIC is that participants may be positively selected relative to other eligibles, and hence that positive measured impacts of WIC could be associated with the positive characteristics of WIC participants rather than with participation in the program per se.

Table 3 demonstrates, that on the contrary, children who participate in WIC at age 4 are less well off than other children, even conditional on being in a family with average in-panel income less than 3.5 times FPL. The WIC child's average family income is lower than that of non-WIC children (1.06 times the FPL vs. 1.83 times the FPL). Children on WIC also have mothers who are less educated than those of

[5]See Bitler, Currie, and Scholz (2003) for a discussion of undercounting of program participation in the SIPP and CPS.

TABLE 3
Summary Statistics for Other Variables, 1996 and 2001 SIPP
(Average Family Income < 350% of FPL)

	WIC while 4	No WIC while 4
On Medicaid now	0.56	0.20
On AFDC/TANF now	0.17	0.06
Average family income-to-needs ratio	1.06	1.83
Elig. cutoff for Medicaid while an infant, share of FPL	1.69	1.65
Elig. cutoff for Medicaid SCHIP, share of FPL	0.88	0.86
Elig. cutoff for public health ins., share of FPL	1.80	1.79
An infant in the family	0.18	0.08
Number of other children 1–4 in family	0.50	0.33
Black	0.26	0.18
Hispanic	0.33	0.19
Asian	0.02	0.04
Other nonwhite	0.02	0.02
Mother absent, age/education missing	0.06	0.07
Father absent from household	0.43	0.30
Mother's age (=0 if no mother in HH)	27	28
Urban	0.76	0.80
Mother is high school dropout	0.31	0.15
Mother is high school grad., no college	0.34	0.32
Mother has some college, no 4-year degree	0.23	0.30
Mother is 4-year college graduate	0.04	0.13
Male child	0.52	0.51
N	1822	5488

Notes: Table contains means (standard deviations) for children with average family income < 3.5 times the FPL from the 1996 and 2001 SIPP. Outcomes for children in first wave that are at least 4. Statistics are weighted.

other children, are more likely to be black or Hispanic, live in larger families, and are more likely to be on welfare than other low-income children.

Finally, Table 4 shows means for the child outcomes we consider.[6] We use the first available measure in the SIPP, after the child in question turned 4. Anthropometric measures we consider include height, weight, BMI, and measures of whether BMI is high or low. Height is considered to be a longer-run measure of nutritional status, since it reflects the cumulative impact of nutrition. Weight is a shorter-run measure. BMI is defined as ((weight in pounds)/(height in inches)^2) x 703. Among children, a BMI less than the 5th percentile for child age indicates that the child is underweight, while a BMI over the 85th percentile indicates that the child is at risk for overweight.[7]

While WIC was originally charged with preventing stunting and wasting (i.e., low height-for-age and low weight-for-height) in children, as well as with the prevention of micronutrient deficiencies such as anemia, there is growing recognition that many American children are at risk of obesity. The Surgeon General's 2001 report on obesity in America shows that the incidence of obesity is rising faster among children than among adults and warns that obesity will cause as many deaths as smoking. Moreover, since the poor are at higher risk of being overweight, obesity's health consequences will fall disproportionately on those of low income, exacerbating health inequalities. The report emphasizes the importance of early community intervention to prevent obesity, since once formed, eating habits are hard to change (U.S. Department of Health and Human Services, 2001).

The prevention of overweight and obesity is now an important goal of WIC. WIC could reduce the risk of obesity either by providing nutritious foods that substitute for less nutritious foods that are

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[6] In addition to the measures we consider here, the SIPP has information about a range of outcomes such as placement in special education for children aged 6 to 8. However, there are relatively few children for whom we have measures of both WIC participation at age 4 and one of these other outcome measures. We found that in this small sample, Medicaid income cutoffs at the time of the birth were no longer statistically significant predictors of WIC participation at age 4, so that our TSLS approach to evaluating the effect of WIC on child outcomes could not be implemented.

[7] See <http://www.cdc.gov/nccdphp/dnpa/bmi/bmi-for-age.htm>.

TABLE 4
Summary Statistics for Children's Outcomes, 1996 and 2001 SIPP
(Family Income < 350% of FPL)

	WIC while 4	No WIC while 4	N total
Anthropomorphic measures (measured at ages 4 or 5):			
Child's body mass index (BMI)	17.9	17.7	3399
Child's weight (pounds)	45	44	3399
Child's height (inches)	42	42	3399
BMI < 5th percentile for sex and age	0.06	0.05	3399
BMI > 85th percentile for sex and age	0.17	0.14	3399
Health care utilization (measured at ages 4 or 5):			
Saw a doctor last year	0.66	0.69	5854
In the hospital last year	0.03	0.03	5854
Health status:			
Condition limits ability to walk, run, or play (measured at ages 4 and 5)	0.07	0.03	3507
Health status fair/poor (measured at ages 4, 5, or 6)	0.05	0.03	5854

Notes: Table contains means (standard deviations) for children with income < 3.5 times the FPL from the 1996 and 2001 SIPP. Outcomes for children in first survey wave that are at least 4 and relevant outcome is reported. Statistics are weighted.

high in calories, or through nutrition education. It is easy to imagine, for example, that having the WIC clinic point out to a mother that her child was overweight and at risk for future health problems could have an impact on her family's diet.

WIC focuses on child nutrition, but WIC programs also refer clients to medical providers, so WIC could have an impact on health outcomes. A second reason for examining measures of health in this study is that we use the generosity of Medicaid at the time of the child's birth as an instrument for WIC participation. States that are more generous in their Medicaid coverage of infants also tend to be more generous in their coverage of older children, so it is possible that the effects we measure actually reflect past participation in Medicaid rather than participation in WIC. We will show, however, that we find much larger effects of WIC on nutritional outcomes than on access to health care, which suggests that what we measure actually is the effect of the nutritional component of the WIC program.

The measures of health care utilization that we focus on are whether the child saw a doctor in the past 12 months and whether the child was hospitalized in the past 12 months. We also present estimates for two measures of health status: whether the child has a condition that limits the ability to walk, run, or play; and whether the child's mother-reported health status is fair or poor (compared to good, very good, or excellent).

Like Table 3, Table 4 indicates that WIC children are less well off than other children. Children on WIC at age 4 are more likely to be above the 85th percentile of BMI for sex and age; are more than twice as likely as other children to have a condition that limits their ability to walk, run, or play; and are much more likely to be in fair or poor health. On the other hand, there is little difference between WIC and non-WIC children in measures of current access to medical care.

IV. METHODS

This report ask two questions. First, how did changes in eligibility for Medicaid/SCHIP affect the take-up of WIC? To answer this question, we use the SIPP data to examine the impact of Medicaid income cutoffs on WIC participation. We estimate OLS regressions that control for family structure, demographics, availability of public health insurance in the state, and state and year fixed effects. We focus on two different Medicaid cutoffs.

The first measure is the Medicaid eligibility cutoff for infants in effect at the time of the child's birth. This variable will capture the effect of making it easier to get Medicaid at birth on future WIC participation. The second measure is the state SCHIP-Medicaid cutoff for young children, which, as we saw in Table 1, was higher than the WIC cutoff in some states. Our regression models take the following form:

$$WIC = \boldsymbol{X}\boldsymbol{g} + MEDICAIDd_1 + PUB\_HEALTHd_2 + \boldsymbol{S} + \boldsymbol{T} + \text{n}, \quad (1)$$

where *WIC* is an indicator equal to 1 if the child used WIC at age 4, *MEDICAID* is one of the two Medicaid income cutoffs described above, and *PUB_HEALTH* is the current cutoff for public health insurance coverage for 4-year-old children. Note that if SCHIP was implemented as a stand-alone program, then *PUB_HEALTH* will differ from the current Medicaid income cutoff. By including *PUB_HEALTH*, we control for current access to public health insurance, so that we can distinguish between the effects of current public health insurance access and WIC participation.

The vector ***X*** includes an indicator equal to 1 if there is an infant in the family, the number of other children aged 1 to 4 in the family, an indicator equal to 1 if the child's mother is in the household, the mother's age and age squared, controls for race (black, Asian, other nonwhite) and ethnicity (Hispanic), controls for the mother's completed education (high school graduate, some college, or 4-year college degree), an indicator for living in an urban area, an indicator for the child being male, and controls for child age and whether we observe the child in the data at ages 0, 1, 2, or 3. ***S*** is a vector of

state fixed effects which capture unobserved relatively constant characteristics of states, such as the extent of maternal and child health infrastructure. $\boldsymbol{T}$ is a vector of year of birth fixed effects, which help to control for any potential differences between cohorts of children. Here our key coefficient of interest is d , the coefficient on the state's Medicaid cutoff.

The second question we address is how WIC participation affects outcomes at age 4, 5, and 6. These regressions are of form:

$$Y = b\ WIC + \boldsymbol{X}\boldsymbol{a} + PUB\_HEALTHd_3 + \boldsymbol{S} + \boldsymbol{T} + e, \quad (2)$$

where Y is a child outcome, *WIC* is whether the child was on WIC at age 4, and the independent variables are defined in the same way as above. The key coefficient of interest in equation (2) is b. We begin by estimating equation (2) by OLS, but as discussed above, it is often argued that WIC participants are a selected sample, so that the OLS estimate of b may be biased by omitted variables.

To control for this possibility, we need an instrumental variable that predicts WIC participation at age 4, but is uncorrelated with outcomes, at least once one controls for the other variables included in the model. The discussion of the close link between Medicaid and WIC suggests the use of Medicaid income cutoffs as possible instruments. As we show below, the SCHIP-Medicaid cutoffs had little impact on WIC participation, so they cannot be used as instrumental variables. Medicaid income cutoffs in the child's first year of life are predictive of WIC participation at age 4, and so this candidate instrument passes this important test.

However, using the Medicaid income cutoff at the time of the birth as an instrument for WIC participation requires the strong assumption that these cutoffs have no separate effects on outcomes once one controls for the other variables, such as *PUB_HEALTH*. We think the best way to think about the problem is to recognize that Medicaid and WIC are closely linked. The figures discussed above suggest that 37 percent of all U.S. infants are covered by Medicaid at birth, and that almost the same number of infants, approximately 42 percent, are on WIC. In fact, all of the evidence suggests that these are largely

the same infants, and given the structure of the SIPP we cannot identify the small group who participated in one program as infants without participating in the other.

Changes in the Medicaid income cutoff at the time of the birth cause infants to take up both Medicaid and WIC. Some fraction of these infants stay on WIC as they age. Thus, children who were induced to be on WIC at age 4 by the Medicaid expansions also received Medicaid at birth as well as prior years of WIC assistance, so that a more accurate way to describe them would be as "Medicaid-at-birth-plus-continuous-WIC children."

The counterfactual highlighted by our instrument is that in the absence of increases in the Medicaid income cutoff, these children would not have received Medicaid at the birth *or* WIC. Thus, we are comparing Medicaid/WIC children to similar children who did not participate in these programs. An additional problem, then, is that some children induced to join Medicaid and WIC by the Medicaid expansions drop WIC before age 4. These children are treated as "no WIC" in our models, so that we understate both the effect of the Medicaid income cutoffs on overall WIC take-up and the effects of WIC use on outcomes. Hence, our estimates should be interpreted as lower bounds on true WIC/Medicaid at birth effects.

All regressions are weighted to be representative of the population since SIPP oversamples blacks and Hispanics. Standard errors are adjusted for arbitrary within state-by-year group correlations. Each regression only uses one observation per child (the observation taken as of the first time the child was at least 4 and the outcome was available).

V. RESULTS

Table 5 presents OLS estimates of the effects of Medicaid income cutoffs and other factors on the probability of childhood WIC participation. The first column shows that the income cutoff in effect at the time of the child's birth has a strong positive effect on the child's probability of being on WIC at age

TABLE 5
OLS Regression of Determinants of WIC Use while 4, 1996 and 2001 SIPP
(Average Family Income < 350% of FPL)

Elig. cutoff for Medicaid while an infant, share of FPL	0.075***	—
	(0.021)	
Elig. cutoff for Medicaid SCHIP, share of FPL		0.014
		(0.009)
Elig. cutoff for public health ins., share of FPL	-0.005	-0.008
	(0.020)	(0.024)
An infant in the family	0.178***	0.177***
	(0.021)	(0.021)
Number of other children 1–4 in fam.	0.081***	0.081***
	(0.012)	(0.012)
Male child	0.004	0.004
	(0.011)	(0.011)
Black	0.129***	0.129***
	(0.017)	(0.017)
Hispanic	0.124***	0.125***
	(0.019)	(0.020)
Asian	-0.025	-0.024
	(0.028)	(0.028)
Other nonwhite	0.088*	0.087*
	(0.049)	(0.049)
Mother absent, age/education missing	-0.039	-0.040
	(0.034)	(0.034)
Mother's age (=0 if no mother in HH)	0.008***	0.008***
	(0.002)	(0.002)
Mother's age squared	-0.000164***	-0.000164***
	(0.000044)	(0.000044)
Urban	-0.061***	-0.061***
	(0.016)	(0.016)
Mother is high school grad., no college	-0.095***	-0.095***
	(0.019)	(0.019)
Mother has some college, no 4-year degree	-0.141***	-0.141***
	(0.021)	(0.021)
Mother is 4-year college graduate	-0.237***	-0.237***
	(0.024)	(0.024)
N	7310	7310
Adjusted Rsquared	0.184	0.109

Notes: Coefficients (SEs) from OLS regressions of the determinants of WIC use while aged 4 for children with average family income < 3.5 times the FPL in the first survey wave. Each column contains the results of one regression. State and year of birth fixed effects and controls for the child being in the sample at 0, 1, 2, or 3 years of age also included. Regression is weighted, and SEs clustered for state and year. ***, **, and * denote significance at the 1, 5, and 10% levels.

4. In the population with incomes less than 3.5 times the FPL, a doubling of the Medicaid income cutoff (say from poverty to two times poverty) would be expected to increase the share of children on WIC by 7.5 percentage points.

Household composition also plays an important role. Having an infant in the family increases the probability of WIC participation by other children in the family by 17.8 percentage points, while having a sibling aged 1 to 4 increases the probability by 8.1 percentage points. These results make sense: Families with more children receive larger benefits, so if there is a fixed cost to maintaining WIC coverage, then families with more children will be more likely to bear this cost. Race, ethnicity, and maternal age also have positive effects on WIC use, as does lack of maternal education. Finally, urban mothers are less likely to participate in WIC than others.

Column 2 of Table 5 shows that in contrast to the cutoff at the time of the birth, higher Medicaid cutoffs due to SCHIP had very little effect on the use of WIC. Note that in this model, the variable "Eligibility cutoff for Medicaid SCHIP" is different from zero only if SCHIP resulted in increases in Medicaid income cutoffs for children. The overall effect of higher public health insurance cutoffs is captured by the variable "Eligibility cutoff for public health insurance." A possible reason for this negative result is that children who do not participate in WIC as infants are unlikely to be subsequently enrolled. Hence, making older children eligible for Medicaid increases eligibility for WIC, but has little effect on enrollments.

Table 6 explores this explanation further by examining the effect of SCHIP on eligibility for WIC and take-up rates. These analyses are conducted by dividing the sample into the groups that one would and would not expect to be affected by SCHIP. For example, WIC eligibility and participation among families with incomes less than 2 times the FPL should not be much affected by SCHIP, since families with incomes less than 1.85 times the FPL were always eligible for WIC. The new eligibles would be concentrated in the higher-income group.

TABLE 6
Variation in WIC Eligibility and Take-Up by Family Income and Type of SCHIP Expansion in Place for Children Aged 4 in 1996 and 2001 SIPP

State has:	No SCHIP	Medicaid SCHIP	Stand-Alone SCHIP
Panel A: Child's family income < 133% FPL			
Any WIC eligibility	1.00	1.00	1.00
N	4058	800	2858
WIC take-up rate for eligibles	0.31	0.32	0.30
N	4058	800	2858
Panel B: 133% FPL <= child's family income < 200% FPL			
Any WIC eligibility	0.85	0.91	0.81
N	1762	380	1257
WIC take-up rate for eligibles	0.20	0.17	0.17
N	1500	345	1028
Panel C: 200% FPL <= child's family income < 350% FPL			
Any WIC eligibility	0.04	0.11	0.04
N	5130	1078	4409
WIC take-up rate for eligibles	0.31	0.16	0.30
N	239	118	215

Notes: Panel A shows the variation in WIC eligibility and take-up for children aged 4 with family income less than 133% of the federal poverty level. Panel B shows the variation in WIC eligibility and take-up for children aged 4 in families with income between 133% and 200% of the FPL from the 1996 and 2001 SIPP. Panel C shows the variation in WIC eligibility and take-up for children aged 4 in families with income between 200% and 350% of the FPL from the 1996 and 2001 SIPP. Column 1 contains means for children in states without any SCHIP, column 2 means for children in states which have implemented Medicaid SCHIP, and column 3 means for children in states with stand-alone SCHIP.

Panel C of Table 6 shows that implementing SCHIP by expanding the Medicaid program did increase eligibility for WIC in this group. In the SCHIP-Medicaid states, 11 percent of 4-year-old children in families with incomes between 2 and 3.5 times the FPL were eligible for WIC, compared to 4 percent of families at this income level in other states. Some of these families reported that they had Medicaid (even though their reported incomes are sometimes higher than the relevant Medicaid cutoff), so we assumed that they were eligible for Medicaid and therefore for WIC. It is possible that these families' incomes had increased since they last renewed their Medicaid coverage.

Table 6 shows that the higher rate of WIC eligibility in the SCHIP-Medicaid states is balanced by lower take-up of WIC: only 16 percent of eligibles took up the program, compared to 30 percent in the stand-alone SCHIP states. On balance then, implementing SCHIP by expanding Medicaid resulted in only a very small increase in the fraction of higher-income families on the program (1.8 percent compared to 1.2 percent in stand-alone SCHIP states), which suggests that take-up in this group was very low. If we reflect on the fact that the WIC package was only worth $31 per month, then it may not be surprising that families with incomes over about $30,000 did not find it worthwhile to participate in the program. This result provides evidence that higher-income families are not driving the increased child participation in WIC, as some critics have argued.

Turning to our second question, Table 7 shows our estimates of equation 2, the effects of WIC participation at age 4 on child outcomes. Column 1 shows that in OLS regressions, WIC use at age 4 did not have any significant effect on anthropometric outcomes or on the use of medical care. Consistent with Table 4, children on WIC at age 4 are more likely than other children to have a health-limiting condition and to have fair or poor health status, even conditional on the observable characteristics of their families. These results may due to negative selection into the WIC program. That is, children who are

TABLE 7
OLS and TSLS Estimates of Impact of WIC Use at Age 4, 1996 and 2001 SIPP
(Average Family Income <350% of FPL)

Coefficient on any WIC while 4	OLS	TSLS	
N			OLS/TSLS
	Anthropomorphics (measured at ages 4 or 5):		
Child's body mass index (BMI)	-0.0610	-8.4157**	3399
	(0.2133)	(3.6655)	
Child's weight (pounds)	0.1806	-19.7435**	3399
	(0.4922)	(9.8184)	
Child's height (inches)	0.1847	-1.6189	3399
	(0.1917)	(3.5681)	
BMI < 5th percentile for sex and age	0.0015	0.1003	3399
	(0.0103)	(0.1928)	
BMI > 85th percentile for sex and age	0.0099	-0.6905**	3399
	(0.0156)	(0.3058)	
	Health care utilization (measured at ages 4 or 5):		
Saw a doctor last year	0.0163	0.7340	5854
	(0.0152)	(0.4939)	
In the hospital last year	0.0043	0.0556	5854
	(0.0069)	(0.1692)	
		Health status:	
Condition limiting ability to walk, run, or play (measured at ages 4 or 5)	0.0342***	0.1476	3507
	(0.0098)	(0.1398)	
Health status fair/poor (measured at ages 4, 5, or 6)	0.0249***	0.2329	5854
	(0.0086)	(0.1988)	

Notes: Table contains coefficient on any WIC use while age 4 from OLS, TSLS, and TSIV regressions of the determinants of various health outcomes (columns 1 and 2). Columns 3 contains sample sizes. Sample is all children with income < 3.5 times the FPL from the 1996 and 2001 SIPP. Outcomes are for children in the first survey wave that are at least 4 and questions were asked unless otherwise noted. Columns 1 and 2 are estimated on the sample for which any WIC use while age 4 is known. Regressions also control for the cutoff at which eligibility for public health insurance ends, whether there is an infant in the family, the number of other children 1–4 in the family, mother's age and age squared, indicators for the child's race (black, Asian, other), age, Hispanic ethnicity, education (high school graduate, some college, 4-year college degree, and education missing), urban residence, the child being male, and controls for the child being in the data at 0, 1, 2, or 3 years of age. Instrument for first stage of TSLS is the average Medicaid eligibility threshold in the child's first year. All regressions also include state, age, and year-of-birth fixed effects. All estimates are weighted and cluster at the state-by-year level.

less healthy for other reasons may be more likely to enroll in WIC. To control for this possibility, we turn to TSLS models.[8]

Column 2 of Table 7 shows estimates of TSLS models using the Medicaid income cutoff at the time of the birth as an instrument. These estimates indicate that WIC participation reduces the child's BMI and weight. However, there is no significant effect on the probability that the child is underweight (less than the 5th percentile of BMI for sex and age). All of the decrease in weight comes from the other end of the distribution, where we see that the probability that a child is at risk of being overweight (over the 85th percentile for sex and age) is greatly reduced. The contrast between the OLS and TSLS results indicates that the WIC children have unobservable characteristics that place them at higher risk of having high BMI than other observationally similar children and that WIC is successful in reducing the risk of overweight among young children. Possible pathways for WIC to affect children's weight are either through the WIC program's provision of healthy foods or through the nutrition education component of WIC.

Column 2 also shows that in contrast to the OLS models, where WIC had a negative effect on measures of health limitations and health status, there is no significant effect of WIC participation in the TSLS models. The contrast between the OLS and TSLS results for these variables confirms that WIC children are negatively selected in terms of health. They are more likely than other children to have activity limitations and poor overall health status for reasons that have little to do with participation in the WIC program, and in fact WIC has little causal impact on these outcomes. These results confirm that selection into the program is an important issue that must be dealt with in evaluations of WIC.

[8] The first stage for our TSLS was presented in column 1 of Table 5.

VI. CONCLUSION

This report offers some initial conclusions regarding selection among child WIC participants, the effects of the Medicaid program on WIC take-up, and the effects of WIC on child outcomes. We find, first, that like women and infants on WIC, children on WIC are negatively selected relative to all eligibles. In particular, they are more likely to be in poor health and to have health-limiting conditions. This selection should be kept in mind in future evaluations of the WIC program, since it implies that positive causal effects of the program may be overlooked if analysts fail to properly control for selection.

Second, we show that Medicaid and WIC use are very closely linked among infants, so that Medicaid policies that affect take-up among infants are likely to have long-term effects on participation in the WIC program. In particular, the income cutoffs for Medicaid that were in effect when a child was born affect the probability of WIC participation 4 years later. By contrast, increases in the generosity of Medicaid toward older children increase WIC eligibility without having much impact on participation. It appears to be extremely difficult to enroll eligible children if the usual "window" for enrollment during infancy is missed. This result also indicates that increases in children's WIC participation have not been driven by increased participation by children from higher-income families made eligible as a result of SCHIP, as some critics have argued.

Our most striking finding is that WIC participation at age 4 has large and significant effects on the probability that a child is at risk of being overweight (i.e., has BMI greater than the 85th percentile for sex and age). This result is robust to using different BMI cutoffs. It suggests that either the nutrition education or the actual provision of healthy food may be having an important effect on preventing obesity among young children. This is an important measure of the success of the WIC program because of the importance of obesity as a public health threat, and because of the importance of establishing healthy eating habits early in life.

An important caveat to our research is that due to the very close link between Medicaid and WIC participation during infancy, it is difficult to isolate the effect of WIC during childhood. The fact that WIC affects nutritional outcomes rather than access to medical care strongly suggests that we are in fact measuring a WIC effect. However, it will be important for future work to find a way to yield a clearer picture of the marginal effect of WIC participation during childhood, net of the impact of Medicaid and WIC use during infancy.

References

Ahluwalia, Indu B., Vijaya K. Hogan, Laurence Glummer-Strawed, William R. Coville, and Alwin Peterson. 1998. "The Effect of WIC Participation on Small-for-Gestational-Age Births: Michigan, 1992." *American Journal of Public Health* 88(9): 1374–1378.

Besharov, Douglas, and Peter Germanis. 2001. "Rethinking WIC: An Evaluation of the Women, Infants, and Children Program." Washington, DC: American Enterprise Institute.

Bitler, Marianne P. and Janet Currie. Forthcoming 2004. "Does WIC Work? The Effects of WIC on Pregnancy and Birth Outcomes." *Journal of Policy and Management*.

Bitler, Marianne P., Janet Carrie, and John Karl Scholz. 2003. "WIC Eligibility and Participation." *Journal of Human Resources* 38(S): 1139–1179.

Brien, Michael J., and Christopher A. Swann. 2001. "Prenatal WIC Participation and Infant Health: Selection and Maternal Fixed Effects." Unpublished manuscript. University of Virginia Department of Economics.

Burstein, Nancy, Mary Kay Fox, Jordan B. Hiller, Robert Kornfeld, Ken Lam, Cristofer Price, and David Rodda. 2000. "WIC General Analysis Project: Profile of WIC Children." Cambridge, MA: ABT Associates.

Chatterji, Pinka, Karen Bonuck, Simi Dhawan, and N. Deb. 2002. "WIC Participation and the Initiation and Duration of Breast-Feeding." Discussion Paper 1246-02, Institute for Research on Poverty, University of Wisconsin–Madison.

Devaney, Barbara. 1992. "Very Low Birthweight among Medicaid Newborns in Five States: The Effects of Prenatal WIC Participation." Alexandria, VA: U.S. Department of Agriculture Food and Nutrition Service, Office of Analysis and Evaluation.

Devaney, Barbara, Linda Bilheimer, and Jennifer Schore. 1992 "Medicaid Costs and Birth Outcomes: The Effects of Prenatal WIC Participation and the Use of Prenatal Care." *Journal of Policy Analysis and Management* 11(4): 573–592.

Devaney, Barbara, and Allen Schirm. 1993. "Infant Mortality among Medicaid Newborns in Five States: The Effects of Prenatal WIC Participation." Alexandria, VA: U.S. Department of Agriculture Food and Nutrition Service, Office of Analysis and Evaluation.

Kowaleski-Jones, Lori, and Greg J. Duncan. 2000. "Effects of Participation in the WIC Food Assistance Program on Children's Health and Development." Discussion Paper 1207-00, Institute for Research on Poverty, University of Wisconsin–Madison.

Kowaleski-Jones, Lori, and Greg J. Duncan. 2002. "Effects of Participation in the WIC Program on Birthweight: Evidence from the National Longitudinal Survey of Youth." *American Journal of Public Health* 92(5): 799–804.

Mokdad, Ali H., James S. Marks, Donna F. Stroup, and Julie L. Gerberding. 2004. "Actual Causes of Death in the United States, 2000." *JAMA* 291(10): 1238–1245.

Moss, Nancy E., and Karen Carver. 1998. "The Effect of WIC and Medicaid on Infant Mortality in the United States." *American Journal of Public Health* 88(9): 1354–1362.

National Governor's Association. 2003. "MCH Update 2002: State Health Coverage for Low-Income Pregnant Women, Children and Parents." Washington, DC: National Governor's Association, June 9.

Oliveira, Victor, Mark Prell, David Smallwood, and Elizabeth Frazeo. 2001. "Infant Formula Prices and Availability: Final Report to Congress." U.S. Department of Agriculture Economic Research Service E-FAN 2-001, October.

U.S. Department of Health and Human Services. 2001. "The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity, 2001." Rockville, MD: Office of the Surgeon General.