The Use of EPSDT and Other Health Care Services by Children Enrolled in Medicaid: The Impact of OBRA'89

NORMA I. GAVIN, E. KATHLEEN ADAMS,
ELICIA J. HERZ, et al.*

Research Triangle Institute; Emory University; The MEDSTAT Group

THE EARLY AND PERIODIC SCREENING, DIAGNOSIS and Treatment (EPSDT) program is an ambitious pediatric component of the Medicaid program. Established in 1967, EPSDT provides for the coverage of comprehensive, periodic evaluation of health, developmental, and nutritional status, as well as vision, hearing, and dental screening services, to all Medicaid-enrolled children from birth to 21 years of age. The program also provides Medicaid coverage of services necessary to correct health problems identified through the evaluation and screening services. The primary goal of the program is to prevent disease and detect correctable conditions early so that more serious health problems and more costly health care services can be avoided.

However, since its inception, the program's success in screening and treating eligible children has fallen short of expectations. These shortfalls are caused by a variety of factors—many of which relate to the health-care-seeking behavior of Medicaid children and their guardians and to the structure of the medical system they must access. Others

*Coauthors of the article are ANITA J. CHAWLA, MARILYN R. ELLWOOD, IAN T. HILL, BETH L. ZIMMERMAN, and JEFFREY WASSERMAN.

relate to program factors, such as inadequate provider participation, insufficient outreach, and variable coverage of both screening and treatment services across the states.

To increase EPSDT participation and to improve children's health status, Congress included several provisions in the Omnibus Budget Reconciliation Act of 1989 (OBRA'89) that address many of these problematic program factors. This report synthesizes the findings of a four-year study funded by the Health Care Financing Administration (HCFA) that investigated the impact of these provisions on children's health service use.

Previous Research

Studies of national survey data from the 1980s demonstrate that Medicaid coverage improved access to primary health care services among poor children who would otherwise be uninsured (Kasper 1987; Newacheck 1988; Newacheck and Halfon 1988; Rosenbach 1989; Short and Lefkowitz 1992; Marquis and Long 1996). However, studies also show that low-income children, regardless of insurance coverage, had lower health service use and less access to care than higher-income children (Kasper 1987; Newacheck 1988; Newacheck and Halfon 1988; Wood et al. 1990; Short and Lefkowitz 1992).

In addition, evidence suggests that the gains Medicaid achieved through providing access to primary and preventive care among children were beginning to erode by the latter half of the 1980s. In an analysis of data from HCFA's *Medicaid Statistical Reports* for the decade from 1979 to 1989, a time of rapidly growing medical costs, Cartland, McManus, and Flint (1993) found that per child recipient costs for physician services under Medicaid grew by only 1 percent each year and per recipient EPSDT costs actually declined by 1 percent each year. In most states in 1989, fewer than half of all eligible children had an EPSDT screening visit; in at least a dozen states, the percentage of eligible children screened was less than 20 percent and was as low as 7 percent in one state (U.S. Health Care Financing Administration 1993).

Low rates of EPSDT participation were accompanied by low rates of childhood immunizations. In their review of immunization coverage in three urban counties among two-year-olds continuously enrolled in the Tennessee Medicaid program from birth, Griffin et al. (1995) found that the proportion who were up to date in their basic series of childhood

immunizations peaked at 50 percent for those born in 1982 and 1983 and decreased to 44 percent for those born in 1989.

The failure of the EPSDT program to realize its full potential for increasing the use of preventive and curative services among Medicaid children was believed to be caused largely by system and program problems. In particular, the physician base was being eroded by the low reimbursement levels and the substantial administrative burden that the program imposed (McManus, Flint, and Kelly 1991; Physician Payment Review Commission 1991). In addition, the states' outreach activities to inform parents about their children's eligibility for Medicaid and EPSDT benefits and to educate them on the importance of screening visits and immunizations were viewed as inadequate.

Except for the impact of Medicaid fee increases, the effectiveness of states' efforts to improve Medicaid children's access to preventive and curative services has been largely unstudied. Several studies have found significant positive correlations between relative Medicaid fees and both Medicaid participation and caseloads among office-based physicians in general (Sloan, Mitchell, and Cromwell 1978; Hadley 1979; Held and Holahan 1985; Mitchell 1991; Adams 1994) and pediatricians in particular (Perloff, Kletke, and Neckerman 1986; Margolis et al. 1992). However, other studies have shown that much of the increase simply reflects a shift of patients from public sites (e.g., public health departments and community health clinics) to private physicians' offices (Long, Settle, and Stuart 1986; Wade 1992; Cohen and Cunningham 1993; Baker and Royalty 1997; Gruber, Adams, and Newhouse 1997). Studies also have found that higher Medicaid enrollment levels independently increase the extent of physicians' participation in Medicaid (Held and Holahan 1985; Mitchell 1991; Adams 1994; Perloff, Kletke, and Neckerman 1986). Furthermore, at least one study found a significant negative effect of administrative inefficiency on physician participation; Perloff, Kletke, and Neckerman (1986) found that physicians who experienced delays in payment were more likely to limit the extent of their participation.

However, few published studies exist on the effectiveness of other state activities designed to increase Medicaid children's access to care and use of preventive or curative services. Most notably, the effectiveness of innovative outreach and informing activities that have been implemented by the states has not been systematically reviewed. Two recent studies have found little or no impact on EPSDT participation among children of mail, phone, or face-to-face outreach efforts when their sole

purpose was to motivate parents to seek EPSDT visits for their children (Oda, Heilbron, and Taylor 1995; Selby-Harrington *et al.* 1995).

Legislative Background

Each year, from 1984 through 1990, Congress enacted legislation expanding both mandates and options for children's Medicaid eligibility (Gavin 1992). The new laws addressed both the financial and categorical eligibility requirements of the program. States are now required to separate the income thresholds for children's Medicaid eligibility from those used for the cash assistance programs and to cover all children meeting the financial requirements, regardless of family structure.

By 1990, states were required to cover all children born after September 30, 1983, in families with incomes below the federal poverty level (FPL) and children under six years of age in families with incomes up to 133 percent of the FPL. States could optionally cover pregnant women and infants in families with incomes up to 185 percent of the FPL and all children up to age 21 years (including those with both parents in the home) in families with incomes up to the state's Aid to Families with Dependent Children (AFDC) income eligibility level or, if the state has a medically needy program, up to the medically needy income limit.

In addition, Section 1902(r)2 of the Social Security Act¹ allows states to use more liberal income and resource criteria to determine Medicaid financial eligibility than those used for the AFDC program. Some states have used this section to raise the financial standards for Medicaid eligibility of children, which enables them to include older children born before September 30, 1983. For example, Vermont in 1992 used the 1902(r)2 provision to extend coverage for all children up to age 18 years with family incomes less than 225 percent of the FPL.

In addition, the legislative initiatives sought to broaden and strengthen the benefits that children receive through Medicaid. These initiatives addressed both preventive care and illness- and disability-related services. In particular, OBRA'89 required states to make screening services available to children, not just at periodic intervals but also whenever a child is suspected of having a physical, mental, or developmental prob-

¹This section was added to the Medicaid statute by the Medicare Catastrophic Coverage Act of 1988.

lem or a condition that requires an assessment, further diagnosis, or treatment. The law also required states to provide all medically necessary services that were eligible for federal financial reimbursement to children whose periodic or interperiodic screens reveal problems, even if the services are not otherwise covered under the state's Medicaid plan.

Furthermore, OBRA'89 codified additional regulations: a requirement that screening, vision, hearing, and dental services be provided at intervals that meet "reasonable standards of medical and dental practice"; a mandate that states develop distinct periodicity schedules for routine health, vision, hearing, and dental screens; a requirement that states screen all children aged one to five years and others at risk for lead poisoning; and a renewed emphasis on the inclusion of health education and anticipatory guidance screening visits.

OBRA'89 also addressed incentives for provider participation in Medicaid. States are generally required to set reimbursement rates for Medicaid-covered services at levels that ensure comparable service availability to that of the general population within the same geographic area; to guarantee compliance with the law, OBRA'89 codified this provision for obstetric and pediatric services. This provision of OBRA'89 is often referred to as the "equal access" provision. Furthermore, OBRA'89 allowed qualified practitioners who provide less than the full set of screening, diagnosis, and treatment services to participate in the EPSDT program. These amendments were intended to encourage a larger number of pediatricians and more specialists, like developmental psychologists, to participate in EPSDT.

In addition, OBRA'89 established federal authority to set state-specific performance standards for the EPSDT program. In response to this latter provision, the secretary of the Department of Health and Human Services (DHHS) set a goal of 80 percent participation in EPSDT among all eligible Medicaid children by fiscal year (FY) 1995. To accomplish this goal, states were expected to reduce the difference between their annual participation rate and the 80 percent goal by one-fifth each year from FY 1990 to FY 1995.

Objectives of the Study

We investigated the impact of the OBRA'89 provisions on the EPSDT programs and the health status, service use, and expenditures of Medicaid children in four states: California, Georgia, Michigan, and Ten-

nessee. These states were chosen for this study largely because of the ready availability of their Medicaid claims data in the Tape-to-Tape database.² Although the states are not necessarily representative of all state Medicaid programs, they are among the largest, both in terms of total recipients and total expenditures (Herz et al. 1994). In 1989 and 1992, these four states together accounted for about one-quarter of all Medicaid recipients and 17 to 18 percent of total Medicaid expenditures. California, with the largest state Medicaid program nationwide, accounted for the majority of these recipients (60 to 62 percent) and expenditures (57 percent).

In this study, we addressed numerous questions surrounding the changes made by the four states to their Medicaid programs in response to the OBRA'89 provisions relating to children and the impact of these changes on provider participation and children's health service use. In particular, we investigated the following questions:

- How did the four states change their eligibility requirements for children, and what impact did these changes have on the composition of enrolled children?
- How did the four states change incentives for provider participation, and what impact did these changes have on provider participation, Medicaid child caseloads per physician, and the provision of preventive care services to children?
- How did the provision of preventive care under Medicaid in general, and EPSDT screening services in particular, change in the four states, and what impact did these changes have on the percentage of children who received any preventive care and the percentage of children who were in compliance with national standards on preventive care for children?
- How did the four states change covered services for children in their Medicaid programs, and how did this affect the types of problems for which children were referred for further diagnosis and treatment and the number and types of services that children utilized?

²The Tape-to-Tape database includes all claims, enrollment, and provider data from the Medicaid Management Information Systems in these states from 1980 through 1992. The data were put into uniform format by the MEDSTAT Group under a series of contracts from HCFA.

Methodology

We conducted case studies of the four states to determine how they operate their EPSDT programs and how program policies changed as a result of the OBRA'89 legislation. In addition, we conducted pre-post analyses of provider participation in Medicaid and EPSDT and children's Medicaid utilization and expenditures based on claims data for 1989 (the year before OBRA'89 was adopted) and 1992 (the first year in which the OBRA'89 provisions were fully implemented).

The case studies were used to gather information not available through the claims data systems, as well as to inform the claims data analysis. They included document reviews and site visits to each of the study states. The site visits lasted four to five days and were conducted by two to three study team members. On the first day of each visit, the team met with key state officials responsible for administering various aspects of the EPSDT program, including officials of the Medicaid, Maternal and Child Health, and welfare programs. To learn how operations vary across local service delivery systems, the remaining days of the site visits were spent visiting different localities, including large urban cities, medium-sized towns, and rural communities. During these visits, meetings were held with local officials: city-county health administrators, federally funded Community Health Center directors, physicians, nurses, and social services staff.

To obtain consistent information across states, we used two structured protocols to conduct the interviews: the first targeted state officials; the second, local officials and providers. Several topics were explored during the interviews:

1. informational, enrollment, and outreach activities
2. provider participation in EPSDT, including the delivery of preventive care outside of EPSDT
3. policies regarding EPSDT screens, including periodicity schedules, lead screening, and immunizations
4. diagnostic and treatment services

For the claims data analysis, we focused on Medicaid enrollees under 21 years of age who were not enrolled either in a Medicaid capitated program or in Medicare and who had not resided in a long-term-care or

other medical institution during the study year. The study subjects were children enrolled under all eligibility categories: AFDC recipients, Supplemental Security Income (SSI) recipients, foster care children, and children enrolled under the poverty-related expansions.

We conducted two distinct analyses with the claims data: in one, the providers serving Medicaid children were the units of analysis; in the other, the children were the units of analysis.

Provider Analysis

We present descriptive data on the levels and growth in provider fees; the number of physicians, free-standing clinics, hospital outpatient departments, dentists, and other providers serving Medicaid children; the number of Medicaid child enrollees per provider; average Medicaid case-loads (i.e., the average number of children ever seen per physician, clinic, or hospital outpatient department); average Medicaid payments per provider; and a measure of service concentration among participating physicians. These data are shown separately for providers billing for any Medicaid-covered services, any Medicaid-covered preventive care services, and any EPSDT screening services.

We used a Paasche weighted price index to measure Medicaid fees for a selected set of child health services relative to private fees for the same set of services. The Paasche price index for the set of $i = 1, \dots, N$ services was computed as follows:

$$\text{Index} = \frac{1}{\sum_i W_i * \frac{\text{Private fee}_i}{\text{Medicaid fee}_i}}$$

where

$$W_i = \frac{\text{Medicaid expenditures}_i}{\sum_i \text{Medicaid expenditures}_i}$$

The Medicaid fees and weights came from the state Medicaid claims data files; the private fees were obtained from the MEDSTAT MarketScan claims data for the same states. Separate indexes were computed for a representative set of services and for a subset of preventive care services. The services reflected those typically billed under Medicaid

and included procedures for which at least 20 claims were found in both the MarketScan and Medicaid claims data files for both 1989 and 1992 (see Appendix A of Adams, Graver, and Kennedy [1996] for a list of these procedures).

To determine whether children's health care services are concentrated among a few high-volume practices, we computed county-level Herfindahl Indexes (HIs) for office-based physicians serving children, using the proportion of all Medicaid claims for the study children in a county that were paid to individual physicians (Adams, Chawla, and Graver 1996). The HI for the $j = 1, \dots, K$ physicians in county i is computed as follows:

$$HI_i = \sum_j P_{ij}^2$$

where

$$P_{ij} = \frac{\text{No. of claims}_{ij}}{\sum_j \text{No. of claims}_{ij}}$$

The index values can range from 0.01 (widely distributed) to 1.00 (totally concentrated in a single practice); thus, the more concentrated the Medicaid service provision in a county, the higher the value of the HI. These indexes have traditionally been used by economists to measure the concentration of markets as one indicator of the level of competition. In the health services field, they previously had been applied to hospital markets (Phibbs and Robinson 1993), but, to our knowledge, they had not been applied to the market for physician services. Below we present the average HI for counties in each study state in 1989 and 1992.

In addition, we ran multivariate logistic equations on the decisions to provide preventive care and EPSDT services among physicians serving Medicaid children and a log-linear ordinary least squares (OLS) regression on the size of participating physicians' Medicaid child caseloads (Adams, Graver, and Kennedy 1996). For all three regressions, we pooled data across the four study states and two analysis years, and we entered a number of variables to control for changes in the demand and supply for physicians' services and in the cost of providing these services. One demand factor entered was the percentage of children in the county

enrolled in Medicaid. In addition, to estimate the impact of the states' efforts to increase physicians' caseloads and their provision of EPSDT and other preventive services, we entered the index of Medicaid to private fees and a dichotomous variable for 1992, plus interaction terms for the 1992 variable and dichotomous indicators for three of the states, using Tennessee as the reference state (see Adams, Graver, and Kennedy [1996] for the actual estimated coefficients).

Thus, the logistic and OLS equations were of the form:

$$Y_{it} = f(\beta_0 + \ln(\text{Fee}_{it})\beta_{\text{fee}} + 1992_i\beta_{92} + 1992_i*\text{State}_{it}\beta_{92*\text{State}} + X_{it}\beta_X + \epsilon_{it})$$

To determine the impact of relative fee changes in the equations for the probability of providing any preventive care and any EPSDT screens, we computed the odds ratio by taking the exponent of the product of the percentage change in the respective Medicaid-to-private-fee index and the coefficient-of-the-fee variable:

$$\text{Odds}(\text{relative fee change})_{\text{State}} = \exp((\text{Fee}_{92*\text{State}} - \text{Fee}_{89*\text{State}})\beta_{\text{fee}})$$

For the impact of other program changes, the odds ratio was computed by taking the exponent of the sum of the coefficients for the year variable and the interaction term for the year and state:

$$\text{Odds}(\text{other changes})_{\text{State}} = \exp(\beta_{92} + \beta_{92*\text{State}})$$

To compute the percentage changes in Medicaid child caseloads per physician resulting from fee and other changes in the OLS equation, we took the actual values rather than the exponents of the product and sum described above:

$$\text{Relative fee impact} = (\text{Fee}_{92*\text{State}} - \text{Fee}_{89*\text{State}})\beta_{\text{fee}}$$

$$\text{Impact of other changes} = \beta_{92} + \beta_{92*\text{State}}$$

Where the coefficients were not significant ($P > 0.01$), they were set to zero. The net impacts of state activities were computed by multiplying the odds of the fee and other program changes in the logistic equations and summing the percentage changes in the OLS equations.

Children's Analysis

We investigated the impact of OBRA'89 on several preventive and curative health care utilization measures for Medicaid children in both

descriptive and multivariate analyses. These measures included EPSDT and other well-child visits, childhood immunizations, diagnostic and treatment visits, dental visits, outpatient prescription drug claims, inpatient stays, and other health care services. The descriptive analyses were performed on the universe of children meeting the study criteria. Because of the large numbers of observations, even very small changes over time would be statistically significant. Therefore, instead of discussing changes in terms of statistical significance, we focus on the relevance or meaningfulness of the changes to their health and economic outcomes.

To determine whether the increase in the number of children enrolled in Medicaid affected the levels of health service use, we separately entered into multivariate equations a county-level ratio of the number of participating primary care physicians serving children to the number of child enrollees, a 1992 indicator variable, and a variable for the interaction between these two variables. We also controlled for the child's demographic characteristics; the child's Medicaid enrollment category and duration; whether the child lived in an urban, suburban, or rural county; and other county-level provider supply variables (e.g., the number of participating clinics per 1,000 population and whether the county is identified as a physician shortage area).

We estimated logistic equations for the probability that children had any care during the year by type of service (e.g., well-child visits) and OLS regressions on the logarithm of the number of these services children had during the year conditional on having had at least one such service (see Herz et al. [1996] for the actual estimated coefficients). The well-child visit analysis was restricted to children under three years of age, and the inpatient care analysis was restricted to children between the ages of one and twelve years of age; all other analyses included children from birth through twenty years of age. To reduce computer time and costs, we took a 10 percent random sample of children and ran separate analyses for each state.

Thus, the logistic and OLS equations were of the form:

$$Y_{it} = f(\beta_0 + \ln(\text{Docs/Children}_{it})\beta_{D/C} + 1992_t\beta_{92} + 1992_t*\text{Docs/Children}_{it}\beta_{92*D/C} + X_{it}\beta_X + \epsilon_{it})$$

To measure the impact of the change in the physician-child ratio and other changes in the logistic equations, we computed the following odds ratios:

$$\begin{aligned} \text{Odds}(\text{Docs/Children})_{\text{State}} &= \exp((\text{Docs/Children}_{92*\text{State}} \\ &\quad - \text{Docs/Children}_{89*\text{State}}) \\ &\quad \times (\beta_{D/C*\text{State}} + \beta_{D/C*92*\text{State}})) \\ \text{Odds}(\text{other changes})_{\text{State}} &= \exp(\beta_{92*\text{State}}) \end{aligned}$$

To measure the impact of the physician–child ratio and other changes in the OLS equations, we computed the change in the number of visits as follows:

$$\begin{aligned} \text{Physician/child impact} &= (\text{Docs/Children}_{92*\text{State}} \\ &\quad - \text{Docs/Children}_{89*\text{State}}) \\ &\quad \times (\beta_{D/C*\text{State}} + \beta_{D/C*92*\text{State}}) \\ \text{Impact of other changes} &= \beta_{92*\text{State}} \end{aligned}$$

Where the coefficients were not significant ($P > 0.01$), they were set to zero.

Our findings on each of the key study questions listed above are summarized in turn below, beginning with a description of changes in the size and composition of the Medicaid child population over the study period.

Medicaid Eligibility

In the four study states, the study population grew from 3.3 million children in 1989 to 4.6 million children in 1992, which meant that it constituted an increasing majority of Medicaid recipients. Among the four states, it represented a range of 53 to 59 percent of the Medicaid population in 1989 and 55 to 60 percent in 1992. As shown in table 1, Georgia experienced the greatest increase in this Medicaid child population between 1989 and 1992 (66 percent), followed by Tennessee (47 percent) and California (42 percent). In Michigan, the noninstitutionalized child population with Medicaid fee-for-service coverage remained relatively stable with a growth rate of only 4 percent.

One reason why Michigan's rate of increase in this population is so low is its exclusion of children in Medicaid capitated plans. However, the inclusion of these children only increases the growth rate to 13 percent—still well below the rates in the other three study states.

TABLE 1
Number of Medicaid Enrollees under 21 Years of Age in Study Population

State	Number of Enrollees		Percentage change 1989-92
	1989	1992	
California	2,065,719	2,923,913	41.5
Georgia	358,838	597,245	66.4
Michigan	598,296	624,662	4.4
Tennessee	312,570	458,588	46.7

All four study states changed their eligibility requirements for children in response to the federal legislation. These changes, the 1990 Supreme Court decision in the *Sullivan v. Zebley* case, and a large influx of undocumented aliens in California resulted in shifts in the composition of the Medicaid child population, which in turn had significant effects on children's health care needs and service use.

AFDC Income Standards

The study states' pre-expansion financial eligibility standards ranged from the highest to among the lowest in the nation. California had the highest AFDC income threshold in the continental United States in 1989 and was second only to Vermont in 1992; California's medically needy income threshold was the highest among the states and territories in both years. However, the income standards in California were unchanged from 1989 to 1992. Therefore, the state's AFDC income threshold for a family of three expressed as a percentage of the FPL fell from 85 percent to 72 percent over the study period (table 2). Similarly, the medically needy income threshold for a family of three in California fell from 113 percent of the FPL in 1989 to 97 percent of the FPL in 1992.

The income standards were lower in the other three states. Michigan, which had a poor economy and experienced a state budget crisis in 1991, actually reduced its income thresholds for the AFDC program. Georgia increased its AFDC and medically needy income thresholds a slight 2 percent from 1989 to 1992, and Tennessee increased its AFDC income threshold by 10 percent but made no changes in its medically needy income threshold. Nevertheless, none of the Medicaid eligibility thresholds in the four states kept pace with the increase in the FPL; the

TABLE 2
Selected Medicaid Income Eligibility Thresholds as a Percentage of the Federal Poverty Level

Income eligibility category	Income threshold as a percent of federal poverty level			
	California	Georgia	Michigan	Tennessee
1989				
AFDC	85	50	70	47
Medically needy	113	45	67	30
Pregnant women and infants	185	100	185	100
Children up to 3 years	—	100	100	100
Children aged 3 to 6 years	—	—	—	100
1992				
AFDC	72	44	57	44
Medically needy	97	39	59	26
Pregnant women and infants	185	133	185	185
Children up to 6 years	133	133	133	133
Children aged 6-9 years	100	100	100	100

AFDC and medically needy income thresholds, shown as a percentage of the FPL in table 2, declined from 1989 to 1992 in all four states.

Poverty-Related Expansions

The implementation of the poverty-related expansions varied in timing and extent among the study states. Tennessee was one of the first states to take advantage of the expansion coverage option for pregnant women, infants, and young children. On the other hand, because its income thresholds for Medicaid were already near the poverty level, California did not move as quickly as other states to exercise the expansion options for children.

By 1992, all four states covered children up to age six years who were living below 133 percent of the FPL, and all other children born after September 30, 1983, in families with incomes up to 100 percent of the FPL, as mandated by OBRA'90. In addition, all study states, except Georgia, covered infants in families with incomes up to 185 percent of the FPL in 1992; Georgia covered infants whose families were living below 133 percent of the FPL. None of the four study states was using 1902(r)2 to expand eligibility in 1992. However, Georgia began to do so in July 1993 to cover children over six years of age in families with incomes up to 100 percent of the FPL.

These changes in eligibility criteria altered the composition of the Medicaid child population (table 3). Medicaid children were younger on average: 47 to 53 percent of Medicaid children in the four study states were under age seven in 1992, compared with a range of 43 to 46 percent in 1989 (Herz et al. 1996b). In three of the study states, a higher percentage of children enrolled in Medicaid were white in 1992 compared to 1989; only California experienced a decrease in the percentage of children classified as white during the study period. We also found that greater percentages of Medicaid children lived in inner-city counties of urban areas in 1992 compared to 1989.

SSI Disability Standards

A greater proportion of the child population was disabled in 1992 than in 1989; the number of children covered by Medicaid because they were receiving SSI payments rose 50 to 79 percent in the four study states.

TABLE 3
Selected Characteristics of Medicaid Children

Characteristics of Medicaid children	Percentage of Medicaid children			
	California	Georgia	Michigan	Tennessee
Aged under 7 years				
1989	46.0	46.6	43.3	46.2
1992	46.8	52.8	47.3	49.4
White				
1989	34.7	29.2	59.1	57.9
1992	28.6	36.7	63.7	63.5
Residing in inner cities				
1989	60.3	20.0	28.1	— ^a
1992	73.0	27.9	33.8	19.0
Disabled				
1989	1.8	3.9	2.1	4.0
1992	2.0	4.1	3.7	4.5

^aTennessee had no counties designated as inner urban areas of large metropolitan areas in 1989; by 1992, Shelby County was so designated.

These increases are at least partly a result of a Supreme Court decision in 1990³ that found the Social Security Administration (SSA) had been using a harsher disability test for children applying to the SSI program than Congress had intended; the Court ordered SSA to assess each child against age-appropriate functional standards. Although SSI recipients comprise 2 to 4 percent of the Medicaid child population, they account for a disproportionately large share of Medicaid expenditures.

The 1996 welfare legislation again narrowed the definition of childhood disability for determining eligibility for SSI benefits. This resulted in the loss of Medicaid coverage to approximately 20,000 disabled children who did not qualify under other Medicaid eligibility rules. The Balanced Budget Act of 1997 restored Medicaid coverage to these children by requiring states to extend Medicaid coverage to all disabled children who were receiving SSI benefits as of the date of enactment of the welfare law (August 22, 1996) and who would continue to be eligible for SSI were it not for the more restrictive disability definition (Schneider 1997).

³*Sullivan vs. Zebley*, February 20.

Undocumented Aliens in California

Finally, almost a quarter of the growth in Medicaid child enrollees in California (201,298 children) was the result of enrollment of undocumented aliens; undocumented aliens accounted for 3.5 percent of the Medicaid child population in California in 1989 and 9 percent in 1992. Medicaid coverage for these children was limited to broadly defined emergency services, including emergency-room visits, prescription drugs, inpatient care, follow-up visits, and any other services necessary to alleviate a medical condition that poses an immediate health threat or would seriously impair ongoing health.

Child Health Providers

Each of the study states undertook initiatives to increase providers' willingness to serve children under the Medicaid and EPSDT programs during the early 1990s. These efforts successfully increased provider participation and caseloads. However, the increased pool of providers did not meet the higher level of demand resulting from the expanded enrollment.

Provider-Related Program Changes

Fee Schedules. Perhaps the most important stipulation in the OBRA'89 legislation to affect providers was the equal access provision, which required states to set payment rates to providers at levels that were sufficient to ensure that the availability of obstetric and pediatric services to Medicaid recipients was comparable to their availability to the general population within the same geographic area. All of the study states were able to convince HCFA that they met this requirement by providing data on physician participation.

However, when we compared Medicaid fees for a selected set of services to fees for the same services paid to physicians for privately insured children in the same state, we found Medicaid fees to be significantly lower than private fees. In 1989, the index of Medicaid-to-private-payment levels for the set of representative services ranged from a low of 0.35 in California to a high of 0.62 in Georgia (table 4). The index for the subset of preventive care services had a narrower range—from a low

TABLE 4
Index of Medicaid-to-Private Payment Levels by Type of Service

State	Representative services		Preventive care services	
	1989	1992	1989	1992
California	0.35	0.37	0.47	0.45
Georgia	0.62	0.57	0.45	0.40
Michigan	0.45	0.45	0.48	0.56
Tennessee	0.54	0.57	0.51	0.48

of 0.45 in Georgia to a high of 0.51 in Tennessee—but it presented a similar picture.

Only Michigan and Tennessee actually raised Medicaid fees for medical providers during the study period. The weighted average increase in Medicaid fees for the representative set of services was 23 percent in Michigan and 10 percent in Tennessee; for the set of preventive care services, the increases were 50 percent in Michigan and 9 percent in Tennessee. Nevertheless, the Medicaid-to-private-fee index for the representative set of services remained constant in Michigan, where fee increases in the private sector matched the Medicaid fee increases. The Medicaid-to-private-fee index improved slightly (6 percent) in both Tennessee and California and fell somewhat (8 percent) in Georgia from 1989 to 1992 (Adams, Graver, and Kennedy 1996). The improvement in California resulted from declining private fees. Michigan was the only state in our study in which the Medicaid-to-private-fee index for preventive care services increased (17 percent) from 1989 to 1992; it declined in the three other states (4 percent in California, 6 percent in Tennessee, and 11 percent in Georgia).

Other Changes. The study states implemented several other notable strategies to increase the base of providers participating in EPSDT after the passage of OBRA'89 (Adams, Graver, and Kennedy 1996b; Hill and Zimmerman 1995a). California established toll-free telephone lines to answer providers' questions regarding claims and eligibility status and dispatched fiscal agents to train providers' billing personnel. Georgia distributed a recruitment video through the local chapter of the American Academy of Pediatrics (AAP), actively recruited schools as EPSDT providers, trained providers in billing procedures, and reduced providers' administrative burden by eliminating referral forms and instituting

electronic billing statewide. Michigan implemented a two-tiered EPSDT billing system in 1990 (described in more detail below). Tennessee hired a pediatrician in late 1992 to develop strategies to recruit and retain physicians.

Physician Participation and Caseloads

Physician Participation. The number of physicians serving Medicaid children grew significantly from 1989 to 1992 in all four study states. The word “physicians” here refers to those in solo and group practices who had ever billed under their own identity. Some physicians were not individually identifiable because their billing agent was always a free-standing clinic, hospital outpatient department, or other institution. The experience of these physicians is reflected in the figures for the institutional providers under which they billed.

The percentage growth in the number of physicians serving Medicaid children was 43 percent in Georgia, 20 percent in Tennessee, and 17 percent in both California and Michigan (Adams, Chawla, and Graver 1996). However, the growth in the number of participating physicians serving children generally did not keep pace with the growth in the Medicaid child population in the study states. Based on county-level estimates, the number of child enrollees per participating physician serving children rose from 1989 to 1992 by 21 percent in California, 20 percent in Georgia, and, most dramatically, by 61 percent in Tennessee, but it fell by 19 percent in Michigan (table 5).

The percentage of physicians serving children who provided any preventive care to children in 1989 and 1992 ranged from a low of 9 percent in Georgia to a high of 30 percent in Michigan; even smaller percentages of physicians serving children provided EPSDT services in the four study states (Adams, Chawla, and Graver 1996). The percentage of physicians serving children who provided any preventive care to children calculated from Georgia claims data represents the percentage who were paid for these services through EPSDT; Georgia does not pay physicians for preventive care visits outside of EPSDT. However, state officials and providers contend that unreimbursed preventive care outside of EPSDT was provided in Georgia during the study period.

For the most part, Georgia and Michigan restricted EPSDT providers to public health departments in 1989 and, consequently, had very low

TABLE 5
Average County-Level Ratios of the Number of Child Medicaid Enrollees to the Number of Medicaid Participating Physicians among Counties with at Least One Participating Physician

State	Children per physician serving Medicaid children		Children per physician providing preventive care to Medicaid children ^a		Children per EPSDT physician	
	1989	1992	1989	1992	1989	1992
California	424	513	382	373	1,015	1,441
Georgia	830	994	839	976	2,665	2,123
Michigan	678	569	237	233	11,518	377
Tennessee	645	954	325	455	1,386	2,101

^aCounties with no preventive care physicians were left out of these calculations, making it appear that more physicians provided preventive care than any care at all.

numbers of EPSDT participating physicians. The changes in state policies resulting from OBRA'89 led to significant increases in the number of participating EPSDT providers in Georgia (from 91 to 247 providers) and in Michigan (from 43 to 2,502 providers) and lower ratios of child enrollees per participating EPSDT physician (table 5). The number of EPSDT providers in California and Tennessee increased at lower rates, by 11 percent and 29 percent, respectively. As a result, the ratios of child enrollees to participating EPSDT providers increased in those states.

In the multivariate analyses, we found significant, positive effects of Medicaid fees on the probability that the providers provided preventive care in general and EPSDT screens in particular to Medicaid children. We also found significant, positive effects of other state activities between 1989 and 1992 for both dependent variables in all states, except for EPSDT services in Tennessee. The estimated effects of the relative fee changes and other state activities are shown in table 6. Recall that the Medicaid-to-private-fee index for preventive services, used in these equations, fell in all states except Michigan from 1989 to 1992.

Thus, we found that, holding constant various demand and supply factors, the net effect of program changes from 1989 to 1992 on the probability of Medicaid participating physicians providing preventive care was positive in all states, except Georgia (Adams, Graver, and Kennedy 1996). In Georgia, the effect of the fall in relative prices was

TABLE 6
Impact of Medicaid Fees and Other Program Changes on the Probability of a Physician
Providing Preventive Care and EPSDT Screens and on the Number
of Children Served per Physician

State	Probability of a physician providing preventive care (odds ratio)			Probability of a physician providing EPSDT screens (odds ratio)			Number of Medicaid children served per physician (percentage change)		
	Fee ^a	Other	Net	Fee ^a	Other	Net	Fee ^b	Other	Net
California	0.92	1.16	1.07	0.76	0.72	0.55	4.0	14.5	18.5
Georgia	0.81	1.42	1.00	0.49	2.51	1.23	-5.6	57.9	52.3
Michigan	1.37	0.89	1.22	2.92	13.62	39.77	—	14.5	14.5
Tennessee	0.90	1.42	1.28	0.68	—	0.68	3.9	14.5	18.4

^aBased on the percentage changes in the Medicaid-to-private-fee index for a subset of preventive care services.

^bBased on the percentage changes in the Medicaid-to-private-fee index for a set of representative services.

exactly offset by the positive effect of other program changes (table 6). The net impact of relative fee and other program changes from 1989 to 1992 on the probability of participating physicians providing EPSDT screens was large and positive in Michigan, small and positive in Georgia, and negative in the other two states.

The variable for the percentage of children covered by Medicaid in the county also had a significant, positive coefficient in the multivariate logistic equations, suggesting that the enrollment increases described above had an independent, positive impact on the probability of physicians providing any preventive care and any EPSDT screening services.

Caseloads. The average Medicaid child caseload and the mean amount paid per physician by Medicaid for children's health care services increased in all four states and for all specialties from 1989 to 1992 (Adams, Chawla, and Graver 1996). The largest increases in pediatricians' Medicaid practice volume occurred in Georgia: the average number of Medicaid child patients per pediatrician increased 87 percent and the average Medicaid amount paid per pediatrician doubled (table 7). Holding constant various demand and supply factors in the multivariate analysis, we found that program changes resulted in significant, positive net effects on participating physicians' Medicaid child caseloads in all study states, ranging from a 14.5 percent increase in Michigan to a 52.3 percent increase in Georgia (table 6). Enrollment increases also had an independent, positive impact on participating physicians' caseloads of Medicaid children.

We found no evidence of a marked concentration of service provision among a few high-volume practices for children's services overall

TABLE 7
Average Medicaid Child Caseloads and Average Total Medicaid Payments
for Children per Participating Pediatrician Practice

State	Average Medicaid child caseload per practice		Average total Medicaid payments per practice (\$)	
	1989	1992	1989	1992
California	202	239	23,076	28,922
Georgia	276	515	33,225	67,207
Michigan	329	350	20,705	29,418
Tennessee	279	422	28,325	49,256

TABLE 8
Herfindahl Indexes for Office-Based Physicians Serving Medicaid Children

State	All services		Preventive care		EPSDT services	
	1989	1992	1989	1992	1989	1992
California	0.13	0.11	0.24	0.25	0.27	0.27
Georgia	0.34	0.29	0.70	0.66	0.79	0.76
Michigan	0.13	0.12	0.27	0.27	0.78	0.45
Tennessee	0.28	0.29	0.57	0.53	0.72	0.66

(table 8). In 1989, the HI for all children's services ranged from a low of 0.13 in California and Michigan to 0.34 in Georgia. In 1992, service concentration lessened even more; the HI for all children's services actually dropped in all states, except Tennessee, and ranged from a low of 0.11 in California to a high of 0.29 in Georgia and Tennessee. The lower HI values for California and Michigan are related to the greater supply of physicians in these states, which allowed Medicaid enrollees to be spread across a larger number of providers.

In all study states, service provision was more concentrated in the more narrowly defined services. This was most pronounced for any preventive care in Georgia and Tennessee (table 8). The provision of EPSDT services was highly concentrated in Georgia, Michigan, and Tennessee in 1989. The concentration of EPSDT services remained high in Georgia and Tennessee in 1992, whereas in Michigan the HI for EPSDT services declined from 0.78 to 0.45.

Institutional Provider Participation and Caseloads

The numbers of free-standing clinics, hospital outpatient departments, and other providers serving children also increased in all four study states from 1989 to 1992 (table 9). Free-standing clinics constituted the other major source of ambulatory care for Medicaid children in all study states and were predominantly the sites of preventive care visits for Medicaid children in Georgia and Michigan in both 1989 and 1992. These clinics include public health departments, rural and community health centers, other federally qualified health centers (FQHCs), and school-based clinics. The average Medicaid child caseload and total Med-

TABLE 9
Number of Institutional Providers Serving Children by Type of Institution

State	Free-standing clinic		Hospital outpatient department		Other providers	
	1989	1992	1989	1992	1989	1992
California	1,445	2,612	2,547	3,614	5,003	6,465
Georgia	261	458	161	164	952	1,130
Michigan	705	1,060	181	192	968	1,210
Tennessee	754	925	138	148	584	756

icaid payments for children per participating clinic in 1989 and 1992 are shown in table 10.

Only in Georgia did clinics have higher average Medicaid child caseloads per clinic compared with the caseloads per practice among office-based pediatricians. However, Medicaid child caseloads per participating clinic increased significantly from 1989 to 1992 in all study states, except Michigan. Despite the decline in the average Medicaid child caseload, average Medicaid payments for children to clinics rose 85 percent from 1989 to 1992 in Michigan, substantially more than the increases in the average payment to pediatricians in Michigan (42 percent) and to clinics in the other three study states: 53 percent in California, 58 percent in Georgia, and 62 percent in Tennessee.

TABLE 10
Average Medicaid Child Caseloads and Average Total Medicaid Payments for Children per Participating Clinics

State	Average Medicaid child caseload per clinic		Average total Medicaid payments per clinic (\$)	
	1989	1992	1989	1992
California	154	233	28,753	43,982
Georgia	480	598	35,218	55,479
Michigan	295	239	23,654	43,855
Tennessee	200	296	24,982	40,482

Dentist Participation and Caseloads

In contrast to the significantly higher numbers of medical providers serving Medicaid children in 1992 compared to 1989, the number of dental providers serving Medicaid children increased only modestly in three of the study states and actually declined in the fourth (Adams, Chawla, and Graver 1996). The number of dentists serving Medicaid children increased by 2 to 3 percent in Georgia and Tennessee and by a larger 9 percent in California, but declined by 10 percent in Michigan.

The modest growth in the numbers of dental providers serving Medicaid children, combined with the large increases in the number of Medicaid child enrollees from 1989 to 1992, led to substantial increases in the ratios of child enrollees to participating dental providers, the average Medicaid child caseloads per participating dental provider, and the average total Medicaid payments for children per participating dental provider (table 11). Despite the decline in the number of dental providers serving Medicaid children, the smallest increases in these figures occurred in Michigan, which also had the smallest increase in children covered by Medicaid from 1989 to 1992.

TABLE 11
Average County-Level Ratios of the Number of Child Medicaid Enrollees
to the Number of Participating Dentists, Average Medicaid Child
Caseloads, and Average Total Medicaid Payments
for Children among Participating Dentists

State	Child enrollees per dental provider		Average caseload ^a		Average total payments (\$) ^a	
	1989	1992	1989	1992	1989	1992
California	487	837	77	109	6,636	17,006
Georgia	481	793	117	189	13,482	23,467
Michigan	409	468	86	101	5,989	7,707
Tennessee	427	640	79	129	9,887	15,994

^aAverage caseloads and total payments are for dentists billing individually. Data on dental clinics are not included in these figures but are shown in Adams, Chawla, and Graver (1996).

Preventive Care

The study states worked hard to increase the use of preventive care services among Medicaid children but were only moderately successful by 1992.

Program Changes

The 80 percent EPSDT participation target set by the secretary of DHHS did not carry with it any specific guidance on how states should change the way they administer their EPSDT program. Many states responded by increasing their EPSDT informing and outreach efforts. Others changed periodicity schedules or the types of preventive care visits that qualified as EPSDT visits.

Informing and Outreach. EPSDT informing and outreach activities are often limited to new enrollees or targeted to subsets of the enrolled child population. Families with children are initially told about EPSDT during the Medicaid enrollment process. Unfortunately, eligibility interviews can take several hours and often include assessments of eligibility, not only for Medicaid but also for AFDC, Food Stamps, and other related programs. As a result, EPSDT informing typically receives very little emphasis during the overall eligibility process. In Georgia, Michigan, and Tennessee, all eligible children were targeted for additional contact, although resource limitations required health departments to focus on infants and young children. In California, additional outreach was limited to families who expressed an interest in the program during the eligibility interview.

Although variations existed across the study states, outreach strategies typically consisted of sending letters and/or placing phone calls to families to inform them of the importance of EPSDT screening visits and to offer assistance with finding providers and arranging transportation. In only a limited number of sites were resources reported to be sufficient to allow for routine home visits, although public health officials across the study states recognized home visits as the most effective means of engaging families.

In response to the EPSDT participation target, states were rethinking how and by whom outreach services should be delivered. For example, in Michigan, the Medicaid agency began distributing monthly outreach

reports to managed care providers under contract with the state, while also diverting a portion of its outreach budget from the local health departments to health maintenance organizations (HMOs) to support HMO-based outreach activities. At the time of the site visits, the Medicaid agencies in both Georgia and Michigan were experimenting with contracting out portions of the EPSDT outreach function to private firms.

EPSDT Periodicity Schedules. A central feature of the EPSDT program is the provision of comprehensive, well-child or screening visits at appropriate age-based intervals. The periodicity schedules for screening visits in effect in three of the study states in 1989 differed from the well-child visit schedule recommended by the AAP; only Georgia had adopted the AAP schedule for its EPSDT program (table 12).

In 1989, Michigan's recommended schedule listed many fewer visits for children under seven years of age than did those of the other states or of the AAP. The AAP recommended that children have nine well-child visits by their second birthday, an annual visit through age six, and

TABLE 12
Number of Recommended Well-Child Visits According to the AAP
Periodicity Schedule and the State EPSDT Screening Schedules

Age at visit	Number of visits recommended				
	AAP	California	Georgia	Michigan	Tennessee
1989					
Birth to 12 months	6	6	6	2-3	6
1-2 years	3	3	3	1	3
3-5 years	3	2	3	1	3
6-8 years	2	1	2	1	2
9-20 years	6	3	6	6	4
Total	20	15	20	11-12	18
1992					
Birth to 12 months	6	6	6	6	6
1-2 years	3	3	3	3	3
3-5 years	3	2	3	3	3
6-8 years	2	1	2	2	2
9-20 years	6	3	6	6	4
Total	20	15	20	20	18

one visit every other year after that through age twenty. Michigan recommended only three EPSDT screening visits by the child's second birthday and one visit every other year from ages two through twenty. By 1992, Michigan had increased the number of recommended screening visits to comply with the AAP standards.

Neither California nor Tennessee increased the number of recommended screening visits during childhood. However, California developed a distinct periodicity schedule for dental services to complement those already in place for general health, vision, and hearing screens.

Preventive Care Outside of EPSDT. Although the 80 percent EPSDT target emphasized the importance of EPSDT screens, it failed to acknowledge the fact that, in many states, Medicaid children receive preventive care outside of EPSDT in the "shadow" EPSDT program. All four study states had shadow EPSDT programs to varying degrees.

Only Michigan responded to the target EPSDT participation rate by officially recognizing the shadow program. In September 1990, Michigan opened the doors of its EPSDT program to all private physicians by instituting a two-tiered system. Under the new arrangements, screening visits provided by certified EPSDT providers were counted as "comprehensive" EPSDT screening visits, whereas well-child examinations provided by other Medicaid participating physicians were classified as "basic" EPSDT screening visits. In addition, to encourage providers to obtain EPSDT certification, the Michigan Medicaid program set higher reimbursement levels for "comprehensive" screening visits than for "basic" screening visits. As a result, the percentage of all preventive care visits received outside of EPSDT was greatly reduced.

EPSDT Participation and Overall Preventive Care Visit Rates

We found that, through the EPSDT program in 1989, the four study states were reaching about 40 percent of Medicaid children expected to have well-child visits—half of the 1995 target rate (Herz et al. 1994). The results improved somewhat when we considered both EPSDT screening visits and other well-child visits paid through the Medicaid program. Nevertheless, only half, or fewer, of the Medicaid children who were expected to have visits had received well-child care through Med-

icaid, and only 30 to 46 percent of all recommended visits were made (table 13).

In addition, despite the legislated service enhancements and the focus on screening visits, the preventive care rates in California were unchanged from 1989 to 1992, and, in the other three states, the percentage of children who had any preventive care visits increased by only a modest 2 to 4 percentage points; the percentage of recommended well-child visits that children had increased by only 6 to 13 percentage points (Herz, Sredl, and Albers 1996). The lack of improvements in preventive care use among Medicaid children in California may be traced at least partly to the large increase in Medi-Cal coverage of children of undocumented aliens, who were eligible for only a limited set of services.

In the multivariate analyses, we found that the deterioration in the ratio of participating primary care physicians to Medicaid child enrollees had a significant, negative impact on the probability of any well-child visits among Medicaid children under three only in California (table 14) and a significant, but small, negative effect on the number of visits made by Medicaid children under three only in California and Tennessee (Herz et al. 1996). Thus, although the failure of the medical system to adjust quickly to absorb the increase in demand was a sig-

TABLE 13
Preventive Care Participation and Visit Rates Based
on All Medicaid-Paid, Well-Child Visits and the
AAP Periodicity Schedule

State	Participation rates ^{a,c}		Visit rates ^{b,c}	
	1989	1992	1989	1992
California	47	46	44	44
Georgia	41	43	30	36
Michigan	51	54	46	59
Tennessee	41	45	38	45

^aParticipation rates are the percentages of children expected to have well-child visits who actually had visits.

^bVisit rates are the percentages of visits recommended for the child population that were actually made.

^cThese rates have been adjusted for age and duration of Medicaid coverage.

TABLE 14
Estimated Impact of OBRA'89 Provisions on the Probability of Any
Well-Child Visits and the Number of Visits among Children
with Visits for Children under Three Years of Age

State	Odds ratio: probability of any visits, 1992–89			Change in the number of visits among children with visits		
	Provider/ child ratio	Other program changes	Combined effect	Provider/ child ratio	Other program changes	Combined effect
California	0.92	—	0.92	–0.03	0.07	0.04
Georgia	1.02	1.64	1.66	—	0.15	0.15
Michigan	—	1.52	1.52	0.01	0.24	0.25
Tennessee	1.03	—	1.03	–0.05	—	–0.05

nificant factor in some states, it was not in others. Other program changes had a sizable, significant, positive effect on the probability of any well-child visits among Medicaid children only in Georgia and Michigan.

Immunizations

The low rates of preventive care use that we found among Medicaid children in the four study states translate to equally low immunization rates. We computed completion rates for basic childhood immunizations that the children should have had during their Medicaid enrollment period. These include diphtheria–tetanus–pertussis (DTP), oral polio vaccine (OPV), measles–mumps–rubella (MMR), tetanus–diphtheria (Td), haemophilus influenza type b (Hib), and hepatitis B virus (HBV).

In 1989, less than half of the study children received the recommended immunizations for their age group (table 15). Significant but modest improvements were noted over the study period, with the largest increases seen in Georgia (15 percentage points), Tennessee (11 percentage points), and Michigan (9 percentage points). California had a small two-percentage-point increase.

Although the Medicaid programs in our study states did not successfully recruit the targeted percentage of children for preventive care and immunizations, they did at least make up for some of the backlog of

TABLE 15
Immunization Completion Rates Based on All Medicaid-Paid
Immunizations for Childhood Diseases^a and the
AAP Periodicity Schedule

State	Age-appropriate immunizations		All immunizations	
	1989	1992	1989	1992
California	48	50	66	68
Georgia	46	61	63	80
Michigan	39	48	54	69
Tennessee	47	58	61	79

^aAdjusted for the age-specific AAP periodicity schedule for childhood immunizations and the duration of Medicaid coverage. Includes immunizations for diphtheria–tetanus–pertussis (DTP), oral polio vaccine (OPV), measles–mumps–rubella (MMR), tetanus–diphtheria (Td), haemophilus influenza type b (Hib), and hepatitis B virus (HBV).

missed immunizations among the children who sought care. If we include all of the childhood immunizations that were administered in the numerator, instead of only those recommended by the AAP for children according to their age, the rates increase substantially (table 15).

Nevertheless, a considerable number of children who had EPSDT visits remained less than fully immunized at the end of their visits. Data on whether children were up to date in their immunizations were collected in the screening forms providers filled out during EPSDT visits in three of the study states. In tabulations of these data, we found that, at the time of their last EPSDT visit in 1989, 83 percent of EPSDT-screened children in Michigan, 81 percent of these children in Tennessee, and 70 percent in California were up to date in their immunizations (Gavin, Bernardin, and Schroeder 1996). In 1992, the percentage of EPSDT-screened children whose immunizations were on schedule rose slightly to 73 percent in California (the only state for which we had 1992 data.)

Diagnosis and Treatment Services

None of the study states significantly changed the depth or breadth of coverage of diagnostic and treatment services for children in their Med-

icaid programs from 1989 to 1992. Nevertheless, we found small increases in the use of diagnostic and treatment services in three of the four states that may be related, at least in part, to program changes during this time.

Coverage of Diagnostic and Treatment Services

In 1989, Michigan covered nearly every optional service for which federal matching funds were available, and California covered most optional services. Georgia and Tennessee covered fewer of these services. All four states had some coverage limits on the amount, duration, and scope of mandatory and optional services in their Medicaid programs. For the most part, however, these limits were minor in California and Michigan.

We found little policy impact of the OBRA'89 provision on Medicaid coverage of any diagnostic or treatment services needed by children for conditions identified during EPSDT screens (Hill and Zimmerman 1995a). In all four of the study states, Medicaid officials voiced their belief that the coverage of services by their programs was sufficient and that no major changes were required to add depth or breadth to coverage of children's services. However, in response to the law, all four Medicaid programs have instituted a medical necessity review process to assess, on a case-by-case basis, whether services beyond those covered by the state plan are needed to treat eligible children.

Problem Identification, Treatment, and Referral

During our site visits, providers reported that, on average, 50 percent of children screened had a health problem needing attention (Hill and Zimmerman 1995b). Many of these health problems were immediately treated by the screening provider. For more complicated cases, referrals were made to outside providers.

In a review of data from administrative forms on which Georgia and Michigan providers recorded information on the health status of children during the EPSDT screening visits, we found that EPSDT providers identified physical/mental health care needs for slightly more than half of the children screened in 1989: 54 percent in Georgia and 60 percent in Michigan (Gavin, Bernardin, and Schroeder 1996). The case

studies revealed that otitis media, skin rashes, and respiratory ailments were among the most frequently identified health care needs for treatment and/or referral. Other frequently uncovered problems related to nutrition, eyes, blood, and the musculoskeletal system. In both states, nearly all children aged three years and older who had an EPSDT screening visit were either treated or referred for dental care.

In general, the problems identified through EPSDT screens were more likely to be treated by the EPSDT provider than referred to another provider (table 16). Although EPSDT providers treated children for physical or mental health problems at similar rates in Georgia and Michigan (43 percent and 37 percent, respectively, were treated or treated and referred), referral rates differed substantially across the two states; providers in Georgia made referrals for physical or mental health care about half as often as providers in Michigan during 1989 (17 percent versus 35 percent). In contrast, children in Georgia were twice as likely to be referred for dental care than were children in Michigan in 1989: 33 percent versus 15 percent. These differences are, at least in part, a result of differing resources available among EPSDT and other community providers in the two states, as well as state-specific Medicaid program characteristics.

In Georgia, providers either treated (41 percent) or referred (11 percent) proportionately fewer children for physical/mental health problems during EPSDT screening visits in 1992 than in 1989 (table 16).

TABLE 16
Percentage of Children with Health Care Needs Identified during EPSDT Screening Visits and the Percentage of EPSDT Screening Visits with Health Care Needs That Were Treated and/or Referred

	Michigan 1989		Georgia 1989		Georgia 1992	
	Physical health	Oral health	Physical health	Oral health	Physical health	Oral health
Percentage of children with needs	60	64	54	60	54	50
Percentage of visits in which children were:						
Treated only	25	48	36	18	37	16
Referred only	23	15	10	33	7	20
Treated and referred	12	<1	7	<1	4	<1

Similarly, referrals were made for oral health care during only 20 percent of the visits in 1992. These trends are consistent with more frequent visits per child: that is, after an initial referral for a particular problem, the child may have been treated or under care during subsequent visits and therefore would not have required another referral. The number of visits per child rose 20 percent in Georgia from 1989 to 1992. The differences may also be explained by the less severe problems found among the newly eligible, poverty-related expansion children.

Use of Diagnostic and Treatment Services

As shown in tables 17 and 18, except for hospital services, the percentage of children who received diagnostic and treatment services, and the number of services per user of each type, increased from 1989 to 1992 in Georgia, Michigan, and Tennessee (Herz, Sredl, and Albers 1996). California was the only state that followed a different trend in outpatient service use over the study period. This divergence may have been caused by the large increase in undocumented aliens who were in the state's Medicaid program but were eligible for a limited set of Medicaid-covered services.

For hospital services, the percentage of children with stays, the number of hospitalizations, and the total number of hospital days among children with at least one stay decreased slightly from 1989 to 1992 in all states, with only a few exceptions. In Michigan, the percentage of children with stays and the number of hospitalizations among children with at least one stay did not change over the study period, and in

TABLE 17
Percentage of Medicaid Children with Any Claims for Diagnostic and Treatment (D&T) Visits and Any Medications and the Number of D&T Visits and Medications among Users

State	Percentage of children with any D&T visits		D&T visits per child with visits		Percentage of children with medications		Medications per child with medications	
	1989	1992	1989	1992	1989	1992	1989	1992
California	64	62	5.2	5.2	55	54	6.0	6.7
Georgia	65	70	4.4	5.8	59	64	5.8	6.6
Michigan	69	71	5.1	5.7	60	63	5.5	6.0
Tennessee	67	71	5.4	6.6	57	64	5.4	6.7

TABLE 18
Percentage of Children with Any Hospital Stays and Other Health
Services and the Number of Hospital Stays and Days
among Children with Hospital Stays

State	Percentage of children with hospital stays		Hospital stays per child with stays		Hospital days per child with stays		Percentage of children with other care	
	1989	1992	1989	1992	1989	1992	1989	1992
California	6	5	1.2	1.3	6.2	5.8	51	49
Georgia	11	10	1.3	1.2	6.9	6.5	54	56
Michigan	13	13	1.2	1.2	4.5	4.2	60	61
Tennessee	11	9	1.3	1.2	6.2	6.5	61	65

Tennessee the number of hospital days among children with stays increased.

The results from the multivariate analyses suggest that changes from 1989 to 1992, including the OBRA'89 provisions, had less of an impact on illness- and disability-related care than on preventive care in Georgia and Michigan, but had more of an impact in California and Tennessee (Herz et al. 1996). However, the net impact on the probability of any diagnostic and treatment visits was negative in California, whereas it was positive in Tennessee (table 19). The ratio of primary care physicians serving children to child enrollees had little impact on any of these measures,

TABLE 19
Estimated Impact of OBRA'89 Provisions on the Probability
of Any Diagnostic and Treatment (D&T) Visits and the
Number of D&T Visits among Children with Visits

State	Odds ratio: probability of any D&T visits 1992-89			Change in number of D&T visits among children with visits		
	Provider/ child ratio	Other program changes	Combined effect	Provider/ child ratio	Other program changes	Combined effect
California	0.98	0.82	0.80	-0.10	—	-0.10
Georgia	1.01	—	1.01	-0.01	0.60	0.59
Michigan	—	—	—	0.01	0.18	0.18
Tennessee	0.98	1.18	1.15	-0.29	—	-0.29

except in Tennessee, where the decrease in this ratio led to a decrease in the average number of diagnostic and treatment visits per user.

The change in the probability of hospitalizations among Medicaid children in the four study states over the study period followed the declining national trend (table 20). However, although nationally the average length of hospital stays also declined, only in Georgia was the decline in the probability of hospitalization among Medicaid children accompanied by a significant decrease in the number of hospital days among children with hospitalizations.

Dental Services

We found that less than 30 percent of Medicaid children received any dental care in the four study states during both study years (Herz, Sredl, and Albers 1996). In California, only 20 percent of children enrolled in the Medicaid program received any dental care in 1989. This percentage changed little from 1989 to 1992 (table 21). The situation was not much better in the other three states, as the percentage of children with any dental care declined from 28 percent to 27 percent in Georgia, remained constant at 26 percent in Michigan, and increased only two percentage points, from 27 to 29 percent, in Tennessee.

TABLE 20
Estimated Impact of OBRA'89 Provisions on the Probability
of Any Hospital Stays and the Number of Hospital Days
among Children with Any Use of These Services

State	Odds ratio: probability of any hospital stays 1992-89 ^a			Change in the number of inpatient days among children with hospital stays ^a		
	Provider/ child ratio	Other program changes	Combined effect	Provider/ child ratio	Other program changes	Combined effect
California	0.96	0.87	0.83	—	—	—
Georgia	1.01	0.73	0.75	—	-0.15	-0.15
Michigan	—	0.83	0.83	—	—	—
Tennessee	—	0.75	0.75	—	—	—

^aThese regressions were restricted to children aged 1 to 12 years.

TABLE 21
Percentage of Children with Any Dental Care and Number of Dental Claims Per Person Year Enrolled among Children with Any Dental Care

State	Percentage of children with any dental care		Dental claims per person year enrolled among children with any dental care	
	1989	1992	1989	1992
California	20	21	1.5	1.7
Georgia	28	27	2.0	2.0
Michigan	26	26	1.6	1.7
Tennessee	27	29	2.5	2.2

The multivariate regression analysis shows significant effects of program changes from 1989 to 1992 on the probability of any dental visits only in Tennessee and on the number of dental visits per child with visits only in California (table 22).

Conclusions

This study investigated the experience of four states in implementing the OBRA'89 provisions relating to children's Medicaid coverage, in-

TABLE 22
Estimated Impact of OBRA'89 Provisions on the Probability of Any Dental Care and the Number of Dental Claims among Children with Claims

State	Odds ratio: Probability of any dental care 1992-89			Change in the number of dental claims among children with claims		
	Provider/child ratio	Other program changes	Combined effect	Provider/child ratio	Other program changes	Combined effect
California	0.94	1.05	1.03	0.45	0.96	1.41
Georgia	—	—	—	—	—	—
Michigan	—	—	—	—	0.18	0.18
Tennessee	1.09	1.45	1.59	0.17	—	0.17

cluding eligibility expansions, provider incentives, and benefit enhancements. Interviews with state officials and Medicaid providers in California, Georgia, Michigan, and Tennessee supplied us with information on how each of these states addressed the OBRA'89 provisions in their state Medicaid programs. Using Medicaid claims data and multivariate regression techniques, we then estimated the impact of these changes on the size and composition of the Medicaid child population; on provider participation, caseloads, and preventive care provision; and on children's preventive and curative health service use.

Overall, we found evidence that in 1992 the study states placed a higher priority on improving the EPSDT's effectiveness than they did prior to 1989. Efforts to expand the EPSDT provider base and enhance outreach and service provision were either directly or indirectly inspired by OBRA'89. These efforts significantly affected provider participation and caseloads and the use of both preventive care and diagnostic and treatment services. However, their impact, although significant, was modest in comparison to the size of the improvement that was needed. Our analyses clearly revealed that the great promise of the legislative initiatives had not been met by 1992.

We found relative Medicaid fees and enrollment increases to be positively correlated with providers' willingness to serve greater numbers of Medicaid children and to offer EPSDT and other preventive care services. Thus, the declines in relative fees for preventive care services in three of the states had a negative impact on the probability of physicians providing EPSDT and other preventive care services. However, in all three states, the negative effect of the decline in relative fees was offset by positive effects of other state activities.

The numbers of providers serving children and the average Medicaid child caseloads increased substantially from 1989 to 1992 in all four states and among all provider types, including office-based physicians, free-standing clinics, and hospital outpatient departments. One notable exception was the number of participating dental providers, which grew only modestly in three of the states and actually declined in Michigan.

Although the number of providers increased, the numbers of enrollees increased even more. The ratio of the number of child Medicaid enrollees to participating physicians rose in all four study states, except Michigan. The same may have been true in Michigan if the same providers served Medicaid children under the capitated plans; these children were not included in our analysis. In Georgia and Tennessee, there

were still more than 2,000 Medicaid children per EPSDT participating physician in 1992.

Furthermore, although the concentration of health service provision to children among physicians eased somewhat over the study period, no marked shift to office-based physicians occurred. Institutional providers remained an important source of health care in general and preventive care in particular for Medicaid children in 1992.

The states' considerable efforts to increase the use of preventive care services among Medicaid children were only moderately successful by 1992. Counting all EPSDT and other well-child visits paid by Medicaid, only 43 to 54 percent of children at ages that were recommended for preventive care visits made any visits, and only 36 to 59 percent of the recommended visits were made. We also found very low completion rates for age-appropriate immunizations, ranging from 48 to 61 percent in 1992. The lowest rates were found in Georgia, which precluded payments for well-child visits outside of EPSDT and had the greatest increase in enrolled children. The highest rates were found in Michigan, which made substantial changes to its EPSDT program during the study period and had the lowest increase in its fee-for-service Medicaid child population.

We tested whether the disappointing rates of preventive care use resulted from the increase in the number of child enrollees per participating physician. However, we found only small negative effects in some of the states. Characteristics of the children and their families may have been more important in accounting for the modest improvements. Children with Medicaid coverage often live in poor conditions, lack reliable and affordable transportation, and move frequently. These and other environmental and cultural factors create barriers to the use of preventive care despite the availability of free services (Bates et al. 1994).

None of the study states made major changes to the depth or breadth of coverage of diagnostic and treatment services for children in their Medicaid programs from 1989 to 1992. Nevertheless, we found small increases in the use of diagnostic and treatment services in three of the four states. These increases may be related, at least in part, to program changes during this time. Of particular concern, however, is the low percentage of Medicaid children with any dental care during the year. In 1989, fewer than 30 percent of Medicaid children in any of the four study states had any dental care, and no improvement had been made by 1992.

Although room exists for significant improvement in reaching and treating eligible children under Medicaid, the program expansions reached newly enrolled children who would have gone without recommended well-child care and needed illness- and disability-related care in the absence of Medicaid coverage. Therefore, the net impact on children's health service use of the Medicaid program changes during the 1989–92 period was unquestionably positive.

These results are important in light of the recent initiatives affecting Medicaid and uninsured children in the 1997 Balanced Budget Act (BBA). In particular, the BBA adds new state eligibility options for children, eliminates the requirement that states submit data on obstetric and pediatric payment levels to demonstrate that payments are sufficient to enlist adequate numbers of providers, and revises cost-based reimbursement rules for federally qualified health centers (FQHCs) and rural health centers (RHCs).

Our results show that eligibility expansions alone are not sufficient to ensure that low-income children obtain adequate levels of preventive care; that physicians' provisions of preventive care and their Medicaid child caseloads are indeed sensitive to relative fee levels; and that free-standing clinics, such as FQHCs and RHCs, are important providers of preventive care services to Medicaid children. Thus, just to maintain current low levels of preventive care use among the nation's low-income children, states must go beyond the federally allowed eligibility expansions and make substantive changes to the program in order to motivate caretakers to seek and providers to administer preventive care services to children. Furthermore, adequate provider reimbursement levels must be maintained and the role of FQHCs, RHCs, and other publicly funded clinics in providing preventive care services to children must be closely examined.

References

- Adams, K. 1994. The Effect of Increased Medicaid Fees on Physician Participation and Enrollee Service Utilization in Tennessee. *Inquiry* 31:173–89.
- Adams, E.K., A.J. Chawla, and L. Graver. 1996. *Analysis of Medicaid Provider Supply: Overall, Preventive Care, and Dental Services*. (Year two report submitted to HCFA for contract 500-92-066.) Washington, D.C.: MEDSTAT Group.

- Adams, E.K., L. Graver, and S. Kennedy. 1996. *Analysis of Medicaid Physician Supply and Participation in EPSDT*. (Year three report submitted to HCFA for contract 500-92-066.) Atlanta: Emory University.
- Baker, L., and A.B. Royalty. 1997. *Medicaid Policy, Physician Behavior, and Health Care for the Low-Income Population*. Paper presented at the Health Economics Research Organization session of the Applied Social Science Association Meetings, New Orleans, January 5.
- Bates, A.S., J.F. Fitzgerald, R.S. Dittus, and F.D. Wolinsky. 1994. Risk Factors for Underimmunization in Poor Urban Infants. *Journal of the American Medical Association* 272:1105–10.
- Cartland, J.D.C., M.A. McManus, and S.S. Flint. 1993. A Decade of Medicaid in Perspective: What Have Been the Effects on Children? *Pediatrics* 91:287–95.
- Cohen, J.W., and P.J. Cunningham. 1993. Physician Fee Generosity and Access to Care for Children under Medicaid. Paper presented at the Annual Meetings of the American Public Health Association, San Francisco, October 23.
- Gavin, N.I. 1992. *Review and Synthesis of the Literature on the Implementation and Effectiveness of Recent Legislative Initiatives Relating to Medicaid and EPSDT Coverage for Children*. (Submitted to HCFA for contract 500-92-066.) Washington, D.C.: MEDSTAT Group.
- Gavin, N.I., M. Bernardin, and D. Schroeder. 1996. *Health Care Needs and Immunization Status among Medicaid Children with EPSDT Screening Visits, 1989 and 1992*. (Submitted to the HCFA for contract 500-92-066.) Washington, D.C.: MEDSTAT Group.
- Griffen, M.R., J. Daugherty, G.W. Reed, et al. 1995. Immunization Coverage among Infants Enrolled in the Tennessee Medicaid Program. *Archives of Pediatric and Adolescent Medicine* 149:559–64.
- Gruber, J., K. Adams, and J.P. Newhouse. 1997. Physician Fee Policy and Medicaid Program Costs. *Journal of Human Resources* 32:612–34.
- Hadley, J. 1979. Physician Participation in Medicaid: Evidence from California. *Health Services Research* 14:266–80.
- Held, P.J., and J. Holahan. 1985. Containing Medicaid Costs in an Era of Growing Physician Supply. *Health Care Financing Review* 7(1):49–60.
- Herz, E.J., N. Gavin, M. Ellwood, and K. Sredl. 1994. *The Use of EPSDT and Other Health Care Services by Medicaid Children, 1989*. (Year one report submitted to HCFA for contract 500-92-066.) Washington, D.C.: MEDSTAT Group.
- Herz, E.J., A. Chawla, K. Sredl, L. Graver, and S. Kennedy. 1996. *Preventive and Illness-Related Care for Children under Medicaid: The*

- Effects of OBRA-89 and Other Factors on Utilization and Expenditure Patterns.* (Year three report submitted to HCFA for contract 500-92-066.) Washington, D.C.: MEDSTAT Group.
- Herz, E.J., K. Sredl, and L.A. Albers. 1996. *Trends in the Use of EPSDT and Other Health Care Services by Children under Medicaid, 1989 and 1992.* (Year two report submitted to HCFA for contract 500-92-066.) Washington, D.C.: MEDSTAT Group.
- Hill, I., and B. Zimmerman. 1995a. *Evaluation of EPSDT Programs in the Tape-to-Tape States.* Volume 1: *Synthesis of EPSDT Case Study Reports.* (Final report submitted to HCFA for contract 500-92-066.) Washington, D.C.: Health Systems Research.
- . 1995b. *Evaluation of EPSDT Programs in the Tape-to-Tape States.* Volume 2: *Case Study Reports.* (Final report submitted to HCFA for contract 500-92-066.) Washington, D.C.: Health Systems Research.
- Kasper, J.D. 1987. The Importance of Type of Usual Source of Care for Children's Physician Access and Expenditures. *Medical Care* 25:386–98.
- Long, S.H., R.F. Settle, and B.C. Stuart. 1986. Reimbursement and Access to Physicians' Services under Medicaid. *Journal of Health Economics* 5:235–51.
- Margolis, P.A., R.L. Cook, J.A. Eap, C.M. Lannon, L.L. Keyes, and J.D. Klein. 1992. Factors Associated with Pediatricians' Participation in Medicaid in North Carolina. *Journal of the American Medical Association* 267:1942–6.
- Marquis, M.S., and S.H. Long. 1996. Reconsidering the Effect of Medicaid on Health Care Services Use. *Health Services Research* 30:791–808.
- McManus, M., S. Flint, and R. Kelly. 1991. The Adequacy of Physician Reimbursement for Pediatric Care under Medicaid. *Pediatrics* 87:909–20.
- Mitchell, J.B. 1991. Physician Participation in Medicaid Revisited. *Medical Care* 29:645–53.
- Newacheck, P.W. 1988. Access to Ambulatory Care for Poor Persons. *Health Services Research* 23(3):402–19.
- Newacheck, P.W., and N. Halfon. 1988. Preventive Care Use by School-Aged Children: Differences by Socioeconomic Status. *Pediatrics* 82(part 2):462–8.
- Oda, D.S., D.C. Heilbron, and H.J. Taylor. 1995. A Preventive Child Health Program: The Effect of Telephone and Home Visits by Public Health Nurses. *American Journal of Public Health* 85:854–5.
- Perloff, J.D., P.R. Kletke, and K.M. Neckerman. 1986. Recent Trends in Pediatrician Participation in Medicaid. *Medical Care* 24:749–60.

- Phibbs, C.S., and J.C. Robinson. 1993. A Variable-Radius Measure of Local Hospital Market Structure. *Health Services Research* 28(3):313–24.
- Physician Payment Review Commission. 1991. *Annual Report to Congress*. Washington, D.C.
- Rosenbach, M.L. 1989. The Impact of Medicaid on Physician Use by Low-Income Children. *American Journal of Public Health* 79:1220–6.
- Schneider, A. 1997. Overview of Medicaid Provisions in the Balanced Budget Act of 1997, P.L. 105-33. Washington, D.C.: Center on Budget and Policy Priorities.
- Selby-Harrington, M., J.R. Sorenson, D. Quade, S.C. Stearns, A.S. Tesh, and P.L.N. Donat. 1995. Increasing Medicaid Child Health Screenings: The Effectiveness of Mailed Pamphlets, Phone Calls, and Home Visits. *American Journal of Public Health* 85:1412–17.
- Short, P.F., and D.C. Lefkowitz. 1992. Encouraging Preventive Services for Low-Income Children: The Effect of Expanding Medicaid. *Medical Care* 30:766–80.
- Sloan, F., J. Mitchell, and J. Cromwell. 1978. Physician Participation in State Medicaid Programs. *Journal of Human Resources* 8(2):212–45.
- U.S. Health Care Financing Administration. 1993. Exhibit A. Expected Improvement in EPSDT Participation. *State Medicaid Manual*. Part 5—*Early and Periodic Screening, Diagnosis, and Treatment (EPS-DT)*. Baltimore.
- Wade, M. 1992. *Medicaid Fee Levels and Medicaid Enrollees' Access to Care*. Washington, D.C.: Urban Institute.
- Wood, D.L., R.A. Hayward, C.R. Corey, H.E. Freeman, and M.F. Shapiro. 1990. Access to Medical Care for Children and Adolescents in the United States. *Pediatrics* 86:666–73.

Acknowledgments: The authors would like to thank the many individuals who contributed to this study. We would like to thank Kate Sredl, Linda Graver, Donald Schroeder, and Sean Kennedy from the MEDSTAT Group and Deo Bencio, previously from the MEDSTAT Group and currently from Mathematica Policy Research, for their programming expertise. We would also like to thank the Technical Advisory Panel for their many helpful suggestions. These individuals include Theodore Joyce, PhD, from the National Bureau of Economic Research; Sara Rosenbaum, JD, from the George Washington University; Janet Perloff, PhD, from the State University of New York at Albany; Charles Homer, MD, MPH, from the Harvard Medical School; and Dennis Williams, from the state of North Carolina. Furthermore, we would like to thank the state and local area officials and the health care providers at the various locations that we visited during our site visits. These individuals, who are too numerous to name here, provided invaluable information, which we have used to interpret the quantitative results. Finally, we would like to thank the Health Care Financing Administration for funding this project (under

contract #500-92-066) and, in particular, Feather Davis, PhD, our HCFA project officer, who provided helpful oversight and guidance throughout the progress of the study.

The conclusions are those of the authors and do not necessarily reflect the opinion of the Health Care Financing Administration.

Address correspondence to: Norma I. Gavin, PhD, Research Triangle Institute, P.O. Box 12194, Research Triangle Park, NC 27709-2194 (e-mail: gavin@rti.org).