USING DISCONTINUOUS ELIGIBILITY RULES TO IDENTIFY THE EFFECTS OF THE FEDERAL MEDICAID EXPANSIONS ON LOW-INCOME CHILDREN

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Abstract—Despite intensive scrutiny, the effects of Medicaid expansions on the health insurance status of low-income children remain controversial. We reexamine the effects of the two largest federally mandated expansions which offered Medicaid coverage to low-income children in specific age ranges and birth cohorts. We use a regression discontinuity approach, comparing Medicaid enrollment, private insurance coverage, and overall insurance coverage on either side of the age limits of the laws. We conclude that the modest impacts of the expansions on health insurance coverage arose because of very low takeup rates of the newly available coverage, rather than from crowdout of private insurance coverage.

I. Introduction

CONCERNS about the adequacy of health insurance coverage for children have expanded Medicaid from a narrowly targeted program for welfare recipients and the disabled to a broadly based program for low-income families. A series of legislative changes during the 1980s allowed states to offer Medicaid coverage to children in married-couple families with incomes below the eligibility limits for welfare, and to young children in higher-income families. Legislation at the close of the decade expanded the program further, *requiring* states to cover all children below certain age limits in low-income families. Despite these efforts, health insurance coverage rates for children with family incomes near the poverty line remain below those of richer or poorer children. Figure 1, for example, shows the fraction of children in various family income groups with health insurance coverage in 1989, 1993, and 1999.[1] Though coverage rose in the early 1990s for children with family incomes above the eligibility limits for welfare but below the poverty line, the expansions only partially closed the gap between the traditional welfare system and private insurance.

A series of recent studies has offered different explanations for the modest effect of the Medicaid expansions.

Cutler and Gruber (1996) estimated that approximately one-quarter of the children made newly eligible by the expansions between 1987 and 1992 actually enrolled in Medicaid. However, they argued that the net effect on overall insurance coverage was less than half this big because of the crowding out of private coverage.[2] Subsequent researchers, including Dubay and Kenney (1996), Shore-Sheppard (2000), Yazici and Kaestner (2000), Blumberg, Dubay, and Norton (2000), and Ham and Shore-Sheppard (forthcoming), have estimated smaller effects of the expansions on Medicaid enrollment and lower rates of crowding out. Though the net impacts on insurance coverage are similar across studies, the question of whether the modest effect arises primarily because of significant crowding out of private insurance or because of low takeup of the newly available Medicaid coverage is of central importance. The crowdout explanation suggests that further gains in coverage can only be achieved with substantial cost shifting from the private to the public sector. The takeup explanation, on the other hand, suggests that information outreach and simplified application procedures for Medicaid might increase total coverage significantly, with little loss of private coverage.

In this paper we reexamine the effects of the Medicaid expansions, focusing on two key federal laws: the "133% expansion" covering children under the age of six in families with incomes less than 133% of the poverty line (included in the 1989 Omnibus Budget Reconciliation Act), and the "100% expansion" covering children born after September 30, 1983 in families below the poverty line (included in the 1990 Omnibus Budget Reconciliation Act). In addition to generating most of the eligibility increase attributable to the Medicaid expansions, these two laws have the feature that their effects can be evaluated by a simple regression discontinuity approach.[3] Under the 133% expansion, five-year-olds in families with incomes from 100% to 133% of the poverty line became eligible for Medicaid, whereas six-year-olds did not. Under the 100% provision, children born in October 1983 with family incomes below the poverty line were eligible for Medicaid, whereas children born just one month earlier were not. Comparisons between children on either side of the eligibility boundaries provide credible and transparent evidence

[1] These data are drawn from the March 1989, 1993, and 1999 Current Population Surveys (CPS). The samples include individuals aged 0–18 who are neither a family head nor a spouse of a head. See the Data Appendix for more information.

[2] Using a very similar methodology, Currie and Gruber (1996) estimated a comparable takeup rate for Medicaid.

[3] See Angrist and Krueger (1999) for a discussion of program evaluation methods that focus on discontinuous program eligibility rules, and a survey of recent applications.

FIGURE 1.—HEALTH INSURANCE COVERAGE RATES BY FAMILY INCOME IN 1989, 1993, AND 1999
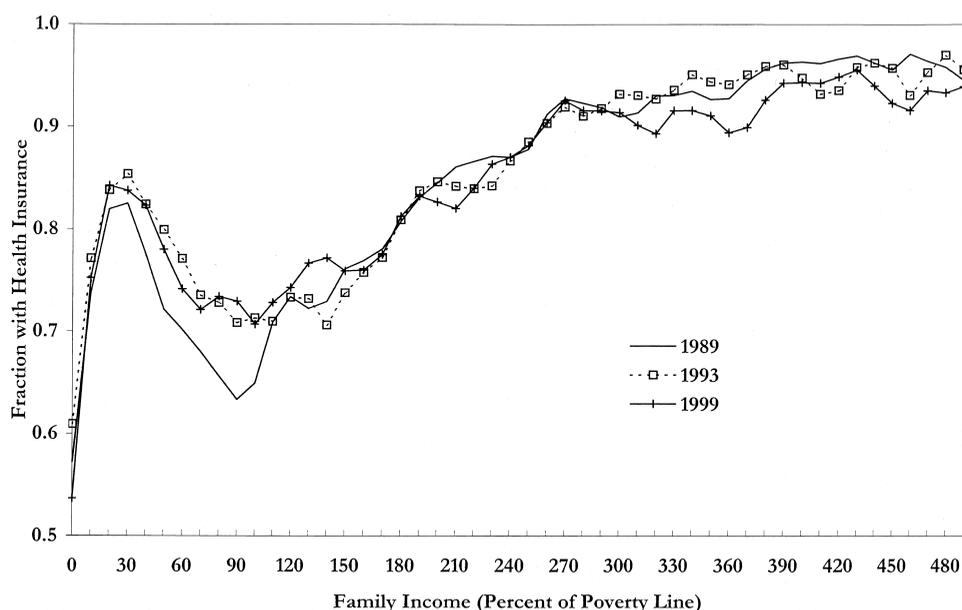
that can help resolve the question of how the expansions actually affected health insurance coverage.

Our results, based on data from the Survey of Income and Program Participation, the March Current Population Survey, and the Health Interview Survey, point to two main conclusions. First, takeup rates for newly available Medicaid coverage under the 100% expansion were around 7%–11%—only approximately one-half as large as the estimates of Cutler and Gruber (1996) and Currie and Gruber (1996). Our estimated takeup rates for coverage under the 133% expansion are even lower—on the order of 5% or less. Second, our estimates of the effects of the expansions on private insurance coverage are also small (although we cannot rule out a small negative effect). Thus, our evidence is more consistent with a low-takeup explanation for the modest effects of the Medicaid expansions than a crowdout explanation. In light of these findings, we also present some new evidence on the robustness of the takeup and crowdout estimates by Cutler and Gruber (1996). We conclude that the relatively large takeup and crowdout estimates reported by them arise from their restrictive empirical specifications (which omit any age-specific trends in coverage) rather than from the use of state-level variation in Medicaid eligibility. More general specifications, including ones that rely on state-specific Medicaid laws, yield estimated takeup and crowdout rates very similar to ours.

II. The Medicaid Expansions

Medicaid eligibility for nondisabled children was originally limited to single-parent families receiving cash assistance under the Aid to Families with Dependent Children (AFDC) program. Over the 1980s the link between Medic-

aid and welfare was gradually severed, starting in 1984 with the Ribicoff program, which allowed states to enroll children in two-parent families with incomes below the AFDC thresholds, and the Deficit Reduction Act, which required states to cover children less than five years old born after September 30, 1983 living in families income-eligible for AFDC, regardless of family structure. Further decoupling occurred with passage of the Omnibus Budget Reconciliation Acts (OBRA) of 1986 and 1987, which allowed states to raise the income limits for Medicaid eligibility above the AFDC thresholds. OBRA 1987 also required states to cover all children less than seven years old born after September 30, 1983 living in families with incomes below the AFDC income threshold. Federally mandated coverage was extended by the Medicare Catastrophic Coverage Act (MCCA, effective July 1989) and the Family Support Act (FSA, effective October 1990). The MCCA required states to cover pregnant women and infants in families with incomes up to 75% of the poverty line, and permitted coverage of children up to age eight in these families. The FSA required states to continue Medicaid coverage for up to one year for families who lost AFDC benefits due to increased earnings.

The two largest federal expansions—and the focus of the analysis in this paper—were included in OBRA 1989 and OBRA 1990. Effective April 1990, OBRA 1989 required states to offer Medicaid coverage to pregnant women and children up to age six with family incomes below 133% of the federal poverty level (the 133% expansion). Effective July 1991, OBRA 1990 required states to cover children born after September 30, 1983 with family incomes below 100% of the federal poverty level (the 100% expansion).

TABLE 1.—ESTIMATED MEDICAID ELIGIBILITY RATES FOR CHILDREN
IN THE MARCH CURRENT POPULATION SURVEY

Survey Year	Total Eligible (%)	Rate (%) by Eligibility Source				
		AFDC	MCCA	OBRA 1989	OBRA 1990	State Program
1988	16.7	16.6	0.0	0.0	0.0	0.1
1989	16.3	15.7	0.0	0.0	0.0	0.6
1990	17.2	16.2	0.0	0.0	0.0	1.0
1991	20.4	16.6	0.0	3.3	0.0	0.4
1992	23.1	17.4	0.1	3.6	1.0	1.1
1993	26.1	17.0	0.0	4.0	1.4	3.8
1994	28.6	17.0	0.1	4.3	2.0	5.2

Note: See text for description of eligibility sources. Based on samples of children under 18 not heading their own families.

These children continue to be covered until they reach the age of 18.[4]

Table 1 summarizes the impact of the Medicaid expansions on the eligibility rate of children age 18 or younger, using data from the 1988–1994 March Current Population Surveys.[5] The first column shows the overall fraction of children eligible for Medicaid in each year, and the second shows the fraction eligible for AFDC or AFDC-related programs (AFDC-UP, Ribicoff, and the DEFRA expansion). This group, virtually all of whom are AFDC-eligible and thus would have been eligible for Medicaid without any expansions, is relatively stable at approximately 16%–17% of children. The third column shows the fraction of children eligible under the federally mandated infant coverage provisions of the MCCA. After 1991 this fraction is also relatively stable at approximately 0.1% of children. The next two columns show the fractions of children eligible under the 133% expansion (OBRA 1989) and the 100% expansion (OBRA 1990). By 1994, these laws had increased eligibility for Medicaid by 6.3 percentage points—an almost 50% increase in the potential coverage of the system.[6] Finally, the last column in table 1 shows the fraction of children eligible under various optional state programs. Very few states took advantage of the optional coverage provisions until the early 1990s. Even as late as 1992 only approximately 1% of children were eligible under state optional programs. As noted by other researchers, the main source of the rise in Medicaid coverage for children in the late 1980s and early 1990s was the federal mandates passed in OBRA 1989 and OBRA 1990.[7]

III. Measuring the Effects of the OBRA 1989 and OBRA 1990 Expansions

A. Data Sources

We use three different data sources to measure the effects of the federally mandated Medicaid expansions in 1990 and 1991. Our primary evidence is drawn from the first-wave interviews of the 1990–1993 Surveys of Income and Program Participation (SIPP). These data have the advantage that family composition, income, and program participation are all recorded for the month just before the interview, reducing the scope for recall errors and minimizing the gaps between Medicaid eligibility rules and observed characteristics.[8] A second key feature of the SIPP (also shared by the Health Interview Survey) is that the public use samples report month and year of birth. This information allows us to form precise comparison groups of children on either side of the Medicaid eligibility thresholds.

The SIPP data have two notable limitations: small sample sizes, and the lack of state identifiers for people living in nine small states (Maine, Vermont, Iowa, North Dakota, South Dakota, Alaska, Idaho, Montana, Wyoming). Since we need state information to assign AFDC and Medicaid eligibility, we exclude residents of these states from our SIPP analysis. To cross-check the SIPP findings and provide a broader perspective, we use data from the 1990–1996 March Current Population Surveys (CPSs) and the 1992–1996 Health Interview Surveys (HISs). The HIS also includes information on recent doctor visits that we use as an indicator of health care access.[9]

From each of the three data sources we constructed samples of children aged 18 or younger who are not heading their own families (see the data appendix for more details). The age, race, and ethnicity distributions in the three samples are similar (see appendix table A1). The three data sources also give similar estimates of the fraction of children in poverty or near-poverty. Despite important differences in the time frame of the health insurance coverage questions, the SIPP and CPS show roughly comparable Medicaid and health insurance coverage rates. The HIS yields Medicaid coverage rates similar to the other two data

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[4] Two other federal rule changes allowed states to expand Medicaid eligibility. The *Section 1902(r)(2) option* permitted states to adopt more liberal standards for calculating income and resources for some categories of eligibility. The *Section 1115 waiver option* allowed states to apply for a research and demonstration waiver. Such waivers could include higher income limits for Medicaid. Neither rule change is likely to affect our analysis. Although the 1902(r)(2) option was added to the Medicaid rules as part of the MCCA, states did not take advantage of it until 1992, and the first waivers to involve eligibility were implemented in 1994.

[5] See the data appendix for details of our eligibility imputation.

[6] Currie and Gruber (1996, table 1) estimate a 7-percentage-point rise in Medicaid eligibility between March 1990 and March 1992.

[7] For example, Cutler and Gruber (1996, page 402) note that "90 percent of children made eligible between 1987 and 1992 qualified for Medicaid under federally imposed minimum guidelines."

[8] In contrast, the March CPS has information on family structure at the interview date, total income in the previous calendar year, and insurance coverage at any time in the previous year. See Bennefield (1996) and Nelson and Mills (2001) for comparisons of health insurance data in the SIPP and CPS.

[9] Currie and Gruber (1996) use this measure as well as the probability of a doctor visit in the past two weeks, the probability of hospitalization last year, and the probability of visiting a doctor's office, hospital emergency room or clinic, or other site.

TABLE 2.—CHARACTERISTICS OF CHILDREN IN 1990–1993 SIPP PANELS

	1990	1991	1992	1993
Age distribution:				
Percent aged 0–5 years	33.3	32.9	33.5	33.2
Percent aged 6+ and born after September 30, 1983	2.5	7.9	13.1	18.4
Family income distribution relative to poverty line and AFDC cutoff:				
Mean AFDC income cutoff (percent of poverty)	68.9	67.4	63.1	60.2
Percent below AFDC cutoff	16.4	18.6	17.5	18.6
Percent between AFDC cutoff and poverty line	5.5	6.2	7.0	8.1
Percent between poverty line and 133% of poverty	7.3	6.7	7.1	6.7
Medicaid eligibility:				
Mean Medicaid income cutoff (percent of poverty line)	77.2	86.6	92.7	111.9
Percent eligible for AFDC	16.4	18.6	17.5	18.6
Percent eligible through expansions	1.7	4.2	6.4	10.7
Source of expansion coverage:				
Infant coverage (MCCA)	0.6	0.8	0.9	1.0
133% expansion (OBRA 1989)	0.7	3.2	3.6	3.8
100% expansion (OBRA 1990)	0.0	0.0	1.1	1.6
Optional state program	0.4	0.2	0.8	4.4
AFDC and Medicaid participation:				
Percent on AFDC	8.4	9.9	10.0	12.0
Percent on Medicaid	12.1	15.6	16.2	19.7
Percent on Medicaid, not AFDC	3.7	5.7	6.2	7.7
Percentage of Medicaid recipients not on AFDC	30.7	36.4	38.3	39.1
Number of observations	16,196	10,268	14,063	14,494

Notes: Sample includes individuals aged 0–18 in wave 1 of the SIPP panels who are not heads of families. Characteristics are measured as of the fourth interview month. See text for description of AFDC and Medicaid income cutoffs. Means are weighted by first-year weights. (All subsequent calculations use first-year weights unless otherwise noted.)

sets, but a slightly lower overall health insurance coverage rate.

B. An Overview of Medicaid Eligibility and Participation in the Early 1990s

Table 2 provides an overview of the children in our SIPP sample. Focusing first on the age characteristics, a large fraction of children—roughly one-third—were under the age of six and therefore potentially eligible for Medicaid under the 133% (OBRA 1989) expansion. A smaller fraction were too old for the 133% rule but were born after September 30, 1983 and therefore potentially eligible under the 100% (OBRA 1990) expansion.

The OBRA 1989 and 1990 expansions were targeted at children in families with incomes above the AFDC threshold in their state of residence, but below 100% or 133% of the poverty line. On average the AFDC income limit faced by children in the 1990 subsample was 68.9% of the family-specific poverty line, although the limit ranged from less than 30% of the poverty line (in some southern states) to just over the poverty line (in some high-benefit states like California). Over the later years of our sample the average ratio of the AFDC limit to the poverty line declined, reflecting benefit cuts in some states and the effect of inflation. Nevertheless, the fraction of children with family incomes below the AFDC cutoff rose from 16.4% in 1990 to 18.6% in 1993. The fraction above the AFDC limit but below the poverty line also increased, from 5.5% to 8.1% while the fraction with family incomes between 100% and 133% of the poverty line was fairly stable at around 7%.

As in table 1, we can classify Medicaid eligibility for children in our SIPP sample according to whether they were eligible through the AFDC program or a federal or state expansion. (In this table we focus on the financial eligibility limits and ignore the family structure rules in non-Ribicoff states.) The expansions in place in 1990 raised the average Medicaid income limit (relative to the poverty line) by 8.3 percentage points above the corresponding AFDC limit, and extended coverage to approximately 1.7% more children than were eligible under AFDC. Over the next three years, the OBRA 1989 and OBRA 1990 expansions, coupled with state-level programs, raised the average Medicaid income cutoff to 112% of the poverty line and raised the fraction of children eligible for Medicaid by 62%.

The final rows in table 2 present data on actual participation in AFDC and Medicaid. Welfare participation rose faster than estimated eligibility in the early 1990s, from 8.4% in 1990 to 12% in 1994.[10] The fraction of children covered by Medicaid and not on AFDC increased slightly faster, from 3.7% percent to 7.7%. These trends imply that the increase in Medicaid enrollment in the early 1990s arose from a combination of three factors: a rise in the fraction of children eligible for Medicaid through the regular welfare system; a rise in the welfare participation rate among those families eligible for welfare; and a rise in the fraction of children eligible for benefits through the Medicaid expansions.

IV. The OBRA 1990 (100%) Expansion

We begin our analysis of the Medicaid expansions by focusing on the OBRA 1990 legislation. Figure 2 shows

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[10] There was a similar rise in the takeup rate of other benefit programs in the early 1990s, including food stamps—see Currie (2003).

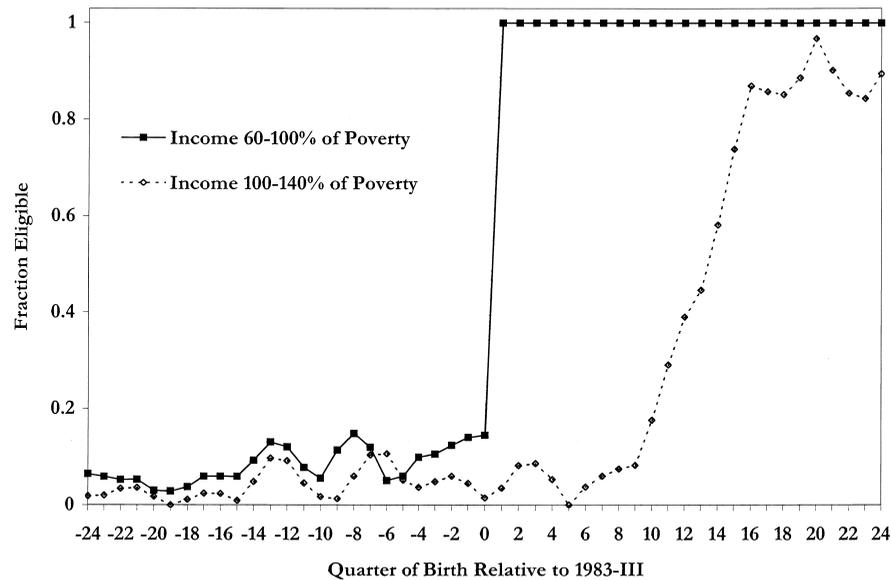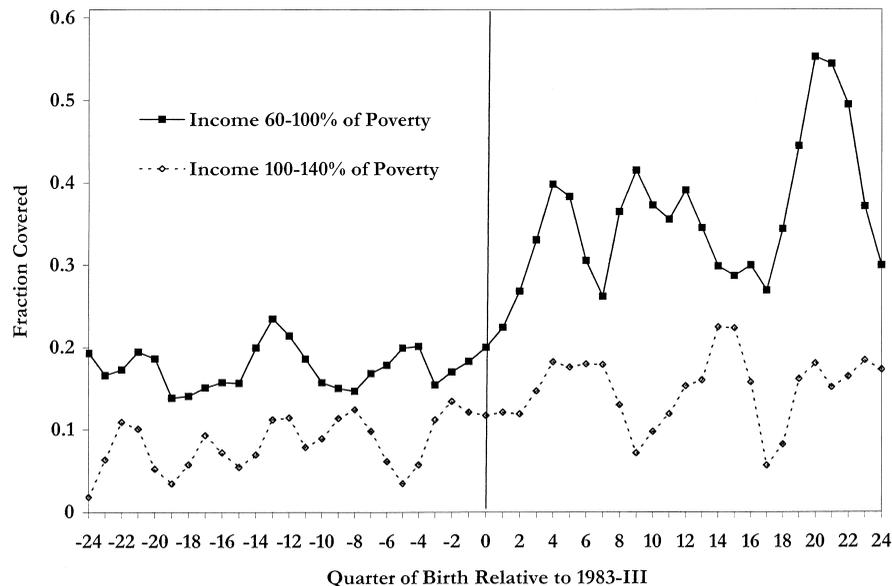FIGURE 2.—MEDICAID ELIGIBILITY BY BIRTH QUARTER

FIGURE 3.—MEDICAID COVERAGE BY BIRTH QUARTER

estimated Medicaid eligibility rates by quarter of birth for children in the 1992 and 1993 SIPPs with family incomes just below the poverty line (60%–100% of poverty) and just above (100%–140% of poverty).[11] The graph illustrates the sharp discontinuity in Medicaid eligibility induced by the 100% expansion.[12] For children in families below the pov-

erty line, Medicaid eligibility rates jump from 6%–8% for those born before September 1983 to 100% for those born after. Among higher-income children, for comparison, eligibility rates are approximately 6%–8% on either side of the 1983-III breakpoint. Further to the right, the eligibility rate for the above-poverty group starts to rise, as the higher-income children fall below age six at the interview date and qualify for Medicaid under OBRA 1989.[13] This underscores the importance of focusing on comparisons close to the

[11] Since most children in families with incomes below the AFDC limit were eligible for welfare-based coverage, we exclude anyone whose family-specific AFDC cutoff exceeds 70% of the poverty line. An examination of AFDC participation rates shows that welfare participation falls off very quickly once the income-to-poverty ratio is within 10% of the AFDC cutoff. We build this 10-point gap into our sample exclusion.

[12] The lines in figures 2–5 are smoothed using a 3-quarter moving average with weights (0.3, 0.4, 0.3).

[13] The rise is gradual rather than discrete because we pool children from two SIPP panels who are surveyed at different dates.

FIGURE 4.—MEDICAID COVERAGE RATES BY FAMILY INCOME
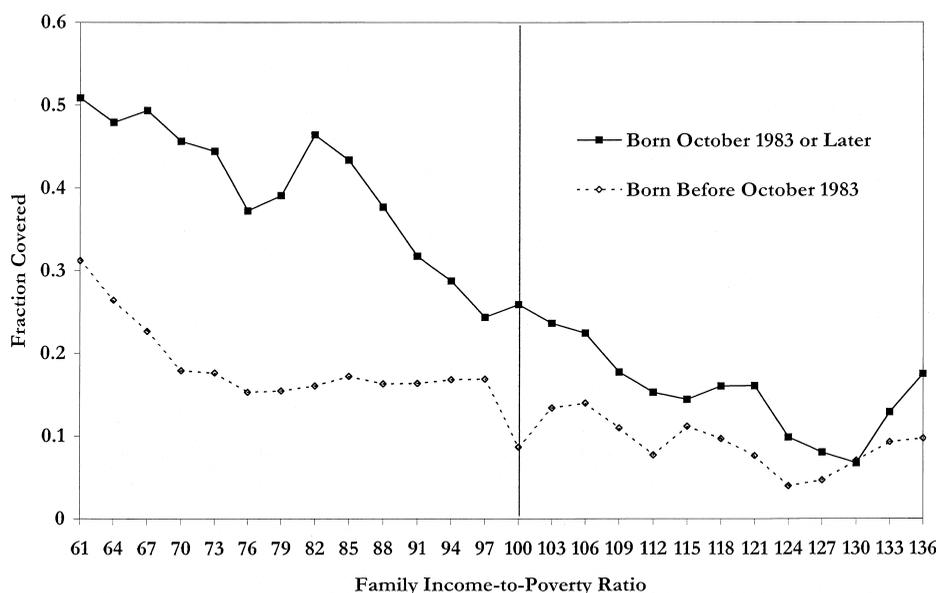
September 1983 cutoff in trying to evaluate the 100% expansion.

Figure 3 shows corresponding patterns of Medicaid coverage. There is a discernible jump in Medicaid enrollment for the below-poverty group between the 1983-III and 1983-IV birth cohorts, with no such jump for the above-poverty group. Moreover, coverage rates of the below-poverty group are fairly stable on either side of the eligibility cutoff, suggesting that the jump is not just a random blip.[14] It is also interesting to note that despite the rise in Medicaid eligibility noted in figure 2 for the above-poverty sample born 12–16 quarters after 1983-III, there is no parallel rise in enrollment. This is consistent with other evidence (presented below) that the 133% expansion had little effect on Medicaid enrollment.

The rules of the 100% expansion also create discontinuities in eligibility by family income. In particular, for children born after September 1983, one would expect Medicaid coverage to fall off as family income passed through the poverty line, whereas there should be no such effect for children born earlier. Figure 4 graphs Medicaid coverage rates by family income for children in the 1992 and 1993 SIPP samples born before and after the OBRA 1990 cutoff date.[15] A key difference between these comparisons and those in figure 3 is that a child's birth date is fixed, whereas

family income can vary from month to month.[16] Since Medicaid enrollment is time-consuming, families will not necessarily enroll if their incomes are only temporarily low, leading to some fuzziness in the discontinuity by income. Moreover, incomes are measured with error, and the SIPP-reported income does not necessarily correspond to the income that would be declared on an application for Medicaid. Consistent with these facts, there is a more gradual shift in Medicaid coverage around the poverty line in figure 4 than at the 1983-III cohort cutoff in figure 3. Nevertheless, the data in figure 4 suggest an effect of OBRA 1990. Above the poverty line, Medicaid coverage rates are fairly similar for the older and younger cohorts. Below the poverty line the coverage rate of the younger cohort is 10 percentage points higher.

A. Differences-in-Differences and Regression-Discontinuity Estimates

The evidence in figures 3 and 4 can be evaluated more formally by constructing differences in differences of health insurance outcomes for children just above and just below the poverty line who were born before and after September 30, 1983. The results are presented in table 3. For the post-September 1983 cohort we present means including all children, and means for the subset who were of age six or older as of the SIPP survey. Focusing on children six or older eliminates the problem that younger children in the higher-income group are potentially eligible for Medicaid through the 133% expansion.

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[14] There are 25–30 children per birth quarter in the 60%–100% poverty group in the combined 1992 and 1993 SIPPs. Thus, the standard error of the estimated Medicaid participation rate for a single birth quarter is approximately 8 percentage points.

[15] As in figures 2 and 3, the samples used in figure 4 exclude children whose AFDC cutoff is greater than 70% of the family-specific poverty line.

[16] See for example Pischke (1995), who fits a variety of models to monthly family income from the SIPP. In our samples, the correlation of monthly family incomes measured 6 months apart is around 0.80.

TABLE 3.—MEDICAID ELIGIBILITY AND PROGRAM PARTICIPATION FOR CHILDREN ELIGIBLE AND INELIGIBLE FOR 100% PROGRAM, 1992–1993 SIPP PANELS

	Number Obs.	Percent Medicaid Eligible	Percent Covered by Medicaid	Percent on AFDC	Percent on Medicaid not AFDC	Percent with Any Insurance	Percent with Other Insurance
Family income 60%–100% of poverty line:							
Born before 10/1/83	813	6.9 (0.9)	18.1 (1.4)	7.4 (0.9)	10.8 (1.1)	54.6 (1.7)	36.5 (1.7)
Born 10/1/83 or later and age 6 or older	247	100.0 (0.0)	32.7 (3.0)	7.0 (1.6)	25.7 (2.8)	65.5 (3.0)	32.8 (3.0)
Born 10/1/83 or later	597	100.0 (0.0)	40.6 (2.0)	6.0 (1.0)	33.3 (1.9)	70.0 (1.9)	29.4 (1.9)
Family income 100%–140% of poverty line:							
Born before 10/1/83	806	3.6 (0.7)	8.7 (1.0)	1.2 (0.4)	7.6 (0.9)	64.6 (1.7)	55.9 (1.7)
Born 10/1/83 or later and age 6 or older	274	6.0 (1.4)	14.9 (2.1)	2.4 (0.9)	12.5 (2.0)	65.1 (2.9)	50.3 (3.0)
Born 10/1/83 or later	661	50.9 (1.9)	16.9 (1.5)	1.8 (0.5)	15.1 (1.4)	70.5 (1.8)	53.6 (1.9)
Comparison of children born before and after October 1, 1983 in poor and near-poor families:							
Ages 6 and older only:							
Difference in differences	—	90.7 (1.8)	8.5 (4.0)	−1.6 (2.1)	10.0 (3.7)	10.4 (4.8)	1.9 (4.9)
Regression-adjusted D in D	—	91.8 (1.9)	6.9 (3.6)	−2.9 (2.0)	9.7 (3.2)	9.9 (4.9)	3.0 (4.9)
All ages:							
Difference in differences	—	45.8 (2.1)	14.3 (3.0)	−2.0 (1.5)	16.3 (2.8)	9.5 (3.5)	−4.8 (3.6)
Regression-adjusted D in D	—	92.3 (2.1)	6.8 (3.8)	−2.8 (2.0)	9.6 (3.5)	10.0 (4.8)	3.2 (4.9)

Notes: Standard errors in parentheses. Sample includes children in month 4 of 1992 and 1993 SIPP in families with incomes from 60% to 140% of poverty line and with family-specific AFDC eligibility thresholds under 70% of poverty line. Regression-adjusted difference in differences includes cubic in age (in months); dummy for age under 6 interacted with dummy for income below poverty; dummies for black, Hispanic, single mother; dummies for region interacted with survey year; ratio of family income to poverty line and its square; dummy if family income below poverty line; dummy if born after October 1, 1983; and interaction of dummies for income below poverty line and born after October 1, 1983 (reported in table).

Consistent with figure 2, the entries in the second column of the table show a big difference in eligibility rates for below-poverty children born before and after 1983-III, and a much smaller difference for the above-poverty children. Indeed, once the sample is restricted to children older than six (to eliminate potential overlap with the 133% expansion), the difference in differences is 91%. Pooling all children, however, the difference in differences falls to 46%, reflecting the contamination of the above-poverty, post-September 1983 group by children who are eligible under the 133% program.

One way to focus directly on the discontinuity in coverage around the September 1983 cutoff is to construct regression-adjusted differences in differences that include smooth functions of age and income, as well as controls for age under six and other factors. In particular, consider the following regression model for the event of Medicaid eligibility (Y):

$$Y = a + b_1\ Poor + b_2(Born\ after\ 9/30/83) + b_3\ Poor$$
$$\times\ (Born\ after\ 9/30/83) + b_4(Age < 6) + b_5(Age < 6)$$
$$\times\ (1 - Poor) + G(Age, Income) + dX + e, \qquad (1)$$

where *Poor* is an indicator for family income under the poverty line, *Age* represents an individual's age, *Income* represents family income relative to the poverty line, $G(\ )$ is some smooth function of age and income (such as a low-order polynomial), and X is a set of other characteristics (including year dummies and controls for race and ethnicity). This specification allows the outcome variable Y to vary smoothly with age and family income, and to exhibit possible discontinuities as family income reaches the poverty line, or the child's birth date approaches September 30, 1983, or the child reaches age six. The impact of OBRA 1990 (the 100% expansion) is identified by the coefficient

b_3 of the interaction between poverty status and birth cohort. Any confounding effect of OBRA 1989 is captured by the coefficient b_5 of the interaction between age less than six and above-poverty status.

If equation (1) is restricted to the first three terms, then the coefficient b_3 equals the difference in differences of the outcome Y for children born before and after September 1983 in above- and below-poverty families. The addition of a flexible function $G(\ )$ shifts the source of identification from a global difference in differences to a local one, concentrated around the eligibility threshold. It is important to note that the coefficients of the age and income controls in $G(\ )$ need not reflect true causal effects. For example, if higher-income families have stronger tastes for health insurance, the coefficients will reflect both the income elasticity of demand and the variation of tastes for insurance across the population. As long as these combined factors are smooth functions of income, however, their contribution will not affect the estimated regression discontinuity identified by the coefficient b_3 (see Angrist and Krueger, 1999).[17]

The regression-adjusted differences in differences in table 3 include a cubic in age, a quadratic in income (relative to poverty), dummies for race, Hispanic ethnicity, and living with a single mother, and interactions of year effects with four region effects.[18] Looking first at the eligibility models, when the comparison is restricted to children age six and older, the regression-adjusted estimate of the eligibility

[17] The regression discontinuity approach may fail if families adjust their incomes to take advantage of the eligibility laws. Such behavior will lead to a regression discontinuity in the characteristics of families on either side of the eligibility thresholds. We tested for a discontinuity in race and found no evidence of selective sorting of families around the income thresholds.

[18] The results from other specifications, including polynomials of different orders and various interactions, are all very similar.

effect is nearly identical to the unadjusted difference in differences (92%). Although the simple difference in differences falls dramatically when younger children are added to the sample, the regression-adjusted estimate remains very stable, suggesting that the addition of the age and income controls shifts the source of identification for b_3 to the discontinuity point.

The models for Medicaid coverage (in column 3 of table 3) imply that the 100% expansion led to a 7-percentage-point rise in enrollment for children close to the eligibility limits. As with the eligibility models, the coverage effects from the regression-adjusted models are similar whether or not children under six are included. Since the 100% program increased eligibility by approximately 92% and increased coverage by 7%, the implied takeup rate among the newly eligible group is 7.7% (with a standard error of 3.6%).[19] This estimate is substantially below the 20% takeup rate estimated by Cutler and Gruber (1996) for the combined federal and state expansions over the 1985–1993 period, but closer to estimates obtained by other researchers.

The models in the remaining columns of table 3 analyze AFDC participation, Medicaid coverage outside of AFDC, overall health insurance coverage, and the presence of non-Medicaid insurance. The results for AFDC and for Medicaid coverage outside of AFDC can be interpreted as specification checks. In principle, the change in the Medicaid income limit should not have affected AFDC participation: thus, the entire rise in Medicaid associated with the rise in eligibility should have occurred outside AFDC. This is confirmed by the unadjusted and regression-adjusted differences in differences.

The results for any health insurance, and for other (that is, non-Medicaid) insurance, address the issue of crowdout. The unadjusted difference in differences that includes children under six shows some evidence of crowdout, with a smaller rise in total coverage than in Medicaid, and a decline in other coverage.[20] However, the preferred specifications that either exclude children under six or add controls for age, income, and coverage under the 133% program show no such patterns.

We have performed a number of specification tests to probe the robustness of the results in table 3. One test is to redo the analysis using data from 1990 and 1991, before the 100% expansion took effect. Unfortunately, this exercise is not very informative, because there are very few children in the right income range who were at least six years old in 1990 or 1991 *and* were born after September 1983 (a total of only 120 observations). Using this small sample, the

difference in differences in Medicaid coverage prior to the effective date of the 100% expansion is actually negative, providing no evidence of a positive bias in the 1992–1993 results.

A second test is to drop the exclusion restriction that eliminates children in high-AFDC benefit states. The main effect of this change is to raise the Medicaid eligibility and participation rates of the below-poverty group born before October 1983. As a consequence, the regression-adjusted difference in differences in eligibility falls to 74.4%, the corresponding effect on Medicaid coverage falls to 5.9% (standard error 3.5), and the effect on overall health insurance falls to 6.5% (standard error 4.0). For this broader sample the implied takeup rate of Medicaid coverage by newly eligible children is 7.9% (standard error 3.3 percent)—quite similar to the estimate using the narrower sample, as would be expected if all the changes in the broader sample are generated by behavioral reactions among children above the AFDC limit.

A third test is to augment the sample for 1992 and 1993 with data from the earlier panels. For example, month 16 of the 1991 panel represents the same calendar period as month 4 of the 1992 panel. We included these data (for the 90% of the 1991 panel who were still in the sample at their 16th month) and reestimated the models in table 3. The results are very similar to those in table 3, though with a somewhat smaller estimate of the overall health insurance effects. The regression-adjusted estimate of the Medicaid coverage effect is 7.7% (standard error 3.3), and the corresponding estimate of the overall health insurance effect is 6.7%, (standard error 4.1). We continue to find little evidence of crowding out: the regression-adjusted estimate for other coverage is −1.0 (standard error 4.2). Adding in data for month 28 of the 1990 panel similarly has very little effect on the results.

V.   The OBRA 1989 (133%) Expansion

Like the 100% expansion, the 133% expansion generated sharp discontinuities in Medicaid eligibility. As a first step in evaluating this expansion, we compare children older or younger than six in families with incomes from 100% to 133% of the poverty line to similar age groups in families with incomes from 133% to 166% of the poverty line. Figure 5 shows Medicaid coverage rates by age measured in quarters for the two groups, using data from the 1991–1993 SIPP samples.[21] Contrary to the pattern in figure 3, there is no evidence of a jump in Medicaid coverage at the age limit of the 133% program.[22] A graph of Medicaid coverage by family income similarly shows no evidence of a drop in

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[19] Taking the ratio of the coverage and eligibility effects is equivalent to an instrumental variables (IV) estimate of the effect of Medicaid eligibility on Medicaid coverage, using the interaction of poverty status and pre-September 1983 birth cohort as an instrument for eligibility. The corresponding OLS estimate is 7.5% with a standard error of 2.4%.

[20] Some children have both Medicaid and other coverage. Thus, the coefficients for Medicaid coverage and non-Medicaid coverage do not add up to the coefficient in the model for any coverage.

[21] To avoid issues of AFDC eligibility, the underlying samples exclude children in families whose AFDC income limit is above 100% of the poverty line. This affects a relatively small number of children.

[22] The lines in figure 5 are smoothed as in figure 3. There are 40–50 observations per quarter for both income groups, slightly more than in the samples in figure 3.

FIGURE 5.—MEDICAID COVERAGE RATES BY AGE
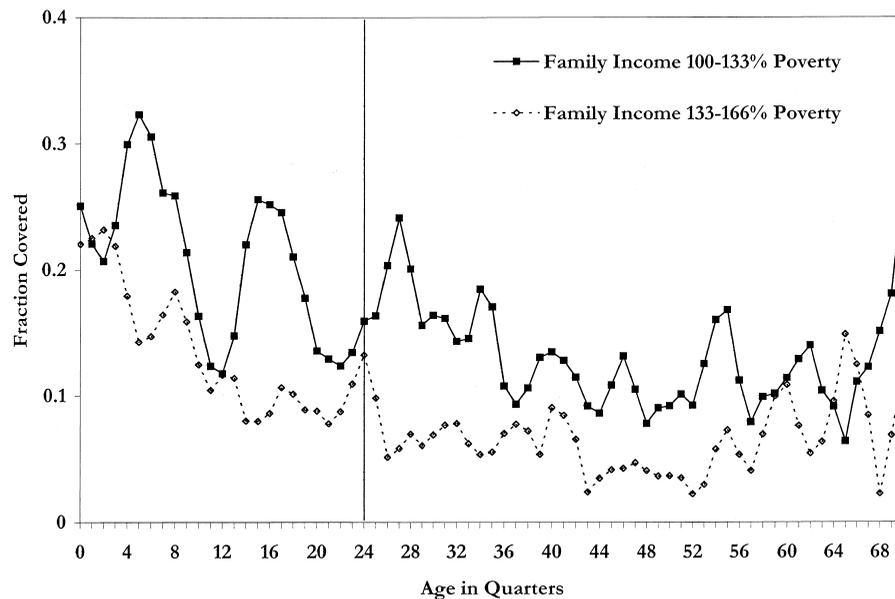
coverage as income reaches 133% of poverty among the under-six children.

Table 4 presents means of Medicaid eligibility and coverage for children older or younger than six in families with incomes below and above the cutoff of the 133% program, along with raw and regression-adjusted differences in differences. The results in the second column show that the 133% expansion raised Medicaid eligibility of the target group by approximately 85%. Unlike the 100% expansion, however, we can find no corresponding effect on Medicaid coverage or health insurance coverage. To check whether these estimates might reflect a slow diffusion of knowledge about the 133% program, we constructed differences in differences using data for 1992 and 1993 only. The results, shown in the bottom row of table 4, are not much different

from the results based on 1991–1993. We also tried various changes in the sample (such as narrowing the income limits of the affected and unaffected groups around the 133% income cutoff, and narrowing the age range), but found no change in the results.

A limitation of the analysis in table 4 is that it focuses on only some of the children who were affected by the 133% expansion—those in families with incomes from 100% to 133% of poverty. OBRA 1989 also extended coverage to children under the age of six with family incomes below the poverty line who were subsequently eligible under the 100% expansion. By pooling a wider range of age and income groups and including indicators for the various age poverty subgroups, it is possible to determine whether this doubly eligible group responded more like the older, lower-

TABLE 4.—COMPARISONS OF MEDICAID ELIGIBILITY AND PROGRAM PARTICIPATION RATES FOR CHILDREN ELIGIBLE AND INELIGIBLE FOR 133% PROGRAM, 1991–1993 SIPP PANELS

	Number Obs.	Percent Medicaid Eligible	Percent Covered by Medicaid	Percent on AFDC	Percent on Medicaid not AFDC	Percent with Any Insurance	Percent with Other Insurance
Family income 100%–133% of poverty line:							
Age 6 and older	1474	8.3 (0.7)	12.8 (0.9)	3.0 (0.4)	9.8 (0.8)	65.7 (1.2)	52.9 (1.3)
Under age 6	776	100.0 (0.0)	20.6 (1.5)	2.4 (0.5)	18.2 (1.4)	76.6 (1.5)	56.0 (1.8)
Family income 133%–166% of poverty line:							
Age 6 and older	1677	7.9 (0.7)	6.6 (0.6)	1.2 (0.3)	5.4 (0.6)	74.3 (1.1)	67.7 (1.1)
Under age 6	906	15.1 (1.2)	12.9 (1.1)	1.6 (0.4)	11.3 (1.1)	84.4 (1.2)	71.5 (1.5)
Comparisons of children younger and older than 6 in families above and below 133% poverty limit:							
Difference in differences	—	84.6 (1.5)	1.5 (2.1)	−1.1 (0.9)	2.6 (2.0)	0.7 (2.5)	−0.7 (2.9)
Regression-adjusted D in D	—	85.8 (1.4)	2.0 (1.9)	−1.0 (0.8)	2.9 (1.8)	0.9 (2.6)	−1.1 (2.9)
Regression-adjusted D in D, 1992 and 1993 only	—	82.9 (1.8)	−0.8 (2.2)	−1.3 (0.9)	0.5 (2.1)	1.4 (3.1)	2.2 (3.4)

Notes: Standard errors in parentheses. Sample includes children in month 4 of 1991–1993 SIPP in families with incomes from 100% to 166% of poverty line and with family-specific AFDC eligibility thresholds under 100% of poverty line. Regression-adjusted difference in differences includes cubic in age (in months); dummies for black, Hispanic, single mother; Census region interacted with survey year; ratio of family income to poverty line and its square; dummy if family income is below 133% of poverty line; dummy if under age 6; and interaction of dummies for income below 133% of poverty line and under age 6 (reported in table).

Table 5.—Combined Models for Medicaid Eligibility and Program Participation Rates for Children in Families with Incomes from 60% to 166% of Poverty, 1992–1993 SIPP Panels

	Medicaid Eligible	Covered by Medicaid	On AFDC	On Medicaid, not AFDC	Have Any Insurance	Have Other Insurance
1. Age 6 or more, born after September 1983, family income < poverty (100% expansion only)	74.1 (2.0)	8.1 (2.9)	−2.1 (1.6)	10.2 (2.7)	8.4 (3.5)	0.3 (3.7)
2. Under age 6, born after September 1983, family income < poverty (100% and 133% expansions)	73.3 (1.8)	10.9 (2.6)	−1.5 (1.4)	12.4 (2.4)	5.3 (3.2)	−5.6 (3.3)
3. Under age 6, family income 100%–133% of poverty (133% expansion only)	82.8 (1.8)	−1.0 (2.6)	−1.2 (1.4)	0.2 (2.4)	1.7 (3.2)	2.7 (3.3)
4. *P*-value of test: coefficients in rows 1 and 2 are equal; coefficient in row 3 is 0.	0.00	0.54	0.54	0.77	0.50	0.14

Notes: Standard errors in parentheses. Models are fitted to sample of 5555 children in 1992 and 1993 SIPP with family incomes from 60% to 166% of the poverty line. All models include cubic in age (in months); dummy for age under 6; dummy if born after October 1, 1983; dummy if family income below poverty, dummy if family income below 133% of poverty; dummies for black, Hispanic, and single mother; dummies for Census region interacted with survey year; ratio of family income to poverty line and its square; and the three dummies reported in the table.

income group affected by the 100% expansion, or more like the younger, higher-income group affected by the 133% expansion. The results of this exercise—using SIPP data for 1992 and 1993 for children with family incomes from 60% to 166% of the poverty line—are reported in table 5. We report the coefficients from an expanded version of equation (1) that includes polynomials in age and income, a dummy for children under six, a dummy for those born after September 1983, dummies for two intervals of family income (60%–100% and 100%–133% of poverty), and dummies for three age-poverty subgroups: those aged six or older but born after September 1983 with family income less than 100% of poverty (who were only eligible for Medicaid under the 100% expansion); those under six with family income less than 100% of poverty (who were eligible under both the 100% and the 133% percent expansions); and those under six with family income from 100% to 133% of poverty (who were only eligible under the 133% expansion).[23]

The results in the first column show that potential eligibility under the 100% expansion, or under both expansions, was associated with an approximately 74% increase in Medicaid eligibility (consistent with our robustness check of the results in table 3), whereas potential eligibility under the 133% expansion was associated with an 83% increase in eligibility (consistent with the results in table 4). The estimated effects on Medicaid coverage in the second column show that children who were eligible for the 100% expansion only, or for both expansions, had 8–11-percentage-point gains in Medicaid enrollment, while those who were eligible for the 133% expansion had a slight decline in Medicaid coverage. As in table 4, the latter effect is attributable to a negative estimated effect of eligibility for the 133% expansion on AFDC coverage.[24] The models for any

health insurance and other insurance show no evidence of crowdout among the groups who were eligible under the 100% expansion only, or under the 133% expansion only, but some weak evidence of crowdout for the dual coverage subgroup. Nevertheless, given the limited precision of the estimates, we cannot reject the hypothesis that the dual coverage group and the 100%-only group have the same responses, while the 133%-only group has zero responses on all margins.

To summarize, our results from the SIPP indicate that the 100% expansion led to approximately a 7–8-percentage-point rise in Medicaid coverage and overall health insurance coverage among previously ineligible children, whereas the 133% expansion had little effect on either. The effects for the set of younger children covered by both expansions are about the same as for those covered by the 100% program only.

VI. Evidence from the March CPS

In view of the surprising results for the 133% expansion obtained from our SIPP samples, we decided to look at the program using March CPS data. Since the age limit of the 133% expansion falls at exactly six years, it is possible to distinguish eligible and ineligible children using age data measured only in years. The results are summarized in table 6. Despite some small differences in the levels of Medicaid, AFDC, and health insurance coverage in the CPS and SIPP, the differences in differences are very similar. In particular, March CPS data from 1991 to 1993 suggest that OBRA 1989 had a very small effect on Medicaid coverage of children under six in families with incomes from 100% to 133% of poverty—on the order of 3%. Despite the much larger CPS sample sizes, only two of the differences in differences are statistically significant—the 3.4% effect on

[23] The models also include region and year effects and controls for race, ethnicity, and family structure.

[24] We examined whether the apparent negative effect of the expansions on AFDC participation was due to our assumption of the full child care disregard for children under six only. In preliminary work we reestimated

the models using alternative assumptions—that no child care disregard was taken, or that the full amount was taken for children of all ages. We found that the AFDC effect became smaller in absolute value and the other coefficients remained largely unchanged.

TABLE 6.—COMPARISONS OF MEDICAID ELIGIBILITY AND PARTICIPATION RATES FOR CHILDREN OLDER AND YOUNGER THAN AGE 6 IN FAMILIES ABOVE AND BELOW 133% OF THE POVERTY LINE, 1991–1993 MARCH CPS

	Number Obs.	Percent Medicaid Eligible	Percent Covered by Medicaid	Percent on AFDC	Percent on Medicaid, not AFDC	Percent with Any Insurance	Percent with Other Insurance
Family income 100%–133% of poverty line:							
Age 6 and older	6012	7.2 (0.3)	19.0 (0.5)	8.3 (0.4)	11.9 (0.4)	70.0 (0.6)	56.6 (0.6)
Under age 6	2600	100.0 (0.0)	29.8 (0.9)	10.4 (0.6)	19.5 (0.8)	76.7 (0.8)	56.4 (1.0)
Family income 133%–166% of poverty line:							
Age 6 and older	6202	6.8 (0.3)	10.9 (0.4)	3.8 (0.2)	7.7 (0.3)	74.1 (0.6)	67.8 (0.6)
Under age 6	2731	14.0 (0.7)	18.5 (0.7)	5.3 (0.4)	13.6 (0.7)	81.7 (0.7)	71.0 (0.9)
Comparisons of children under and older than 6 in families above and below 133% poverty limit:							
Difference in differences	—	85.6 (0.8)	3.2 (1.3)	0.7 (0.9)	1.8 (1.1)	−0.9 (1.4)	−3.4 (1.6)
Regression-adjusted D in D	—	85.7 (0.6)	3.4 (1.2)	0.9 (0.8)	1.7 (1.0)	−0.6 (1.4)	−3.3 (1.5)

Notes: Standard errors in parentheses. Sample includes children in 1991–1993 March CPS in families with incomes from 100% to 166% of poverty line and with family-specific AFDC eligibility thresholds below 100% of poverty line. Regression-adjusted difference in differences includes age in years; dummy for age under 6; dummies for black, Hispanic, single mother; dummies for Census region interacted with CPS year; ratio of family income to poverty line and its square; dummy if family income is below 133% of poverty line; dummy if under age 6; and interaction of dummies for income below 133% of poverty line and under age 6 (reported in table).

TABLE 7.—COMPARISONS OF MEDICAID ELIGIBILITY AND PARTICIPATION RATES FOR CHILDREN OLDER AND YOUNGER THAN AGE 6 IN FAMILIES ABOVE AND BELOW 133% OF THE POVERTY LINE, 1991–1996 MARCH CPS

CPS Year	Percent Medicaid-Eligible	Percent Covered by Medicaid	Percent on AFDC	Percent on Medicaid, not AFDC	Percent with Any Insurance	Percent with Other Insurance
1991	93.9 (0.6)	6.3 (2.0)	1.0 (1.4)	4.8 (1.6)	−0.8 (2.5)	−7.2 (2.7)
1992	85.4 (1.1)	0.9 (2.2)	−0.7 (1.4)	0.6 (1.8)	1.8 (2.4)	1.5 (2.7)
1993	78.4 (1.4)	2.3 (2.2)	2.5 (1.3)	−0.9 (1.9)	−2.6 (2.4)	−3.3 (2.7)
1994	66.3 (1.5)	1.2 (2.3)	−1.3 (1.3)	2.0 (2.1)	1.6 (2.3)	1.4 (2.6)
1995	72.7 (1.4)	−1.2 (2.4)	1.6 (1.4)	−2.4 (2.1)	0.2 (2.4)	0.9 (2.7)
1996	82.9 (1.1)	3.8 (2.5)	4.9 (1.6)	−0.0 (2.3)	−0.2 (2.5)	−4.8 (2.8)

Note: Table entries are regression-adjusted differences in differences. See note to table 6 for model specifications and sample definitions.

Medicaid coverage and the −3.3% effect on other health insurance. Paradoxically, the CPS data suggest that 133% expansion caused other insurance coverage to fall by about the same amount as the rise in Medicaid, leading to no net change in overall health insurance coverage.

We also conducted a year-by-year analysis using the CPS files for 1991 to 1996, to check if the effect of the 133% expansion changed over time. The results are summarized in Table 7. Though there is some year-to-year variation, on balance we see no systematic effects of OBRA 1989 on Medicaid enrollment or total health insurance coverage. The (unweighted) average of the six regression-adjusted difference-in-differences estimates of the effect on Medicaid enrollment is 2.2%: the corresponding average of the estimated effects on overall coverage is 0%. There is no evidence of increasing takeup of coverage offered by the 133% expansion, or of increasing crowdout effects. If anything, the variability in results from the six years suggest the need for caution in interpreting the point estimates from the 1991–1993 sample.

VII.   Evidence from the Health Interview Survey

Our final set of estimates is based on data from the 1992–1996 Health Interview Surveys. We focus on three key dependent variables from the HIS: Medicaid coverage, any health insurance coverage, and the number of doctor visits in the past year. Following previous researchers (Holl et al., 1995; Currie and Gruber, 1996), we distinguish between children who had at least one visit last year, and those who did not. Whereas many visits may indicate serious health problems, at least one visit is interpreted in the literature as a positive indicator of access to preventative medical care.

The upper panel of table 8 reports unadjusted and regression-adjusted difference-in-differences estimates of the effect of the 100% poverty expansion, using children in families with incomes from 60% to 140% of poverty born before and after September 30, 1983.[25] Because the public use samples of the HIS do not report state of residence, we cannot estimate Medicaid (or AFDC) eligibility rates. The estimated differences in differences of Medicaid coverage and overall insurance coverage in the HIS sample are relatively precise, and suggest that the 100% expansion significantly raised Medicaid enrollment and overall health insurance coverage. Using the 66-percentage-point Medicaid eligibility increase estimated from the SIPP (for a comparable sample that includes children in high-AFDC-

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[25] As described in the Data Appendix, we estimate the ratio of family income to poverty using income intervals reported in the HIS and family size information. We exclude the roughly 15% of individuals with missing family income information.

TABLE 8.—HEALTH INSURANCE COVERAGE AND PROBABILITY OF AT LEAST ONE DOCTOR VISIT, 1992–1996 HIS

	Covered by Medicaid	Have Any Insurance	At Least One Doctor Visit in Past Year
A. Analysis of 100% Program Only: Children in Families with Incomes from 60% to 140% of Poverty ($n = 24{,}964$)			
(a) Unadjusted difference in differences	5.0 (1.2)	6.8 (1.2)	1.8 (1.1)
(b) Regression-adjusted D in D	6.0 (1.5)	4.8 (1.5)	2.9 (1.3)
B. Analysis of 100% and 133% Programs: Children in Families with Incomes from 60% to 166% of Poverty ($n = 32{,}617$)			
(c) Age 6 or more, born after September 1983, family income < poverty (100% expansion only)	8.0 (1.2)	5.3 (1.3)	3.8 (1.2)
(d) Under age 6, born after September 1983 family income < poverty, (100% and 133% expansions)	9.6 (1.3)	9.3 (1.3)	1.6 (1.2)
(e) Under age 6, family income 100%–133% of poverty (133% expansion only)	5.8 (1.2)	2.7 (1.4)	0.5 (1.2)

Notes: Standard errors in parentheses. Samples include children aged 0–18 in 1992–1996 Health Interview Surveys who report data on family income, Medicaid coverage, and date of birth. Family-specific poverty lines are assigned using family size information and midpoints of reported family income categories. Specifications in panel A are the same as in table 3. Specifications in panel B are the same as in table 5.

FIGURE 6.—MEDICAID COVERAGE RATES BY QUARTER OF BIRTH, 1992–1996 HIS
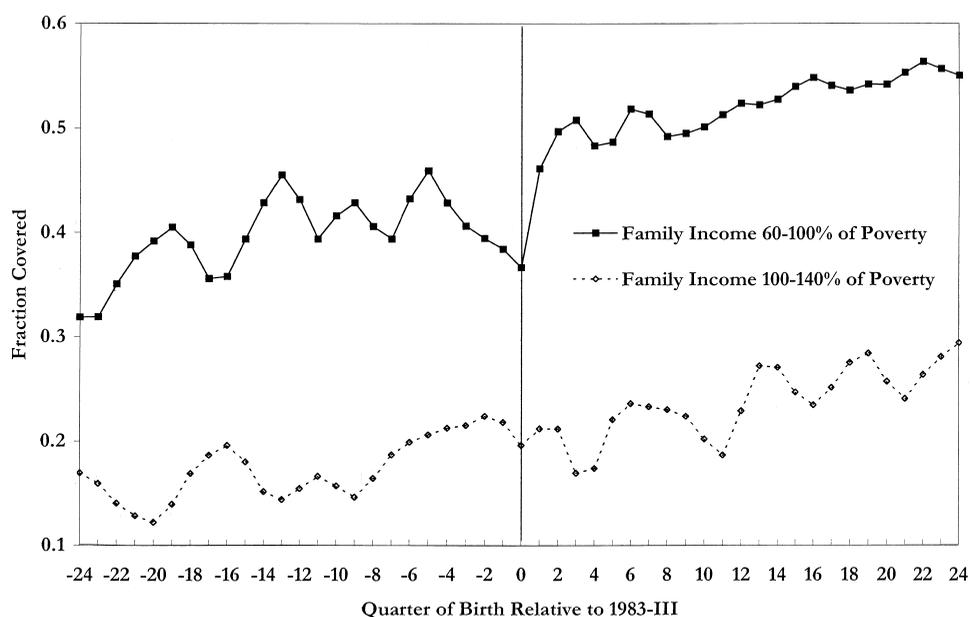
benefit states), the implied takeup rate for Medicaid coverage offered by the 100% expansion is 8%–9%—just slightly above our estimates from the SIPP. The regression-adjusted HIS estimates suggest that the 100% expansion raised Medicaid coverage a little more than overall coverage, although the difference—which is an estimate of the crowdout effect—is not significant ($t = 0.8$). The impact of the expansion is illustrated in figure 6, which plots Medicaid enrollment rates by quarter of birth for children in families just below and just above the poverty line.[26] As in Figure 3, there is a noticeable jump in Medicaid coverage after the September 30, 1983 eligibility date for the poor children, and no such jump for the near-poor children.

The results in the third column of table 8 suggest that the 100% expansion also had a positive effect on health care utilization. The unadjusted effect on the likelihood of at least one doctor visit in the past year is not quite statistically significant, and the regression-adjusted effect is marginally so, with a t-ratio of 2.18.[27] Compared with the rather modest estimate of the expansion's effect on insurance coverage, the effect on doctor visits is rather large. Specifically, the estimates suggest that children with newly available health insurance coverage have a 60% higher probability of at least one annual doctor visit than in the absence of the expansion, although this estimate is rather imprecise (standard error 31%).[28] By comparison, an OLS regression of doctor visits

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[26] The lines in figure 6 are smoothed using a 3-quarter moving average with weights (0.25, 0.5, 0.25).

[27] The mean fractions of children with at least one doctor visit in the previous year for the four groups used in the difference-in-differences are as follows: poor children born before October 1983, 65.2%; poor children born later, 83.1%; above-poverty children born before October 1983, 65.6%; above-poverty children born later, 81.6%.

[28] This is the instrumental variables estimate of the effect of health insurance coverage on the probability of visiting a doctor at least once, using the interaction of poor and born after September 1983 as an instrument for coverage.

TABLE 9.—REANALYSIS OF CUTLER-GRUBER (1996) MODELS

Dependent Variable	Covered by Medicaid	Covered by Private Insurance	Covered by Any Insurance
Cutler and Gruber (1996, Table IV)	0.235 (0.017)	−0.074 (0.021)	0.119 (0.018)
Replication	0.235 (0.017)	−0.064 (0.021)	0.123 (0.018)
With age × year dummies	0.118 (0.026)	−0.019 (0.031)	0.087 (0.026)
With age × year, age × state, and state × year dummies	0.113 (0.042)	−0.028 (0.053)	0.065 (0.045)

Notes: Standard errors in parentheses. Entries are the coefficients on imputed Medicaid eligibility from instrumental variables regressions, using the percentage of a national sample simulated to be eligible in each state-year-age cell as the instrument. Models are fitted to 266,421 observations of children aged 18 and under from the 1988–1993 March Current Population Surveys and include the number of people in the family and dummies for age, state, year, male, white, household head type, and number of workers.

on insurance coverage and the same set of control variables has a coefficient of only 12% (standard error 0.6%). This pattern of results is consistent with takeup occurring primarily among children who needed care or whose parents were motivated to obtain preventive care for their children. Unfortunately, we are unable to explore this possibility further, due to data limitations.

The models in the lower panel of table 8 examine the combined effects of the 100% and 133% expansions, using the same framework as in table 5. The results are comparable to those based on the SIPP, although in the HIS sample there is more evidence of an effect of the 133% program on Medicaid coverage. Interestingly, however, this increase in Medicaid was not associated with a significant change in the probability of visiting a doctor. It is also interesting that among children eligible for the 100% expansion the SIPP sample showed larger crowdout effects for younger children who were also eligible for the 133% program, whereas in the HIS sample any evidence of crowdout is confined to the older children who were excluded from the 133% program.

Overall, we interpret the HIS results as supportive of our findings from the SIPP and CPS, although differences across the various specifications suggest the need for caution in drawing strong inferences from any one data set. Based on the combined evidence, we conclude that OBRA 1990 had a significant effect on Medicaid enrollment, with a takeup rate of around 8%. It also increased overall health insurance coverage, with little or no crowdout of non-Medicaid coverage. By comparison, the 133% expansion in OBRA 1989 had smaller effects on Medicaid enrollment. Our estimates suggest takeup rates on the order of 0%–5%, with the SIPP and March CPS estimates clustered around zero. Our estimated effects of the 133% expansion on overall health insurance coverage are, if anything, smaller than the estimated effects on Medicaid, implying that any effect on Medicaid was offset by reductions in other coverage.

VIII. Comparisons with Earlier Literature

Our analysis of the OBRA 1989 and OBRA 1990 Medicaid expansions point to much lower estimated takeup rates, and lower rates of crowding out, than does the analysis by Cutler and Gruber (1996). In an effort to reconcile the evidence, we conducted a replication and reanalysis of Cutler and Gruber's main findings. They estimate models of the form

$$Y_{iast} = \alpha + \beta X_{iast} + \gamma Elig_{iast} + \varepsilon_{iast}, \qquad (2)$$

where Y_{iast} is an indicator for Medicaid enrollment (or another form of insurance coverage) for individual i in age group a from state s in year t, X_{iast} is a set of observed characteristics of the individual (including demographic characteristics), $Elig_{iast}$ is a dummy indicating whether the individual is eligible for Medicaid, and ε_{iast} is an error term. Cutler and Gruber calculate eligibility for each child based on AFDC rules and the expansion provisions applicable for each child (depending on age, state of residence, and family income and structure). They estimate this model by instrumental variables, using as an instrument for individual eligibility the average eligibility rate of a nationally representative sample of children of age a under the laws in effect in state s in year t. They use samples of children under 18 in the March 1988–1993 Current Population Surveys, and include unrestricted state, year, and age dummies in their models.

Their main estimates are reproduced in the top row of table 9. The first column reports IV estimates of the takeup rate for Medicaid coverage. Their estimate (0.235) is substantially larger than the takeup rates we estimate for OBRA 1989 or OBRA 1990 coverage, although they are combining takeup rates for AFDC and expansion-based coverage. The second column shows their estimate of the crowdout rate of private insurance. This is negative and significant. Finally, the third column presents their estimate of the effect on overall insurance coverage.[29] As we noted earlier in the paper, this is only one-half as large as the effect on Medicaid enrollment, implying substantial slippage between gains in Medicaid and gains in overall coverage.

Our replications of Cutler and Gruber's estimates are reported in the second row of table 9. We can approximately replicate their estimated coefficients, and we obtain identical estimates of the sampling errors of the coefficients.

As noted by Cutler and Gruber (1996, p. 406), their identification strategy mixes state and national level sources of variation in Medicaid eligibility. It also imposes the assumption that in the absence of the expansions, Medicaid participation rates of different age groups would have moved in parallel over time. Row 3 of table 9 reports estimates from a specification that relaxes this assumption

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[29] They actually report models for noninsurance status, but the effects on overall coverage are equal and opposite.

by including age $\times$ year dummies. This turns out to have an important effect on the estimates of the Medicaid takeup rate and the crowdout rate, lowering the estimated takeup rate by 50% and reducing the magnitude of the crowdout effect by 75%. As shown in the last row of the table, adding a full set of two-way interactions to the model, and relying on the three-way interaction between state, year, and age as the source of identification, leads to very similar (though less precise) estimates. Interestingly, estimates from the less restrictive specifications in rows 3 and 4 are very comparable to our estimates, showing an approximately 11% takeup rate for Medicaid coverage, and small and statistically insignificant crowdout effects. We conclude that our results from a regression-discontinuity analysis of the two major federal Medicaid expansions are fully consistent with results that rely on state-level variation in the eligibility rules for different age groups.

IX. Explanations for Differential Takeup of the 100% and 133% Expansions

The contrast between the modest but positive effects of the OBRA 1990 expansion and the more limited effects of the OBRA 1989 expansion raises the question: what factors can explain the difference? One hypothesis is that the higher-income families eligible for coverage under the 133% expansion have a lower probability of remaining Medicaid-eligible in the near future, and are therefore less willing to undertake a lengthy enrollment process. To evaluate this hypothesis, we used the 1992 and 1993 SIPP panels to calculate Medicaid eligibility status 12 months after the first interview for children in different eligibility groups at the first interview. As expected, future eligibility rates are somewhat lower for families covered only by the 133% expansion (61%) than for families eligible at the first interview via the 100% expansion only (64%) or via both expansions (73%). The differences are very small, however.

Another hypothesis is that families affected by the 133% expansion have less experience with means-tested benefit programs and therefore have less information about such programs, or perhaps attach greater stigma to participating in them. Comparisons of the characteristics of the children and families in the different eligibility groups suggest that there may be some truth to this idea. For example, families in the 133%-only eligibility group are less likely to be female-headed or black than families in the 100%-only eligibility group: both characteristics are highly correlated with welfare participation rates. More formally, we compared the previous welfare and Medicaid participation histories of children in the 16th month of the 1992 and 1993 SIPP panels who were eligible for Medicaid under the 100% and 133% expansions. As expected, families of children who are eligible under the 133% expansion have lower rates of participation in Medicaid one year earlier (25%) than families of children who are eligible under the 100% expansion (38%) or under both expansions (44%). Neverthe-

less, the difference is modest. Moreover, our analysis of the March CPS data over the 1991–1996 period shows no evidence of rising takeup rates for children eligible for the 133% program, so it seems unlikely that slow learning can explain the limited effect of OBRA 1989.

X. Conclusions

This paper presents new estimates of the effects of the federal Medicaid expansions in the early 1990s, using comparisons of children close to the eligibility limits of the laws. We find that the OBRA 1990 expansion—which extended Medicaid eligibility to children born after September 30, 1983 in families below the poverty line—led to approximately an 8-percentage-point rise in Medicaid coverage for children just inside the eligibility limits, and a similar rise in overall health insurance. It also increased the fraction of children in the newly eligible group with a doctor visit in the previous year. The effects of the expansion on Medicaid enrollments are discernible from a simple graphical analysis, in conventional differences in differences, and in a regression-discontinuity framework. Nevertheless, the takeup rate in the newly eligible population was low. The OBRA 1989 expansion—which opened up Medicaid to children under six in families with incomes below 133% of the poverty line—had even smaller effects. We find no effect of the 133% expansion on Medicaid coverage of children close to the eligibility limits of the law in the SIPP or CPS. Even in the HIS, which shows a small effect on Medicaid enrollment, there is no effect on overall health insurance coverage.

Our findings suggest that the overall effect of the Medicaid expansions was substantially limited by low takeup rates among the newly eligible children, rather than by the crowding out of other forms of health insurance coverage. This is in contrast to the well-known study by Cutler and Gruber (1996), which argued that the Medicaid expansions led to higher takeup rates of coverage (roughly 25%), but substantial losses in private coverage. A replication and reanalysis of their evidence shows that the relatively large takeup and crowdout estimates arise from their restrictive empirical specifications, rather than from their use of state-level variation in Medicaid laws. Less restrictive specifications, including models that rely exclusively on state-specific eligibility laws, yield estimated takeup and crowdout rates nearly identical to ours.

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DATA APPENDIX

1. Surveys of Income and Program Participation

Our SIPP samples are taken from the 1990–1993 full panel research files. The samples include individuals up to 18 years of age in the fourth interview month who are neither the head of a family nor the spouse of a head. Individuals in nine states that are not separately identified are dropped. We constructed nuclear families for the children in our sample using information on relationship to household head, family status, and relationship to family head. In most cases the reconstructed families correspond to the members of the SIPP households. In cases where a child and his or her parent(s) live with other adults, however, our families include only the children and parent(s) of the appropriate subfamily. This definition corresponds to the family benefit unit that would be potentially eligible for AFDC or Medicaid. Variables such as family income and family structure are then calculated by summing the individual values for people in the family. We also assign family-specific poverty thresholds based on family size and year. To determine the maximum income cutoff for AFDC, we merge AFDC benefit levels and need standards to individuals, based on state of residence and family size. There are two income tests that a family must pass in order to qualify for AFDC—the *gross test,* which requires that a family's gross income be less than 1.85 times the state's need standard, and the *net test,* which requires that a family's income after disregards be less than the state's payment standard. In determining AFDC eligibility, families are permitted to disregard actual child care expenses up to a maximum of $175 per month ($200 per month for children under two). Since we do not know actual child care expenses, we assume that families deduct the full disregard for all children under age six, and no disregard for older children. This assumption overstates the amount of the disregard for families that use informal or low-cost care, and understates the disregard for families that pay for care for children older than six. Income eligibility cutoffs for Medicaid are determined using the age of the child, the ratio of family nonwelfare income to the family-specific poverty line, and the parameters of the relevant state Medicaid programs.

2. Current Population Surveys

We use data for individuals 18 and younger who are neither the head of a family nor the spouse of a head from the 1989–1999 March Current Population Surveys. Since subfamilies are identified directly in the CPS, we use subfamily income and poverty levels to assign income relative to the family poverty level. Income eligibility cutoffs for AFDC and Medicaid are determined as in the SIPP. We use information on health insurance coverage from the individual responses and the children's recoded variables to assign Medicaid and other insurance coverage.

3. Health Interview Surveys

We use data for individuals age 18 or younger who are neither the head nor the spouse of a head in the 1992–1996 Health Interview Surveys. We exclude observations with missing family income, Medicaid coverage, parental status, or birth month/year. We assign midpoint values to the HIS categorical annual family income variable, and we use information on the number of individuals in the family to assign approximate family poverty lines. We assign Medicaid coverage to individuals who report that they are covered by Medicaid or other public assistance health insurance programs. We assign overall coverage if an individual has Medicaid, private health insurance, or military coverage.

TABLE A1.—CHARACTERISTICS OF CHILDREN IN 1992–1993 SIPP, MARCH CPS, AND HIS

			HIS:	
	SIPP	March CPS	All	With Income
Percent aged 0–5 years	33.3	34.0	33.7	34.0
Percent born after 9/30/1983	49.1	—	50.7	51.2
Percent black	16.7	15.8	15.8	14.8
Percent Hispanic	13.8	11.6	13.0	12.8
Percent with single mother	24.4	24.4	16.1	16.1
Percent below poverty line	25.6	23.4	22.0	22.0
Percent 100%–200% pov. line	22.4	21.0	26.7	26.7
Percent on AFDC	11.0	13.2	—	—
Percent on Medicaid	18.0	20.3	17.3	17.1
Percent on Medicaid, not AFDC	7.0	7.5	—	—
Percent with health insurance	85.8	87.4	81.9	84.0
Number of observations	28,557	88,227	52,796	45,000

Notes: Sample includes individuals aged 0–18 in wave 1 of the 1992 and 1993 SIPP panels, the 1992 and 1993 March CPS, and the 1992 and 1993 Health Interview Surveys. SIPP sample excludes observations in Maine, Vermont, Iowa, North Dakota, South Dakota, Alaska, Idaho, Montana, and Wyoming. HIS sample excludes observations with missing birth date information. All means are weighted.