
Preventive Services for Children Under Medicaid, 1989 and 1992

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Receipt of key preventive services among Medicaid children in four States is examined. Between 1989 and 1992, small-to-moderate improvements in well-child visit and immunization rates were observed. Age, eligibility group, and statewide factors affected these rates. Uniformly low use of preventive dental care was found. These rates were generally higher among children with well-child visits. To understand the full extent of preventive care for children, all Medicaid-financed well-child services should be considered, not just those provided under the Early and Periodic Screening, Diagnostic, and Treatment (EPSDT) services program. Nonetheless, EPSDT is a critical vehicle for outreach and case management.

INTRODUCTION

The goal of providing preventive medical and dental services for children is to improve overall health status by reducing the incidence of avoidable illness and disease. The basic components of preventive care for children include screening services such as well-child visits, immunizations, and regular dental checkups.

Access to and use of such preventive services has been the subject of a number of studies (Herz et al., 1996). By and large, most research points to the impor-

tance of financial factors (e.g., insurance coverage, availability of free care, and lower out-of-pocket costs) and sociodemographic characteristics as determinants of the use of preventive care among children. Children in families considered to be disadvantaged¹ generally receive lower levels of preventive care. Other family-related barriers to care include parental knowledge and perceptions of the importance of preventive care for their children and lack of a usual source of care. Finally, provider-driven factors also influence receipt of preventive care among children. These factors include low provider participation in Medicaid, low provider reimbursement rates, perceived administrative burden of Medicaid participation, and missed opportunities for providing care, especially delivery of needed immunizations during office visits initiated for other reasons.

To promote better access to preventive care for Medicaid-enrolled children, the EPSDT program was added to the Medicaid program under Public Law 90-248 in 1967. EPSDT provides screening and preventive care, as well as referral for services necessary to correct health problems identified through screening. Because of concerns over low EPSDT participation rates among both beneficiaries and providers, Congress included provisions to address EPSDT participation in the Omnibus Budget Reconciliation Act of 1989 (OBRA 89). OBRA 89 set standards

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¹ Characteristics of disadvantaged families examined in recent studies include relatively low income, membership in a racial or ethnic minority group, having a mother without a high school diploma, having a relatively large number of children under 6 years of age, residence in non-metropolitan areas, and having a single-parent household.

for performance at the State level, created incentives for greater provider participation, and broadened the scope of services covered to include both preventive and illness-related care.

In this article we describe the results of descriptive analyses that investigate trends in the receipt of preventive services among Medicaid-enrolled children, before and after the implementation of OBRA 89. These results are drawn from a study sponsored by HCFA, the Comparative Study of the Use of EPSDT and Other Preventive and Curative Health Care Services by Children Enrolled in Medicaid (Herz et al., 1994; Herz et al., 1996; and Herz, Sredl, and Albers, 1996). As a part of this study, child-level administrative claims from HCFA's Medicaid research files from four States (California, Georgia, Michigan, and Tennessee) for calendar years 1989 and 1992 were analyzed.

Although the Federal legislative initiatives of the late 1980s and early 1990s were aimed at improving the delivery of preventive care through the EPSDT program, the data from preliminary analyses and State-specific case studies conducted as part of the EPSDT study previously mentioned indicated that a considerable amount of Medicaid-financed well-child care was provided outside of the EPSDT program through the regular Medicaid program. The Children's Defense Fund refers to such provision as the "shadow" program. Consequently, the overall study ultimately focused on all Medicaid-financed preventive services, not just those provided under EPSDT.

Conceptual Framework for Analysis

The components of comprehensive well-child care, as defined under the EPSDT

program, include several types of basic screening services. During EPSDT full screening visits, providers are required to deliver:

- A comprehensive health and developmental history.
- A comprehensive unclothed physical examination.
- Appropriate immunizations according to age and health history.
- Laboratory tests, including blood lead level assessments, appropriate for age and risk factors.
- Health education, including anticipatory guidance.
- Vision screening.
- Hearing screening.
- Dental screening.

Guidelines for well-child care as delineated by the American Academy of Pediatrics (AAP) are very similar.

Service utilization measures developed for this study capture the essential subset of these components, including the receipt of: the preventive visit as a whole, standard immunizations, and preventive dental care. Selection of these components of well-child care for analysis was also determined by the availability of complete and accurate coding of individual, itemized services, in conjunction with diagnostic information, on Medicaid administrative claims.

DATA AND METHODS

The primary data source for the analyses presented in this article was HCFA's Medicaid research files known as the Tape-to-Tape database. This database includes all enrollment and claims data from the automated Medicaid information systems in four States (California, Georgia, Michigan, and Tennessee) for calendar years 1980-92. Data maintained in this data-

base have been edited and reformatted to produce uniform files that facilitate cross-State and cross-year comparative analyses.

Study Population

The study population included all Medicaid-enrolled children in the four study States who were under 21 years of age during 1989 or 1992, with a few exceptions. For children who reached 21 years of age during each analysis year, only data on enrollment and service use for the months during which they were 20 years of age were analyzed.

Three groups of children were excluded from the analyses: (1) children residing in institutions, (2) children covered under Medicaid capitated health plans, and (3) children with dual Medicare and Medicaid coverage. Institutionalized children included recipients of nursing home care, services in intermediate care facilities for the mentally retarded, or inpatient psychiatric services. These children were excluded because they have dramatically different claims experience compared with those who are not institutionalized. Children who were enrolled in capitated plans and children who were dually enrolled in both Medicare and Medicaid were excluded because they generally have incomplete claims information in Medicaid source files.

Of all Medicaid enrollees under 21 years of age, the study population included (for 1989 and 1992, respectively) 85 and 82 percent of enrolled children in California, nearly 100 percent in Georgia (both years), 84 and 77 percent in Michigan, and 95 and 93 percent in Tennessee. The excluded institutionalized and Medicare-Medicaid children together represented less than 1 percent of the total population of Medicaid child enrollees across study States and analysis years. All other excluded children were enrolled in capitated plans.

Development of the Analytic Files

For this study, child-level records were created that summarized information on eligibility, enrollment duration, demographics, and utilization by category of service as previously described (Herz et al., 1996). Only information based on Medicaid-paid claims that received Federal matching dollars was retained; claims for State-only services were excluded. Medicaid-paid claims for services rendered by out-of-State providers were retained.

Preventive Care Participation and Visit Rates

To accurately assess children's receipt of preventive care visits, a methodology was developed to account for: periodicity guidelines that indicate the ages at which children should receive these services, and Medicaid enrollment duration within each analysis year. Actual use (numerator) is divided by expected use (denominator) to calculate a rate. Adjustments for age, periodicity guidelines, and enrollment duration are applied to the denominator value (see Technical Note; Herz et al., 1996).

This methodology produced two key measures of the receipt of well-child visits. The "participation rate" gives the percent of children with at least one screening visit among those recommended (expected) to have at least one screening visit. The "visit rate" gives the percent of total recommended (expected) screening visits children actually receive. Compared with unadjusted rates, application of this methodology typically increases reported participation and visit rates, sometimes substantially, depending on average enrollment duration coupled with the age distribution, and hence the periodicity guidelines applicable to each subgroup of children.

The periodicity guideline used in this study was the AAP schedule for health supervision visits. For both 1989 and 1992, the AAP recommended a total of 20 well-child visits from birth through age 20 years at the following intervals:

- Children up to 1 year of age should receive a total of six visits at 2-3 month intervals.
- Those age 1-2 years should receive a total of three visits at 15, 18, and 24 months.
- Children 3-5 years of age should have a total of three annual visits.
- Those 6 years of age or over should have a total of eight visits, one every other year.

In several cases, State EPSDT periodicity schedules differed from these AAP guidelines. For both analysis years, Tennessee required two fewer visits than did the AAP for children ages 9-20 years. California's EPSDT visit schedule was the same as that for AAP in both years for younger children but required 50 percent fewer visits than did the AAP for children age 4 years or over. Georgia's schedule was identical to AAP guidelines in both years, as was Michigan's in 1992. However, for 1989, Michigan's EPSDT schedule differed substantially from AAP guidelines across all age groups, requiring many fewer visits and at longer intervals, for a total of 11-12 visits over a child's youth.

In general, for both 1989 and 1992, when State EPSDT periodicity schedules differed from the AAP guidelines previously described, the States recommended fewer visits for selected age groups, usually older children. In separate analyses (data not shown), participation and visit rates based on State schedules were higher than corresponding rates based on AAP guidelines. However, within each State, the pattern of findings overall and by age and eligibility group was similar, regardless of whether

rate computations were based on AAP guidelines or State EPSDT periodicity schedules.

Immunization Completion Rates

In this study, group differences in the receipt of standard childhood immunizations were also examined. The same methodological approach used to determine well-child visit rates was applied to the calculation of immunization completion rates. Thus, the "immunization completion rate" gives the percent of total recommended (expected) immunizations children actually receive during each analysis year. Again, this method takes into account Medicaid enrollment duration and periodicity guidelines that indicate the ages at which children should receive standard immunizations (see Technical Note; Herz et al., 1996).

Children who miss receiving immunizations at the recommended age frequently obtain them later, particularly at school entry. The immunization completion rate gives credit for any and all immunizations received, in spite of whether the immunization was in fact age-appropriate. Specifically, all immunizations obtained during the analysis year were counted in the numerator. Older children catching up on missed immunizations appear to have been more compliant with periodicity guidelines than they actually were. Thus, a second completion rate was also computed for which the numerator includes only those immunizations that were in fact "on schedule" or age-appropriate.

Again, AAP periodicity schedules for immunizations were used in this methodology. The immunization schedule recommended by the AAP differed in 1989 and 1992. The guidelines for common childhood immunizations in 1989 contained the following recommendations:

- Infants up to 6 months of age should receive three doses of diphtheria-tetanus-pertussis (DTP) vaccine and two doses of an oral polio vaccine (OPV) at 2-month intervals.
- Between 15 and 18 months of age, toddlers should receive an additional DTP and OPV, plus single doses of the measles-mumps-rubella (MMR) and the Haemophilus influenza type b (Hib) vaccines.
- Children between the ages of 4 and 6 years should receive a fourth dose of DTP and a third OPV.
- Preteens (ages 11 and 12 years) should receive a second MMR.
- Adolescents between the ages of 14 and 16 years should receive a tetanus-diphtheria (Td) booster.

For 1989 there were few variations from AAP guidelines among the four State-specific EPSDT schedules for standard immunizations. Both Georgia and Tennessee followed AAP guidelines. California followed AAP guidelines with one exception—the second MMR vaccination was recommended at school entry (e.g., ages 4 to 6 years) rather than at 11 to 12 years of age. Michigan also followed AAP guidelines, except that the State had no specific recommendation for administration of the Hib vaccine.

In 1992 the AAP made two modifications to its guidelines for common childhood immunizations:

- Of the original set of five common immunizations, the AAP changed its guidelines for only one—the Hib vaccine. Although a single dose of Hib was recommended at 18 months of age in 1989, by 1992 the AAP recommended a three-dose series² at 2, 4, and 15 months of age.

² Two types of Hib vaccines were approved by the AAP for children under 15 months of age. One vaccine required a three-dose series, and the other vaccine required a four-dose series (additional injection at 6 months of age). To simplify the analyses, for all children, use of the three-dose schedule for the Hib in 1992 was assumed.

- One new immunization—the Hepatitis B vaccine (HBV)—was added to the set of standard vaccinations recommended for all children. Three doses of HBV were to be administered: at birth,³ 2 months, and 18 months of age.

For 1992 there were several variations between State-specific EPSDT schedules and AAP recommendations on the timing of immunizations. Michigan and Tennessee followed the 1992 AAP guidelines for immunizations. California's schedule differed in two ways: (1) the fourth DTP and third OPV were recommended earlier (at 15 months of age) than AAP guidelines (at 18 months), and (2) as in 1989, the second MMR was scheduled for earlier administration at school entry rather than early adolescence. Georgia's EPSDT immunization schedule differed the most from 1992 AAP guidelines. Several vaccinations of different types were recommended at earlier ages than specified in AAP guidelines.

In general, when differences existed between State EPSDT and AAP guidelines for standard immunizations, States recommended earlier administration of selected vaccines, mostly for children under age 7 years. In separate analyses (data not shown), immunization completion rates based on State schedules were about the same as or lower than corresponding rates based on AAP guidelines.⁴ However, within each State, the pattern of findings overall and by age and eligibility group was similar, regardless of whether immunization rate computations were based on AAP guidelines or State EPSDT periodicity schedules.

³ Although the AAP recommended an HBV injection for newborns during the delivery hospitalization, for analytic purposes, only HBV immunizations by 2 and 18 months of age were examined for 1992. Identification of HBV injections during delivery hospitalizations was beyond the scope of this study.

⁴ The opposite pattern was found for Michigan in 1989 among toddlers, because the State's schedule made no recommendation for Hib administration, but the AAP schedule called for one Hib at 18 months of age.

Preventive Dental Care Rates

States are required to provide dental services to Medicaid-eligible children under age 21 to comply with EPSDT requirements. Although the EPSDT program was authorized by Congress in 1967, EPSDT dental guidelines were not developed until 1980 (U.S. Department of Health, Education, and Welfare, 1980).

As part of the EPSDT screen that constitutes the basic health assessment, the program requires that the screening provider refer children for a visit to a dentist, or a dental professional under the supervision of a dentist, for a dental screening. Referrals and a subsequent visit to the dentist are required for Medicaid-eligible children age 3 years, or at a younger age if medically necessary. The initial referral should be made without regard to a State's periodicity schedule, but subsequent referrals and visits are to conform to the periodicity schedule. Given the nature of the regulations for provision of dental care to children enrolled in Medicaid, the analyses presented here focus on dental services in the preventive care category that were billed separately under Medicaid, regardless of whether or not they were provided explicitly through the EPSDT program.

Preventive services⁵ include instruction in self-care oral hygiene procedures; oral prophylaxis (cleaning of teeth), both necessary as a precursor to the application of dental caries preventives where indicated, or independent of the application of caries preventives for patients 10 years of age or over; and professional application of dental sealants when appropriate to prevent pit and fissure caries.

⁵In addition to requiring dental screening, the EPSDT program mandates that States provide dental services for the "relief of pain, infections, restoration of teeth, and maintenance of dental health." These services include diagnostic, preventive, therapeutic, and emergency services for dental disease.

In the descriptive analyses for preventive dental care, rates of dental service utilization are presented. These measures include: the percent of Medicaid child enrollees who received any preventive dental services, and the average service use rate, which is represented by the number of claims for any preventive dental care service per person-year-enrolled. In addition, service use rates for specific types of preventive dental care are also presented. The rates are stratified by receipt of a preventive medical care visit during the year of analysis.

RESULTS

Age Distribution

The distribution of Medicaid children by age group was similar across the study States; however, the population shifted to younger ages over time (Table 1). In 1989 across study States, 43-46 percent of children were under 7 years of age. By 1992 this age group had grown, accounting for 47-53 percent of the child Medicaid population.

Patterns of Medicaid Eligibility and Enrollment

The distribution of Medicaid children by eligibility category varied somewhat across the four study States in 1989 and 1992 (Table 2). These variations in eligibility patterns were related to different income thresholds and expansion implementation dates. In all States and both analysis years, the majority of Medicaid children were recipients of cash assistance under Aid to Families with Dependent Children (AFDC). In 1989 AFDC beneficiaries represented 54-74 percent of Medicaid-enrolled children across the four study States. By 1992 the percentage of

Table 1
Percent Distribution of Medicaid Children, by State and Age Group: 1989 and 1992

State	All Children	Age Group				
		Under 12 Months	1-2	3-6	7-12s	13-20
California						
1989	2,065,719	9.4	14.4	Percent 22.2	25.4	28.6
1992	2,923,913	8.9	15.6	22.3	24.5	28.7
Georgia						
1989	358,838	8.7	15.3	22.6	26.3	27.2
1992	597,245	9.6	17.7	25.5	23.6	23.6
Michigan						
1989	598,296	9.0	13.2	21.1	25.2	31.5
1992	624,662	8.9	15.6	22.8	24.2	28.4
Tennessee						
1989	312,570	9.4	15.3	21.5	23.5	30.3
1992	458,588	8.6	16.5	24.3	22.9	27.7

NOTES: Children in capitated Medicaid plans, institutionalized children, and children who were dually enrolled in Medicaid and Medicare are excluded. Otherwise, for each analysis year separately, the study population includes children enrolled in Medicaid for at least 1 month.

SOURCE: Health Care Financing Administration, Office of Strategic Planning: Data from the Medicaid Tape-to-Tape Project, 1989 and 1992.

AFDC cash-assistance children had declined, largely as a result of growth in the poverty-related and, to a lesser extent, the blind/disabled groups. California and Georgia also experienced considerable growth in the medically needy/other eligibility category.

Enrollment duration within eligibility group also varied (data not shown). In 1989 the blind/disabled group had the longest average number of months enrolled (10-11 months) among the eligibility groups. Children in the poverty-related category had the shortest enrollment duration (3-7 months). By 1992 the enrollment duration for each eligibility subgroup had stayed about the same or increased.

State-Level Rates for Well-Child Visits

Tables 3 and 4 display well-child participation and visit rates, respectively, for EPSDT alone and in combination with non-EPSDT services, for each study State and both analysis years. The findings were somewhat mixed with regard to how successful States were in providing children with preventive care visits.

Across States in 1989, unadjusted participation rates for EPSDT alone show that less than one-fourth of Medicaid-enrolled children obtained at least one EPSDT screening visit. In Michigan in particular, the low rate of 16 percent is most likely the result of a restriction on the provider pool that essentially limited certification of EPSDT comprehensive screening providers to local public health departments and a very small number (never more than 50) of private physicians. By 1992 across States, unadjusted EPSDT participation rates had improved only slightly. Michigan's larger gain was primarily the result of an expansion of the EPSDT provider pool to include office-based physicians that continued to provide usual well-child visits classified as "basic" EPSDT screens.

Adjusting for Medicaid enrollment duration and the age-specific AAP guidelines for well-child visits, between 1989 and 1992 in three of four States (excluding California), there were slight-to-moderate improvements in corresponding participation and visit rates for EPSDT screens alone and in combination with well-child visits provided through the regular

Table 2
Percent Distribution of Medicaid Children, by State and Eligibility Group: 1989 and 1992

State	All Children	Eligibility Group				
		Blind/Disabled	AFDC Cash	Foster Care	Poverty-Related	Medically Needy/Other
California				Percent		
1989	2,065,719	1.8	62.5	4.2	0.7	30.7
1992	2,923,913	2.0	52.0	3.2	4.2	38.7
Georgia						
1989	358,838	3.9	73.9	2.3	9.8	10.1
1992	597,245	4.1	56.3	1.7	25.5	12.4
Michigan						
1989	598,296	2.1	74.0	—	3.4	20.5
1992	624,662	3.7	63.1	—	12.9	20.4
Tennessee						
1989	312,570	4.0	53.7	1.3	18.1	23.0
1992	458,588	4.5	44.3	2.4	31.0	17.9

NOTES: AFDC is Aid to Families with Dependent Children. Children in capitated Medicaid plans, institutionalized children, and children who were dually enrolled in Medicaid and Medicare are excluded. Otherwise, for each analysis year separately, the study population includes children enrolled in Medicaid for at least 1 month. In Michigan, foster care children could not be identified separately from AFDC cash-assistance children.

SOURCE: Health Care Financing Administration, Office of Strategic Planning: Data from the Medicaid Tape-to-Tape Project, 1989 and 1992.

Medicaid program. Rates for California remained basically the same over time.

Nonetheless, by 1992 the study States were still reaching less than one-half (39-42 percent) of the children expected to receive an EPSDT screen and were providing less than one-half (35-42 percent) of the recommended number of screens. When well-child visits rendered outside of EPSDT were also considered, 43-54 percent of children had at least one visit and 36-59 percent of scheduled visits were received.

A considerable number of well-child visits were received and billed through Medicaid but outside of EPSDT in both

1989 and 1992 in the three study States that allowed payment for such visits. The extent to which well-child visits were received outside of EPSDT in Georgia is unknown because the State did not allow payment for these services, and therefore such services do not show up in the Medicaid administrative claims analyzed for this study. However, the provision of unreimbursed well-child care is believed to occur in Georgia.

Overall, the observed gains occurred in spite of the fact that there was considerable growth in the Medicaid child population in three of four study States (excluding

Table 3
EPSDT and Overall Preventive Care Participation Rates: 1989 and 1992

State	Unadjusted EPSDT Only		Adjusted ¹ EPSDT Only		Adjusted ¹ All Well-Child	
	1989	1992	1989	1992	1989	1992
			Percent			
California	22	24	39	41	47	46
Georgia	24	27	40	42	41	43
Michigan	16	26	27	42	51	54
Tennessee	22	24	37	39	41	45

¹ Adjusted for enrollment duration and age-specific periodicity schedules of the American Academy of Pediatrics.

NOTES: EPSDT is Early and Periodic Screening, Diagnostic, and Treatment services. Children in capitated Medicaid plans, institutionalized children, and children who were dually enrolled in Medicaid and Medicare are excluded. Otherwise, for each analysis year separately, the study population includes children enrolled in Medicaid for at least 1 month.

SOURCE: Health Care Financing Administration, Office of Strategic Planning: Data from the Medicaid Tape-to-Tape Project, 1989 and 1992.

Table 4
EPSDT and Overall Preventive Care Visit Rates: 1989 and 1992

State	EPSDT Screening Visits Only				EPSDT Plus Other Well-Child Visits			
	Visits per User		Adjusted ¹ EPSDT Visits		Visits per User		Adjusted ¹ All Well-Child	
	1989	1992	1989	1992	1989	1992	1989	1992
	Number		Percent		Number		Percent	
California	1.4	1.5	34	37	1.5	1.6	44	44
Georgia	1.2	1.5	30	35	1.2	1.5	30	36
Michigan	1.0	1.6	18	42	1.5	1.8	46	59
Tennessee	1.5	1.6	34	37	1.6	1.7	38	45

¹ Adjusted for enrollment duration and age-specific periodicity schedules of the American Academy of Pediatrics.

NOTES: EPSDT is Early and Periodic Screening, Diagnostic, and Treatment services. Children in capitated Medicaid plans, institutionalized children, and children who were dually enrolled in Medicaid and Medicare are excluded. Otherwise, for each analysis year separately, the study population includes children enrolled in Medicaid for at least 1 month.

SOURCE: Health Care Financing Administration, Office of Strategic Planning: Data from the Medicaid Tape-to-Tape Project, 1989 and 1992.

Michigan) by 1992. Enrollment for Medicaid children grew by 42-66 percent in California, Georgia, and Tennessee. Only in Michigan did such enrollment remain relatively stable with a 4-percent increase by 1992.

Well-Child Visits by Age and Eligibility Group

Age

As shown in Table 5, with the exception of Georgia in 1989, children under 3 years of age had higher adjusted well-child visit participation rates (at or exceeding 50 percent) than did children 3 years of age and over (with adjusted rates usually well under 50 percent). Results with respect to visit rates by age group were less consistent. For 1989 the highest adjusted visit rates were found among the age groups of 3-6 and 7-12 years. By 1992 the subgroups with the highest rates had shifted somewhat to younger children (those age 1-2 and 3-6 years). Across study States and analysis years, the groups with the lowest visit rates tended to be at the extremes of the age distribution, most often adolescents and sometimes infants.

Overall, between 1989 and 1992, younger children (those under 3 years of age) showed greater improvements in

their participation and visit rates than did their older counterparts. In fact, the rates for older children (those age 3 years or over) either showed no major changes or actually declined over time.

In 1989 and 1992, for children 3 years of age or over for whom no more than one visit was expected per year, visit rates were equal to or greater than corresponding participation rates. These data suggest that some well-child visits may have been rendered "off schedule," that is, either sooner than expected or perhaps to compensate for missed visits. Service duplication may also partially account for these findings. In addition, OBRA 89 allowed for interperiodic screening visits when a medical problem was suspected.

In contrast, among children 2 years of age and under for whom multiple visits were expected per year, adjusted visit rates were consistently below corresponding participation rates. These findings suggest that many young children were not receiving the full series of well-child visits recommended by the AAP.

Eligibility

Variations in well-child participation and visit rates were evident among the five eligibility groups analyzed in this study (Table 6). In 1989 and 1992, across study States,

Table 5

Adjusted Preventive Care Participation and Visit Rates,¹ by State and Age Group: 1989 and 1992

State	All Children	Age Group				
		Under 12 Months	1-2	3-6	7-12	13-20
California						
1989						
Participation Rate	47	51	63	46	33	35
Visit Rate	44	35	47	54	38	41
1992						
Participation Rate	46	62	64	41	31	33
Visit Rate	44	41	49	47	36	40
Georgia						
1989						
Participation Rate	41	38	42	38	46	40
Visit Rate	30	20	26	39	47	41
1992						
Participation Rate	43	61	49	37	38	31
Visit Rate	36	39	33	40	39	33
Michigan						
1989						
Participation Rate	51	64	58	46	50	40
Visit Rate	46	47	40	55	53	43
1992						
Participation Rate	54	79	65	52	42	36
Visit Rate	59	69	55	66	48	42
Tennessee						
1989						
Participation Rate	41	60	53	39	28	23
Visit Rate	38	42	37	48	30	26
1992						
Participation Rate	45	71	60	42	28	22
Visit Rate	45	55	45	49	30	25

¹ All rates are adjusted for enrollment duration and the age-specific periodicity schedules of the American Academy of Pediatrics.

NOTES: Children in capitated Medicaid plans, institutionalized children, and children who were dually enrolled in Medicaid and Medicare are excluded. Otherwise, for each analysis year separately, the study population includes children enrolled in Medicaid for at least 1 month.

SOURCE: Health Care Financing Administration, Office of Strategic Planning: Data from the Medicaid Tape-to-Tape Project, 1989 and 1992.

foster care children had some of the highest participation rates (51-66 percent) and visit rates (44-66 percent). These relatively high rates may be in part because of foster parents' contractual obligation to attend to the health needs of their foster children.

With the exception of Georgia, children in the poverty-related eligibility group also had some of the highest participation rates (43-66 percent). Visit rates for this group showed less consistency across States and analysis years. In addition, visit rates were often much lower than corresponding participation rates for these children, suggesting that they were not receiving all recommended well-child visits. This pattern of findings is likely the result in part of the large proportion of infants and young chil-

dren that comprise the poverty-related group (data not shown) who are expected to have multiple visits per analysis year.

Finally, in 1989 and 1992, the supplemental security income (SSI) blind/disabled eligibility group consistently had some of the lowest participation rates (26-36 percent) and visit rates (29-45 percent). It is unknown whether these children actually forgo preventive screening services or receive them through ongoing care for their disabling conditions.

State-Level Rates for Immunizations

Tables 7 and 8, respectively, display overall immunization completion rates and completion rates for age-appropriate immu-

Table 6
Adjusted Preventive Care Participation and Visit Rates,¹ by State and Eligibility Group:
1989 and 1992

State	Eligibility Group					
	All Children	Blind/ Disabled	AFDC Cash	Foster Care	Poverty-Related	Medically Needy/Other
California	Percent					
1989						
Participation Rate	47	30	47	64	43	43
Visit Rate	44	35	44	62	30	40
1992						
Participation Rate	46	33	48	66	57	40
Visit Rate	44	37	46	66	48	38
Georgia						
1989						
Participation Rate	41	34	42	54	33	38
Visit Rate	30	32	33	44	20	25
1992						
Participation Rate	43	32	41	51	48	42
Visit Rate	36	31	36	46	37	35
Michigan						
1989						
Participation Rate	51	33	51	—	55	51
Visit Rate	46	37	46	—	46	47
1992						
Participation Rate	54	36	54	—	66	50
Visit Rate	59	45	57	—	67	57
Tennessee						
1989						
Participation Rate	41	26	38	54	56	35
Visit Rate	38	29	35	57	45	36
1992						
Participation Rate	45	28	41	55	56	33
Visit Rate	45	31	39	55	53	36

¹ All rates are adjusted for enrollment duration and age-specific periodicity schedules of the American Academy of Pediatrics.

NOTES: AFDC is Aid to Families with Dependent Children. Children in capitated Medicaid plans, institutionalized children, and children who were dually enrolled in Medicaid and Medicare are excluded. Otherwise, for each analysis year separately, the study population includes children enrolled in Medicaid for at least 1 month. In Michigan, foster care children could not be identified separately from AFDC cash-assistance children.

SOURCE: Health Care Financing Administration, Office of Strategic Planning: Data from the Medicaid Tape-to-Tape Project, 1989 and 1992.

nizations only, for EPSDT alone and in combination with non-EPSDT services, for each study State and both analysis years. The study States were moderately successful in immunizing Medicaid children against common childhood diseases. In 1989 and 1992, in three of four study States (excluding Michigan), the majority of Medicaid-financed immunizations among Medicaid-enrolled children were delivered through the EPSDT program.

The effects of shadow programs on rates of immunization mirrored the effects found for rates of well-child visits already reported. The greatest impact of a shadow program was observed for Michigan in

both 1989 and 1992. Over time in this State, the EPSDT provider pool was greatly expanded, improving access to care and hence service utilization.

In 1989 adjusted immunization completion rates for EPSDT and non-EPSDT services combined indicated that children received one-half to two-thirds of recommended immunizations across study States. By 1992 these rates had improved such that 68-80 percent of scheduled vaccinations were delivered. When only age-appropriate immunizations were considered, completion rates were lower. About one-third to one-half of recommended age-appropriate immunizations were provided

Table 7
EPSDT and Overall Immunization Completion Rates, 1989 and 1992

State	EPSDT Immunizations Only				EPSDT Plus Other Well-Child Immunizations			
	Immunizations per User		Adjusted ¹ EPSDT Immunizations Only		Immunizations per User		Adjusted ¹ All Immunizations	
	1989	1992	1989	1992	1989	1992	1989	1992
	Number		Percent		Number		Percent	
California	2.6	3.6	57	61	2.5	3.5	66	68
Georgia	2.5	3.8	60	77	2.6	3.8	63	80
Michigan	1.9	2.8	8	30	2.5	3.2	54	69
Tennessee	2.8	3.9	56	66	2.8	3.9	61	79

¹ Adjusted for enrollment duration and age-specific periodicity schedules of the American Academy of Pediatrics.

NOTES: EPSDT is Early and Periodic Screening, Diagnostic, and Treatment services. Children in capitated Medicaid plans, institutionalized children, and children who were dually enrolled in Medicaid and Medicare are excluded. Otherwise, for each analysis year separately, the study population includes children enrolled in Medicaid for at least 1 month.

SOURCE: Health Care Financing Administration, Office of Strategic Planning: Data from the Medicaid Tape-to-Tape Project, 1989 and 1992.

in 1989. Comparable 1992 figures ranged from 48 to 61 percent.

During the period of this study, not only was there an increasing amount of public attention given to children's immunization status, but such services became more widely available through a variety of funding mechanisms accessible to all families regardless of insurance coverage or ability to pay. Thus, analyses based on Medicaid administrative claims only, such as in this study, may underrepresent total immunization completion rates for Medicaid-enrolled children.

Immunizations by Age and Eligibility Group

Age

Children in the group 3-6 years of age had the highest immunization completion rates (Table 9). Adjusted age-appropriate immunization rates for this group ranged from 67 to 84 percent in 1989 and from 86 to 92 percent in three of four study States (excluding California) by 1992. The high rates among children in this age group are very likely related to medical requirements

Table 8
EPSDT and Overall Immunization Completion Rates For Age-Appropriate Immunizations Only: 1989 and 1992

State	Adjusted ¹ EPSDT Only		Adjusted ¹ EPSDT Plus Non-EPSDT	
	1989	1992	1989	1992
	Percent			
California	43	46	48	50
Georgia	44	59	46	61
Michigan	5	22	39	48
Tennessee	43	49	47	58

¹ Adjusted for enrollment duration and age-specific periodicity schedules of the American Academy of Pediatrics.

NOTES: EPSDT is Early and Periodic Screening, Diagnostic, and Treatment services. Children in capitated Medicaid plans, institutionalized children, and children who were dually enrolled in Medicaid and Medicare are excluded. Otherwise, for each analysis year separately, the study population includes children enrolled in Medicaid for at least 1 month.

SOURCE: Health Care Financing Administration, Office of Strategic Planning: Data from the Medicaid Tape-to-Tape Project, 1989 and 1992.

Table 9
Immunization Completion Rates¹ For Age-Appropriate Immunizations Only, by State and Age Group: 1989 and 1992

State	All Children	Age Group				
		Under 12 Months	1-2	3-6	7-12	13-20
California						
1989	48	44	47	86	2	15
1992	50	48	52	77	8	17
Georgia						
1989	46	41	47	84	<1	22
1992	61	59	61	92	19	25
Michigan						
1989	39	37	38	67	3	9
1992	48	45	48	89	21	14
Tennessee						
1989	47	47	48	68	<1	10
1992	58	56	59	86	13	14

¹ Adjusted for enrollment duration and age-specific periodicity schedules of the American Academy of Pediatrics.

NOTES: Children in capitated Medicaid plans, institutionalized children, and children who were dually enrolled in Medicaid and Medicare are excluded. Otherwise, for each analysis year separately, the study population includes children enrolled in Medicaid for at least 1 month.

SOURCE: Health Care Financing Administration, Office of Strategic Planning: Data from the Medicaid Tape-to-Tape Project, 1989 and 1992.

for school entry, which undoubtedly serve as a strong motivator for both parents and providers.

Infants had some of the lowest immunization completion rates, receiving less than one-half of age-appropriate immunizations in 1989 but improving to 45-59 percent by 1992. Infants also had the most demanding schedule of immunizations, which could account for their often low rates compared with other age groups.

Children over 6 years of age had the greatest number of immunizations rendered “off schedule,” making their adjusted completion rates for all immunizations relatively high in some cases (data not shown). However, when only age-appropriate immunizations were considered, adjusted rates for these older children were extremely low, reaching a maximum of 25 percent in 1992.

Eligibility

Unlike the results for well-child visits, adjusted age-appropriate immunization completion rates showed inconsistent pat-

terns across eligibility groups, States, and years (Table 10). Rates improved over time for all groups across the four States, with the largest gains observed for the poverty-related group and, to a lesser extent, the medically needy/other children. By 1992 three eligibility groups tended to have the highest rates—AFDC cash assistance (49-60 percent), foster care (54-59 percent), and poverty-related children (47-67 percent). As with well-child visits, with the exception of California in 1989, the SSI blind/disabled group had the lowest rate of age-appropriate immunizations in both analysis years.

State-Level Rates for Preventive Dental Care

In all four States, utilization of preventive dental care was quite low, according to all the measures that were computed. Approximately one-fourth of Medicaid child enrollees received preventive dental care in Georgia, Michigan, and Tennessee; in California, less than 5 percent of child enrollees received any preventive dental

Table 10

Immunization Completion Rates¹ for Age-Appropriate Immunizations Only, by State and Eligibility Group: 1989 and 1992

State	Eligibility Group					
	All Children	Blind/Disabled	AFDC Cash	Foster Care	Poverty-Related	Medically Needy/Other
California						
1989	48	33	51	54	32	39
1992	50	38	53	56	53	44
Georgia						
1989	46	33	50	51	39	38
1992	61	43	60	59	64	54
Michigan						
1989	39	24	40	--	30	36
1992	48	39	49	--	47	46
Tennessee						
1989	47	24	46	44	50	40
1992	58	34	55	54	62	53

¹ Adjusted for enrollment duration and age-specific periodicity schedules of the American Academy of Pediatrics.

NOTES: AFDC is Aid to Families with Dependent Children. Children in capitated Medicaid plans, institutionalized children, and children who were dually enrolled in Medicaid and Medicare are excluded. Otherwise, for each analysis year separately, the study population includes children enrolled in Medicaid for at least 1 month. In Michigan, foster care children could not be identified separately from AFDC cash-assistance children.

SOURCE: Health Care Financing Administration, Office of Strategic Planning: Data from the Medicaid Tape-to-Tape Project, 1989 and 1992.

care (Table 11). There was almost no change in the percent of children receiving any preventive dental services between 1989 and 1992. This percentage was generally higher among children who had received a preventive medical care visit in Georgia and Michigan; however, this difference was more pronounced in 1989 compared with 1992.

Analyses of use of any preventive dental care stratified by age and eligibility group (data not shown) (Herz et al., 1996) revealed that—consistent with dental periodicity guidelines—the lowest rates by age group were observed for infants and toddlers. By 1992 for all States (excluding California), the highest percentage of children with any preventive dental care was found for the group age 7-12 years (36-42 percent). In California, the comparable figure was only 9 percent. The poverty-related eligibility group had the lowest percentage with any preventive dental care; in 1992 this percentage ranged from 0.6 to 16 percent across the study States. With respect to the eligibility group with the

highest rates of preventive dental care use, results were inconsistent across States.

Enrollment-adjusted service use rates for preventive dental care indicate that, on average, children received less than one service during the year, even in 1992 (Table 11). These overall service use rates are the result of the relatively low percentage of children who received any dental care as well as the receipt of few services among users. For all four States, there was little change in the enrollment-adjusted utilization rates between 1989 and 1992. The rate of preventive dental service use for recipients of a preventive medical care visit was notably higher only in Georgia.

Because utilization of dental services was consistently low across all study States for both years of analysis, additional analyses for key preventive dental care services (prophylaxis/cleaning, topical application of fluoride, and application of sealants) are provided here as illustrative of how little care is received. Detailed enrollment-adjusted service utilization rates for specific types of preventive dental care reveal

Table 11
Preventive Dental Care Utilization Rates and Receipt of Preventive Medical Care, by State:
1989 and 1992

State	All Children		Preventive Medical Care Visit During Year		No Preventive Medical Care Visit During Year	
	1989	1992	1989	1992	1989	1992
California						
Percent With Any Preventive Dental Service	4.0	4.3	3.3	3.6	4.3	4.5
Rate of Use of Preventive Dental Services ¹	0.06	0.06	0.04	0.05	0.07	0.07
Georgia						
Percent With Any Preventive Dental Service	24.2	23.9	37.5	28.8	19.8	22.0
Rate of Use of Preventive Dental Services ¹	0.42	0.41	0.57	0.45	0.36	0.39
Michigan						
Percent With Any Preventive Dental Service	22.4	22.8	25.5	23.9	21.1	22.2
Rate of Use of Preventive Dental Services ¹	0.36	0.43	0.37	0.40	0.36	0.45
Tennessee						
Percent With Any Preventive Dental Service	22.9	25.5	22.8	23.4	22.9	26.2
Rate of Use of Preventive Dental Services ¹	0.40	0.42	0.35	0.35	0.41	0.46

¹ Utilization rates are adjusted for enrollment duration and represent claims for preventive dental services per person-year-enrolled.

NOTES: Children in capitated Medicaid plans, institutionalized children, and children who were dually enrolled in Medicaid and Medicare are excluded. Otherwise, for each analysis year separately, the study population includes children enrolled in Medicaid for at least 1 month.

SOURCE: Health Care Financing Administration, Office of Strategic Planning: Data from the Medicaid Tape-to-Tape Project, 1989 and 1992.

some variation among the four States in the mix of services that Medicaid child-enrollees received (Table 12). In general, service use rates for prophylaxis/cleaning were higher than for topical application of fluoride, except in California. Claims for the application of sealants were found only for Michigan (1992) and Tennessee (1989 and 1992); consequently, there is no evidence suggesting that Medicaid-enrolled children received this preventive service in California or Georgia.

DISCUSSION

Preventive medical and dental services are designed to improve the overall health status and well-being of children. For eligible poor children, EPSDT was added to Medicaid in the late 1960s to focus delivery of these services under a targeted preventive care program initiative. Later changes to EPSDT through OBRA 89 were implemented to further enhance access to and use of these services.

The components of comprehensive well-child care, as defined under EPSDT for

Medicaid-enrolled children and by the AAP for all children, include a number of specific preventive services, such as health and developmental history; physical examination; appropriate immunizations; laboratory assessments; health education and anticipatory guidance; and various screening tests for vision, hearing, and dental problems. Service utilization measures developed for this study focus on the essential subset of these components of comprehensive well-child care—preventive care visits, immunizations, and preventive dental care.

Overall, the study States were somewhat successful in improving well-child visit and immunization rates between 1989 and 1992. Because well-child services were covered outside of EPSDT in three of four study States, the level of success in improving rates of preventive care was enhanced when rate computations combined EPSDT services with preventive care provided through the shadow program, permitting an assessment of all well-child care financed through Medicaid. Still, by 1992 only 43-54 percent of Medicaid children

Table 12
Rates¹ of Preventive Dental Care Service Use, by State and Receipt of Preventive Medical Care: 1989 and 1992

State	All Children		Preventive Medical Care Visit During Year		No Preventive Medical Care Visit During Year	
	1989	1992	1989	1992	1989	1992
California						
Prophylaxis/Cleaning	0.05	0.05	0.04	0.04	0.06	0.06
Topical Application of Fluoride	0.16	0.14	0.14	0.14	0.16	0.15
Sealants	—	—	—	—	—	—
Georgia						
Prophylaxis/Cleaning	0.41	0.39	0.56	0.44	0.35	0.37
Topical Application of Fluoride	0.36	0.36	0.50	0.40	0.31	0.34
Sealants	—	—	—	—	—	—
Michigan						
Prophylaxis/Cleaning	0.36	0.36	0.37	0.35	0.35	0.37
Topical Application of Fluoride	0.21	0.21	0.23	0.21	0.20	0.21
Sealants	—	0.07	—	0.05	—	0.08
Tennessee						
Prophylaxis/Cleaning	0.39	0.42	0.35	0.35	0.41	0.45
Topical Application of Fluoride	0.35	0.37	0.31	0.31	0.37	0.40
Sealants	0.30	0.32	0.16	0.14	0.36	0.41

¹ Utilization rates are adjusted for enrollment duration and represent claims for preventive dental services per person-year-enrolled.

NOTES: Children in capitated Medicaid plans, institutionalized children, and children who were dually enrolled in Medicaid and Medicare are excluded. Otherwise, for each analysis year separately, the study population includes children enrolled in Medicaid for at least 1 month.

SOURCE: Health Care Financing Administration, Office of Strategic Planning: Data from the Medicaid Tape-to-Tape Project, 1989 and 1992.

who were expected to obtain a well-child visit actually had at least one such visit, and only 36-59 percent of recommended visits were received. Similarly, children obtained 48-61 percent of recommended age-appropriate immunizations.

Receipt of preventive dental care was quite low among all study States, particularly in California. Neither receipt nor intensity of service use increased over time for this category of dental services. Well-child visits are a vehicle through which children gain access to dental services. In other analyses, nearly all children age 3 years and over were either treated during EPSDT screens or referred to other providers for dental care in Georgia and Michigan (Gavin, Bernardin, and Schroeder, 1996).

A variety of statewide factors were present during the analysis period that may in part account for the small-to-moderate observed improvements in well-child care.⁶ Gains over time in well-child visit

and immunization rates occurred in spite of the considerable growth in the Medicaid child population in three of four study States (excluding Michigan) by 1992. The ratio of child Medicaid enrollees to providers increased in three of four States. In addition, there were significant declines in the relative (to private sector) Medicaid fees for preventive care services in three of four States (excluding Michigan), which had a negative impact on the probability of physicians providing EPSDT and other preventive services. However, in these three States, this negative effect was offset by other factors. For example, the number of providers serving children and the average Medicaid caseload increased between 1989 and 1992 in all four States, with one major exception—the number of participating dental providers grew only modestly in three States and actually declined in

⁶ See Gavin et al., 1998, for a summary of major findings from all descriptive and multivariate analyses conducted for the project from which results for this article are drawn.

Michigan. Low dental provider supply was an important factor in the low preventive dental care utilization rates observed in this study.

State-level analyses give a broad picture of the patterns of receipt of well-child services over time. But detailed analyses by key child-level characteristics are needed to develop targeted strategies for better program operations.

Age and periodicity guidelines played an important role in the observed patterns of well-child service utilization in this study. Many more visits and immunizations are recommended for younger than for older children. Because expectations for the number of well-child visits were highest for infants, they were more likely than older children to receive at least one such visit. But the higher number of recommended visits and higher number of recommended immunizations for infants resulted in this age group receiving the lowest percentage of expected visits and immunizations compared with older children.

These results challenge the generally held view that infants and toddlers are more likely than their older counterparts to receive timely and appropriate well-child visits and immunizations. Are there differences across age groups in the receipt of illness-related care that might provide opportunities for provision of preventive services? That is, do some age groups receive more illness-related care and hence more preventive care? In other analyses (data not shown), a higher percentage of children with well-child visits also obtained illness-related outpatient visits, compared with children without such preventive care. This finding was consistent for all age groups, especially among those under 3 years of age. Similarly, for every age group, children who received well-child visits had more illness-related

outpatient visits than did those with no well-child visits. Thus, although there was a clear, positive relationship between receipt of illness-related care and well-child visits, this relationship was observed across all age groups and does not explain the low levels of preventive care receipt among infants compared with other age groups. Because periodicity guidelines call for so many more well-child visits and immunizations among infants, there are simply many more opportunities to fail to meet these guidelines for this youngest age group, despite their frequent contacts with medical providers for illness-related care.

Patterns of well-child visits and age-appropriate immunizations by eligibility group were inconsistent across States and analysis years. Foster care children had some of the highest utilization rates for well-child visits and immunizations, again, perhaps in part because of their foster parents' contractual obligations to address their health care needs. In contrast, SSI blind/disabled children consistently had some of the lowest rates for well-child visits and immunizations. Perhaps their need for separate preventive screening is minimal, because they have regular contact with the health care delivery system for their disabling conditions. Nonetheless, the low immunization rates for blind/disabled children are cause for concern.

Results from this study show that a considerable amount of preventive care was provided outside of EPSDT in 1989 and 1992, especially for older children (data not shown). This result may be due at least in part to the fact that EPSDT outreach is often targeted to younger children. The lack of organized outreach efforts through EPSDT or the regular Medicaid program may have contributed to the lack of improvement in utilization of preventive care among older children over time.

Preventive services for Medicaid children are available outside of EPSDT for several reasons. First, many States permit payment of well-child care through the regular Medicaid program (Herz, 1997). Second, limited provider participation in EPSDT also plays a role. Among medical practitioners, reasons cited for providing preventive services outside of EPSDT include a desire to retain their independence and perceptions that EPSDT reporting and billing requirements are more burdensome than those for other Medicaid services. Third, although payments for EPSDT screening visits are often higher than payments for comparable well-child services provided outside of EPSDT, providers may view the differential payment rates as inadequate to offset perceived disadvantages associated with participation in EPSDT.

In general, to understand the full extent of preventive care for children, policymakers should consider all Medicaid-financed well-child services, not just those rendered under EPSDT. Assessing the magnitude of preventive care provided outside of EPSDT to subgroups of Medicaid children may provide clues for restructuring State EPSDT programs with respect to targeted outreach activities and strategies to increase provider participation.

Given its existing administrative structure and historical functional responsibilities, the EPSDT program has a significant potential for coordinating the delivery of preventive services to Medicaid children. Unlike the regular Medicaid fee-for-service program under which few organized case management services are provided, State EPSDT programs can provide the critical vehicle through which access to care may be facilitated on a routine basis. In many States, EPSDT program staff are responsible for outreach and education, tracking of children to ensure receipt of services in a

timely manner, followup on referrals for diagnostic and treatment services, recruiting and monitoring of providers, and implementation of State and Federal regulations governing preventive services for children.

Finally, subsequent to the analysis years investigated in this study, many States have moved their child Medicaid populations into capitated managed care arrangements, which have traditionally focused attention on preventive care. The data sources used for this study did not permit an analysis of children in managed care, but did provide a fee-for-service baseline for further studies. Although detailed data on access to and use of such services under capitated arrangements are sparse currently, the potential is even greater for better case management and coordination of EPSDT preventive services for children under managed care. Future research should examine how children's use of preventive services is affected under capitation.

TECHNICAL NOTE

This Technical Note illustrates the calculation methods used in this study to determine adjusted rates of utilization for well-child services. The numerator for these rates are counts of services (by type) actually received. The denominator represents the expected number of services received adjusted for age at year end, periodicity guidelines, and duration of enrollment. Derivation of the denominator is described further here.

Periodicity guidelines specify the frequency and age intervals at which children should receive well-child visits and immunizations. Children in compliance with these schedules will have a different number of visits and immunizations during the year depending on their age at the end of the year. In addition, the presence of claims for such services in the analytic files

depends on the receipt of those services during periods of Medicaid enrollment.

For example, according to 1989 and 1992 AAP guidelines, children 10 months of age at the end of the year should have received five well-child visits; children 6 years of age at the end of the year should have had one well-child visit; and children reaching 18 years of age at the end of the year should have had one well-child visit sometime during the preceding 2 years. Assuming a full 12 months of enrollment during the analysis year, for the denominator of adjusted visit rates, a child 10 months of age would contribute five visits and a child 6 years of age would contribute one visit. Because a child of age 18 could obtain the single recommended visit either the year before or during the analysis year, the contribution to the denominator in this case is 0.5.

Because enrollment duration is often less than 12 full months during the period of observation, an additional adjustment is required. The expected number of visits for a child based on age and periodicity guidelines is weighted by the proportion of time during the analysis year that the child is enrolled in Medicaid (i.e., number of months enrolled divided by 12.) In the case of infants under 12 months of age at the end of each analysis year, the weight is the number of months enrolled divided by the number of months of life. For example, a child 10 months of age enrolled for 6 months would contribute 3.0 ($6/10 \times 5$) to the expected value in the denominator for an adjusted visit rate. Similarly, a child 6 years of age enrolled for 8 months would contribute 0.7 ($8/12 \times 1$), and a child 18 years of age enrolled for 4 months would contribute 0.2 ($4/12 \times 0.5$).

Computations for adjusted preventive care participation rates and adjusted immunization completion rates follow the same methods described in this article for adjusted preventive care visit rates. Once

counts of services actually received (numerator) and expected values (denominator) are determined for each child in the analytic files, adjusted percentages or rates are calculated for different subgroups of children (e.g., by age group).

HCFA requires States to submit an annual report, based on another methodological approach, that documents use of specific services under the EPSDT program. Currently known as the Form HCFA-416, this report has undergone some changes over time. During 1989 and 1992, the EPSDT participant and screening (visit) ratios reported to HCFA by States were not computed in a consistent manner across States and were not believed to provide accurate measures of States' success in reaching and screening Medicaid children. In particular, these ratios neglected to take periodicity recommendations and length of Medicaid enrollment into account and counted children in continuing care arrangements as having received all screens regardless of whether they actually received any screens. Subsequent to the analysis period for this study, HCFA issued revised guidelines to the States (effective 10/1/93) on how to more accurately compute participant and screening ratios by accounting for AAP age-specific periodicity schedules and average enrollment duration by age group.

The methodology used for the current Form HCFA-416 is similar to the methodology described in this article for computation of well-child participation and visit rates. The main differences between the two methodologies are:

- Form HCFA-416 counts only EPSDT services. The methodology used for this study produces rates that include both EPSDT services and well-child care delivered under the shadow program.
- In this study, a methodology was developed to assess immunization completion

rates for all immunizations combined and for age-appropriate immunizations only. Form HCFA-416 does not require reporting of immunization data.

- Form HCFA-416 summarizes rates for other EPSDT services including number of eligible children: referred for corrective treatment, receiving vision assessments, and receiving hearing assessments. These measures are excluded from this study.
- The number of eligible children receiving EPSDT dental screening assessments is also collected on Form HCFA-416. In the methodology used for this study, two different dental measures are provided: (1) percent of children with any preventive dental care, and (2) number of preventive dental services per person-year-enrolled. Preventive dental care includes prophylaxis/cleaning, topical application of fluoride, application of sealants, and other preventive services.

In 1996 HCFA formed an EPSDT Work Group to address continuing concerns about the accuracy and completeness of data submitted by States on Form HCFA-416 (Sredl, 1998). Three key areas that may change in a revised reporting form include: (1) formal inclusion of preventive services rendered outside of EPSDT but paid for by Medicaid, (2) use of State-specific periodicity guidelines in calculations of participant and screening ratios, and (3) expansion of reported dental services (i.e., to include preventive, diagnostic, and treatment services).

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