
Children's Preventive Care Use Under Two Mature Medicaid Managed Care Plans in California

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We investigated the extent to which children continuously enrolled in two mature county-organized Medicaid managed care plans for 6, 12, and 24 months received recommended well-child visits and immunizations. We also investigated whether any improvements in compliance were evident during the period 1989-92. Compliance was low for well-child visits and immunizations at the recommended ages regardless of eligibility group. Although slight improvements in immunizations were made over time, little progress was made in compliance with well-child visits. Continued vigilance is required to achieve the government's goal of 90 percent immunization compliance among 2-year-olds.

INTRODUCTION

The Santa Barbara Health Initiative (SBHI) and the Health Plan of San Mateo (HPSM) are two of the longest-running 1915(b) waiver programs in the United States; the SBHI was initiated in 1982 and the HPSM in 1987. As such, they provide a unique opportunity to investigate children's preventive care use in mature Medicaid managed care (MMC) programs.

Most studies of MMC have focused on cross-sectional program effects from newly enrolled Medicaid participants or have explored pre/post program effects in early

implementation years. In addition, previous studies could not always reliably gauge the impact of MMC because enrolled populations differed in systematic ways from non-enrolled comparison populations.

In this article, we examine preventive care use among infants and toddlers continuously enrolled in the SBHI and HPSM programs for 6, 12, and 24 months since birth during the years 1989-92. In particular, we investigate the extent to which children in two county-organized managed care health systems were compliant with national guidelines for the receipt of health supervision visits and childhood immunizations and whether improvements in preventive care use were realized as the programs matured.

Furthermore, we broke out the analysis by Medicaid eligibility category. In particular, we stratify between Aid to Families with Dependent Children (AFDC) enrollees and all other non-disabled enrollees to examine whether MMC differentially affected these groups. Because children enrolled under the poverty-related expansions are likely to be from families with higher income on average and because of the increased enrollment of immigrants in Medi-Cal (California's Medicaid program) during the early 1990s, the composition of other eligibility groups has changed over time. The greater diversity in background and the possibility for differential health status among different eligibility categories are potentially important distinctions that have not been examined for children in other research.

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BACKGROUND

A recent study of the preventive care use of children enrolled in California's traditional fee-for-service (FFS) Medi-Cal in 1989 and 1992 found virtually no improvement in either the percentage of children who had any recommended well-child visits (46-47 percent in both years), the percentage of well-child visits that were made (44 percent in both years), or the percentage of recommended childhood immunizations received by these children from 1989 to 1992 (48 percent in 1989 and 50 percent in 1992) (Gavin et al., 1998; Herz, Stredl, and Albers, 1996).

The only significant improvements seen in these measures occurred among infants (less than 12 months old at the end of the year), but the rates of compliance with national standards remained very low. The percentage of infants enrolled in the FFS Medi-Cal program who had any well-child visits increased from 51 percent in 1989 to 62 percent in 1992, the percentage of recommended visits made by infants increased from 35 percent to 41 percent, and the percentage of recommended immunizations received by infants increased from 44 percent to 48 percent (Herz, Stredl, and Albers, 1996).

Other studies have found equally low rates of preventive care use among Medicaid children (U.S. Government Accounting Office, 1993; Gavin, Farrelly, and Simpson, 1998). One study of immunization coverage rates among 2-year-olds continuously enrolled in the Tennessee Medicaid program from birth 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 (Griffin et al., 1995).

MMC presents opportunities for increased use of preventive care among

Medicaid children. The assignment of a primary care gatekeeper under these plans is designed to enhance access to routine primary and preventive care. Moreover, the availability of a "medical home" may enhance continuity of care and offer a network of providers not available and/or not easily accessible under the FFS system (Rosenbach and Gavin, 1998).

The HPSM and SBHI programs provide a unique opportunity to study the impact of one type of MMC arrangements on children's preventive care use. Even though our dataset spans a period through the early 1990s, our results are still highly relevant to current policy discussions, because many States are only now implementing new managed care programs and may gain insight from the experience of two of the oldest county-organized MMC programs extant. Both programs are at-risk county-organized health systems and are locally administered. Both programs require that all Medicaid eligibles sign up with a primary care provider (PCP), who is responsible for delivering all primary care and for issuing prior authorization for care from specialists and hospitals. PCPs are at financial risk in both plans; PCPs are paid on a capitation basis, wherein 80 percent of the capitation is advanced monthly, while the remaining 20 percent is withheld until the end of the year, when account adjustments are made. Overall, upwards of 70 percent of all primary care providers in each county, including institutional providers such as county health departments and federally qualified health centers, were participating in the plans (Research Triangle Institute, 1997).

Each plan contracts with local providers to deliver Medi-Cal-approved services in the area. However, certain services have been excluded, or "carved out," and are offered through regular FFS Medi-Cal. In particular, screening (or well-child) visits

under the Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) program, called the Child Health and Disability Prevention (CHDP) program, were carved out from the MMC programs in both counties during the study period (1989-92). Immunizations also were not covered under the capitation payment; thus, plan providers who delivered such services to plan enrollees could receive reimbursement by submitting claims for FFS reimbursement. Alternatively, they could refer patients to county health department clinics for these services. Our study investigated whether, when EPSDT services are carved out from capitated coverage in this manner (a relatively common practice in MMC programs), children received the recommended number of preventive care visits and immunizations—that is, whether PCPs were successful in ensuring that these services were received. We also investigated whether the likelihood that children received recommended preventive care improved over time as the county gained experience with MMC.

Methodology

We compare the rates of compliance with national guidelines for the receipt of well-child visits and childhood immunizations within and between the two counties over time. Because well-child visits and immunizations could be received by children either under the CHDP program or under the managed care programs, we combined data from different sources to obtain a complete utilization history for the study children. To identify children enrolled in the programs, we used enrollment records from the HCFA Medicaid research files known as the Tape-to-Tape

database.¹ CHDP paid claims records for EPSDT screening visits and immunizations were included in the Tape-to-Tape database each year from 1989-92. We supplemented these data with pseudo-claims (claims filed by HPSM and SBHI but without paid amounts) for preventive care visits and immunizations filed with the State of California by HPSM and SBHI. Few prior studies have had the ability to examine a population with the same level of detail as our study.

Our interest is in examining how the rates of children's preventive care use evolved over time within individual MMC counties, thus we do not explicitly model MMC results relative to a FFS comparison group. Other research, such as the aforementioned studies, compared MMC and FFS rates of compliance with children's preventive care services using larger data sets. Further, the comparison county available to us, Ventura, conducted an intensive outreach program during the period of our study, which is likely to limit the validity of any comparisons between MMC counties and FFS counties.

File Construction

We included in our analytical file beneficiaries who initially appeared in the Tape-to-Tape eligibility file at no more than 2 months of age and who maintained continuous eligibility through 6, 12, and 24 months of life. We omitted children with FFS coverage during these time periods. Because of the small number of Supplemental Security Income (SSI) children under 2 years of age

¹ This database includes all enrollment and claims data from the automated Medicaid information systems in California and three other States for calendar years 1980-92. Data maintained in this database have been edited and reformatted to produce uniform files that facilitate cross-State and cross-year comparative analyses.

enrolled in Medi-Cal in the two counties and the very different health care utilization of these infants, we also excluded SSI children from the analysis. From eligibility files, we obtained information on the children's date of birth, enrollment status by month, enrollment category, sex, and race. An unfortunate aspect of using administrative data is the paucity of covariates available to the researcher, most notably health status.

The enrollment and claims data were linked across time by Social Security number and aggregated to the person-month level. Because the periodicity schedules recommend visits and immunizations with a given vaccine at intervals no less than 2 months apart, we counted only one visit and one immunization of each vaccine type per month. In this manner, we avoided any duplication of service records that may have occurred in the CHDP and Tape-to-Tape files and the MMC pseudo-claims files. To avoid uncertainty in our outcome measures we only examined continuously enrolled children.

We used the American Academy of Pediatrics (AAP) guidelines for health supervision visits and childhood immunizations as the national guidelines for preventive care use against which to measure compliance among children enrolled in the MMC programs. We defined full compliance with AAP recommendations for health supervision visits as 3 visits in the first 6 months of life, 5 visits in the first 12 months of life, and 8 visits in the first 24 months of life. Our compliance criterion allows for some leniency from the guidelines because children often do not receive their own Medi-Cal identification number for several weeks after birth.² As a result, their early utilization information from the claims files would not be attributed to them.

Similarly, we defined full compliance with the AAP recommendations for immu-

nizations as 2 DTP immunizations and 2 OPV in the first 6 months of life; 3 DTP and 2 OPV immunizations in the first 12 months of life; and 4 DTP, 3 OPV, and 1 MMR immunizations in the first 24 months of life. These three vaccination types represent the basic immunization series for which the Public Health Service is seeking a 90-percent compliance rate among 2-year-olds by the year 2000 (Centers for Disease Control and Prevention, 1990).

While we made every effort to count all well-child visits and immunizations for which a record was included in either the CHDP or Tape-to-Tape and pseudo-claims files, we could not count services for which providers did not submit a claim and/or fill out the appropriate paperwork. Site visit interviews with providers reveal that this does occur (Research Triangle Institute, 1997). However, we have no way of determining the magnitude of unreported service provision. As a result, our compliance rates may underestimate true compliance.

Analytic Techniques

We performed both descriptive and multivariate analyses of these preventive care measures. For the descriptive analyses, we computed the percentages of continuously enrolled children at each of the three ages with no health supervision visits and with none of the basic series immuniza-

² Full compliance with AAP recommendations requires that children receive 4 visits in the first 6 months of life, 6 visits at 12 months, and 9 visits at 24 months. Full compliance with the immunization schedule was 3 diphtheria-tetanus-pertussis (DTP) immunizations and 2 oral-polio-vaccinations (OPV) by 6 or 12 months, and 4 DTP, 3 OPV, and 1 measles-mumps-rubella (MMR) immunizations by 24 months of age. Medi-Cal recommendations for health supervision visits and for the three vaccinations we study did not change for children under 2 years of age from 1989-92, except that in 1992 the fourth DTP and the third OPV was recommended at 15 months of age instead of 18 months of age as in the AAP schedule, which would not affect our measures; otherwise, the AAP schedule was identical to the Medi-Cal requirements. Because it is often difficult in claims data to reliably encompass the entire period from birth forward, particularly during the first few weeks of life, we chose our compliance criteria conservatively by allowing for one fewer visit than was required at each critical age.

Table 1
Number and Percent Distribution of Continuously Enrolled Medi-Cal Children at 6, 12, and 24 Months of Age Over Eligibility Group, by County: 1989-92

Eligibility Group	San Mateo			Santa Barbara		
	6 Months	12 Months	24 Months	6 Months	12 Months	24 Months
AFDC Recipients						
Number of Children	4,180	2,338	915	3,030	1,993	952
Percent	74.5	78.2	83.4	72.6	78.2	87.7
Other Eligibles						
Number of Children	1,428	651	182	1,142	557	134
Percent	26.5	21.2	16.6	27.4	21.8	12.3
All Children	5,608	2,989	1,097	4,172	2,550	1,086

NOTE: AFDC is Aid to Families with Dependent Children.

SOURCE: Health Plan of San Mateo and Santa Barbara Health Initiative administrative records, 1989-92.

tions and the percentages in full compliance with the AAP health supervision visit and the basic series immunization periodicity schedules. These data are presented by county and year of birth separately for AFDC recipients and other non-disabled Medicaid children eligible for the MMC programs. This latter group includes the medically needy, Ribicoff children (children in two-parent families with incomes less than the AFDC income cut-off), and children enrolled in Medicaid under the poverty-related expansions of the late 1980s and early 1990s. Because of the relatively small sample sizes, particularly for 24-month continuously enrolled children, pooling the non-disabled, non-AFDC enrollees was necessary.

In the multivariate analyses, we used logistic estimation procedures to determine the statistical significance and magnitude of any changes over time in the probability of compliance with the AAP health supervision visit and the basic immunization series periodicity schedules at the three different age cutoffs. The basic multivariate specification was:

$$Pr(Compliance_i) = f(\beta_0 + \beta_1 AFDC_i + \beta_2 1990_i + \beta_3 1991_i + \beta_4 1992_i + \beta_5 AFDC_i \times 1990_i + \beta_6 AFDC_i \times 1991_i + \beta_7 AFDC_i \times 1992_i + X_i \gamma + \epsilon_i)$$

where $i = 1, \dots, N$; X is a vector of person-level attributes including race and sex; AFDC indicates enrollment under AFDC categories; 1990, 1991, and 1992 indicate year of birth; Greek letters represent parameters to be estimated; and we assume $f(\cdot)$ to be a logistic distribution. The interaction terms between the enrollment category and the year of birth allow us to determine how compliance with AAP recommendations for health supervision visits and immunizations differed for birth-cohorts of children over time in the two different enrollment groups. The program effects over time are measured against those for children in the "other non-disabled" eligibility category who were born in 1989.

Results

As shown in Table 1, considerably more children were enrolled for their first 6 months of life than for either their first 12 months or first 24 months of life. During the period 1982-92, 5,608 children were continuously enrolled from birth to 6 months of age in the HPSM, 2,989 were continuously enrolled from birth to 12 months of age, and 1,097 were continuously enrolled from birth to 24 months of age.

Table 2
Percent Distribution of Continuously Enrolled Medi-Cal Children at 6, 12, and 24 Months of Age Over Demographic Characteristics, by County: 1989-92

Demographic Characteristics	San Mateo			Santa Barbara		
	6 Months	12 Months	24 Months	6 Months	12 Months	24 Months
AFDC Recipients						
Year of Birth						
1989	14.3	17.6	33.3	17.6	22.0	40.1
1990	21.5	26.8	46.7	23.3	29.6	50.4
1991	31.2	40.1	20.0	31.5	40.2	9.5
1992	33.0	15.5	—	27.6	8.2	—
Race/Ethnicity						
White	18.8	19.2	20.8	28.0	28.8	29.0
Black	22.9	27.7	33.1	6.8	7.3	7.7
Other	58.3	53.1	46.1	65.2	63.9	63.3
Sex						
Male	52.6	51.3	52.0	50.8	49.7	49.6
Female	47.4	48.7	48.0	49.2	50.3	50.4
Other Eligibles						
Year of Birth						
1989	12.1	12.1	22.0	12.5	14.8	27.6
1990	18.5	25.7	51.1	18.5	24.4	63.4
1991	34.2	47.5	26.9	36.3	51.3	9.0
1992	35.2	14.7	—	32.7	9.5	—
Race/Ethnicity						
White	10.4	8.5	7.2	9.0	8.0	9.0
Black	4.3	4.9	8.2	1.4	1.3	2.2
Other	85.3	86.6	84.6	89.6	90.7	88.8
Sex						
Male	49.2	46.5	51.1	53.1	53.0	52.2
Female	50.8	53.5	48.9	46.9	47.0	47.8

NOTE: AFDC is Aid to Families with Dependent Children.

SOURCE: Health Plan of San Mateo and Santa Barbara Health Initiative administrative records, 1989-92.

Because AFDC children had longer enrollment periods than children enrolled in the other eligibility categories, the percentage of these children who were AFDC recipients increased with the age cut-off, from 74.5 percent among children continuously enrolled in the HPSM from birth to 6 months of age to 83.4 percent of children enrolled from birth to 24 months of age.

The same trends were evident in Santa Barbara. During the period 1989-92, 4,172 children were continuously enrolled in SBHI from birth to 6 months of age, 2,550 were continuously enrolled from birth to 12 months of age, and 1,086 were continuously enrolled from birth to 24 months of age. Whereas 72.6 percent of children continuously enrolled in SBHI for their first 6 months of life were AFDC recipients, 87.7

percent of children enrolled from birth to 24 months of life were AFDC recipients.

In both eligibility groups and counties, an increasing percentage of children were born in the latter years of the study period (Table 2). In addition, the majority of each subgroup was characterized by the Tape-to-Tape eligibility data as “other” races, which in California is generally comprised of Hispanics and Asians. In both county programs, a considerably greater proportion of enrollees in the “other non-disabled eligibility” category compared with AFDC enrollees were designated as “other” race/ethnicities. San Mateo had a much higher proportion of Black enrollees than Santa Barbara. Also the higher relative proportions of Black enrollees found for the 6-month populations compared with

Table 3
Compliance With the AAP Schedule of Health Supervision Visits Among Continuously Enrolled Medi-Cal Children, by Age and Year, AFDC Enrollees

Year of Birth	San Mateo			Santa Barbara		
	No Visits	Partial Compliance	Full Compliance	No Visits	Partial Compliance	Full Compliance
6 Months ¹						
1989	32.7	60.3	7.0	14.3	66.4	19.3
1990	33.6	57.4	9.0	18.0	69.4	12.6
1991	36.6	54.0	9.4	19.1	68.3	12.6
1992	31.7	60.5	7.8	14.7	68.3	17.0
All Years	33.8	57.8	8.4	16.8	68.2	15.0
12 Months ²						
1989	15.2	79.3	5.5	6.7	78.9	14.4
1990	17.0	76.2	6.8	9.1	83.8	7.1
1991	15.7	77.6	6.7	5.5	85.7	8.8
1992	13.7	83.0	3.3	4.3	89.5	6.2
All Years	15.7	78.3	6.0	6.7	84.0	9.3
24 Months ³						
1989	8.4	90.3	1.3	3.4	89.6	7.0
1990	9.9	88.8	4.7	3.1	93.6	3.3
1991	8.2	89.6	2.2	1.2	98.8	0.0
All Years	9.1	87.8	3.1	3.0	92.5	4.5

¹ Full compliance at 6 months of age is considered to be 3 visits.

² Full compliance at 12 months of age is considered to be 5 visits.

³ Full compliance at 24 months of age is considered to be 8 visits.

NOTES: AAP is American Academy of Pediatrics. AFDC is Aid to Families with Dependent Children.

SOURCE: Health Plan of San Mateo and Santa Barbara Health Initiative administrative records, 1989-92.

the 24-month populations suggest that Black enrollees were disproportionately long-term enrollees in the MMC programs. Finally, approximately equal proportions of the study population were male and female.

Health Supervision Visits

AFDC Recipients

The majority of infants and toddlers had at least one EPSDT or other well-child visit, with the probability of at least one visit increasing with age and enrollment duration (Table 3). However, overall in San Mateo, one-third of AFDC infants continuously enrolled for their first 6 months of life, 15.7 percent of AFDC infants continuously enrolled in their first year of life, and 9.1 percent of AFDC children continuously enrolled for their first 2 years of life had no

well-child visits paid by CHDP or the MMC programs. The low rates of health supervision visits are alarming given that, by the age of 6 months, children should have had multiple visits.

The percentage of AFDC infants and toddlers continuously enrolled in the HPSM who were in full compliance with the AAP-recommended periodicity schedule for health supervision visits was alarmingly low as well. Only 8.4 percent of AFDC infants enrolled from birth to 6 months of age, 6.0 percent of AFDC infants enrolled from birth to 12 months of age, and 3.1 percent of AFDC children enrolled from birth to 24 months of age met our definition of full compliance with the AAP guidelines.

Compliance with the national guidelines was considerably higher in Santa Barbara compared with San Mateo. Among AFDC infants and toddlers continuously enrolled since birth in SBHI, the percentages of

Table 4
Compliance With the AAP Schedule of Health Supervision Visits Among Continuously Enrolled Medi-Cal Children, by Age and Year, Other Non-Disabled Enrollees

Year of Birth	San Mateo			Santa Barbara		
	No Visits	Partial Compliance	Full Compliance	No Visits	Partial Compliance	Full Compliance
6 Months¹						
1989	39.9	43.9	16.2	30.1	55.2	14.7
1990	28.8	56.4	14.8	21.3	66.8	11.9
1991	30.5	55.4	14.1	19.8	65.7	14.5
1992	26.6	58.7	14.7	17.4	64.4	18.2
All Years	30.0	55.3	14.7	20.6	64.2	15.2
12 Months²						
1989	13.9	68.4	17.7	9.8	81.7	8.5
1990	9.6	75.4	15.0	4.4	83.8	11.8
1991	9.7	79.3	11.0	5.6	81.1	13.3
1992	9.4	83.3	7.3	7.6	83.0	9.4
All Years	10.1	77.6	12.3	6.1	82.1	11.8
24 Months³						
1989	7.5	85.0	7.5	10.8	81.1	8.1
1990	5.4	89.2	5.4	1.2	94.1	4.7
1991	4.1	87.7	8.2	0.0	100.0	0.0
All Years	5.5	87.9	6.6	3.7	91.1	5.2

¹ Full compliance at 6 months of age is considered to be 3 visits.

² Full compliance at 12 months of age is considered to be 5 visits.

³ Full compliance at 24 months of age is considered to be 8 visits.

NOTE: AAP is American Academy of Pediatrics.

SOURCE: Health Plan of San Mateo and Santa Barbara Health Initiative administrative records, 1989-92.

children who had no well-child visits were half as large or less than among HPSM AFDC infants and toddlers, and the percentages who met our definition of full compliance were nearly double in the first 6 months and approximately 50 percent greater in the first 12 and 24 months of life (Table 3). Nevertheless, these rates were still extremely low.

Furthermore, no improvement in compliance with the AAP recommendations for health supervision visits was evident over time as the programs matured. For example, in HPSM, 32.7 percent of AFDC infants in the 1989 cohort continuously enrolled at 6 months of age compared with 31.7 percent of the 1992 cohort had no well-child visits, and 7.0 percent of the 1989 cohort compared with 7.8 percent of the 1992 cohort were in full compliance. In Santa Barbara, we see a similar pattern.

Other Non-Disabled Children

In general, other non-disabled infants and toddlers continuously enrolled in HPSM were less likely to have had no well-child visits and were more likely to have met our definition of full compliance than were AFDC infants and toddlers continuously enrolled in HPSM. Thirty percent of other non-disabled infants continuously enrolled for their first 6 months of life, 10.1 percent of other non-disabled infants continuously enrolled for their first 12 months of life, and 5.5 percent of other non-disabled children continuously enrolled for their first 24 months of life had no well-child visits (Table 4). The percentage of other non-disabled infants continuously enrolled in HPSM who were in full compliance with the AAP recommendations for health supervision visits was 14.7 percent at 6

Table 5
Logistic Regression Results for Health Maintenance Visit Compliance Among Continuously Enrolled Children

Independent Variable	6 Months		12 Months		24 Months	
	San Mateo	Santa Barbara	San Mateo	Santa Barbara	San Mateo	Santa Barbara
Number	5,608	4,172	2,989	2,550	1,097	1,086
AFDC	-0.958** (0.263)	0.306 (0.262)	-1.282** (0.369)	0.551 (0.420)	-2.029* (0.798)	-0.076 (0.643)
AFDC 1990 x	0.344 (0.336)	-0.244 (0.355)	0.426 (0.453)	-1.126* (0.521)	1.701 (0.940)	-0.295 (0.859)
AFDC 1991 x	0.468 (0.308)	-0.486 (0.311)	0.770 (0.429)	-1.040* (0.470)	0.467 (1.074)	-0.014 (351.700)
AFDC 1992 x	0.201 (0.308)	-0.404 (0.308)	0.468 (0.611)	-1.026 (0.709)	—	—
Black	-0.373* (0.153)	-0.407 (0.227)	-0.289 (0.238)	-0.214 (0.320)	-0.683 (0.455)	-0.236 (0.654)
Other	-0.388* (0.118)	-0.145 (0.105)	-0.108 (0.196)	-0.129 (0.160)	-0.870* (0.410)	0.033 (0.337)
Female	0.128 (0.090)	0.051 (0.087)	0.018 (0.142)	-0.071 (0.134)	0.219 (0.327)	0.460 (0.299)
1990	-0.074 (0.271)	-0.243 (0.318)	-0.208 (0.366)	0.351 (0.477)	-0.371 (0.760)	-0.518 (0.794)
1991	-0.116 (0.246)	-0.011 (0.275)	-0.568 (0.348)	0.494 (0.433)	0.148 (0.805)	-11.542 (330.200)
1992	-0.058 (0.243)	0.268 (0.272)	-1.021* (0.492)	0.110 (0.615)	—	—
Constant	-1.410** (0.229)	-1.656** (0.257)	-1.428** (0.345)	-2.217* (0.425)	-1.864* (0.703)	-2.750** (0.708)

*Significance at the 0.05 level.

**Significance at the 0.01 level.

NOTES: Standard errors in parentheses. AFDC is Aid to Families With Dependent Children.

SOURCE: Health Plan of San Mateo and Santa Barbara Health Initiative administrative records, 1989-92.

months of age, 12.3 percent at 12 months of age, and 6.6 percent at 24 months of age.

In Santa Barbara, AFDC and other non-disabled infants and toddlers continuously enrolled in SBHI had similar rates of compliance with the AAP health supervision visit periodicity schedule. At 6 months of age, 20.6 percent had no well-child visits and 15.2 percent were in full compliance; at 12 months of age, 6.1 percent had no well-child visits and 11.8 percent were in full compliance; and at 24 months, 3.7 percent had no well-child visits and 5.2 percent were in full compliance.

The only subgroup of other non-disabled infants and toddlers with an obvious improvement over time in compliance with the AAP recommendations for health supervision visits was infants continuously enrolled in SBHI at 6 months of age.

Multivariate Results

The full regression results are presented in Table 5. The marginal odds ratios computed from the estimated coefficients in the multivariate logistic regression equations for the probability of full compliance

Table 6
Marginal Odds Ratios for the Probability of Compliance With the AAP Health Supervision Visit Recommendations Among Continuously Enrolled Medi-Cal Children: 1989-92

	6 Months		12 Months		24 Months	
	AFDC	Other	AFDC	Other	AFDC	Other
San Mateo						
1989	0.384**	1.000	0.277**	1.000	0.131*	1.000
1990	0.502**	0.929	0.345**	0.812	0.497	0.690
1991	0.546*	0.890	0.340**	0.567	0.243	1.159
1992	0.443**	0.943	0.160**	0.360*	—	—
Santa Barbara						
1989	1.358	1.000	1.734	1.000	0.927	1.000
1990	0.835	0.785	0.799	1.421	0.415	0.602
1991	0.827	0.989	1.005	1.639	0.000	0.000
1992	1.185	1.307	0.694	1.116	—	—

* Significance at the 0.05 level.

** Significance at the 0.01 level.

NOTES: Odds ratios relative to 1989 non-AFDC non-disabled enrollees. AAP is American Academy of Pediatrics. AFDC is Aid to Families With Dependent Children.

SOURCE: Health Plan of San Mateo and Santa Barbara Health Initiative administrative records, 1989-92.

with the AAP periodicity schedules for health supervision visits are shown in Table 6. All ratios are referenced against other non-disabled children born in 1989.

The results agree with the descriptive findings of a significantly lower probability of compliance among AFDC infants and toddlers in San Mateo compared with infants and toddlers enrolled under other non-disabled eligibility categories. In addition, the discrepancy widened with age and enrollment duration.

No consistent improvement over time was evident in San Mateo among AFDC recipients. Whereas the marginal odds ratio rose slightly in 1990 and 1991 from its 1989 level for AFDC recipients, it fell back slightly in 1992. None of the odds ratios for the 1990-92 other non-disabled birth cohorts in San Mateo at 6 and 24 months were statistically different from the odds for the 1989 cohort. However, among infants continuously enrolled for their first 12 months of life, there was a marked decline in the probability of compliance with the AAP recommendations. The 1992 cohort was significantly less likely than the 1989 cohort to have been in compliance.

In Santa Barbara, we found no statistically significant differences between AFDC and other non-disabled children continuously enrolled in SBHI who were in compliance with the AAP periodicity schedule for health supervision visits. Nor did we find any consistent or significant trends over time among either eligibility group.

Childhood Immunizations

AFDC Recipients

At 6 months of age, more than one-third (37.1 percent) of AFDC infants continuously enrolled in HPSM had no immunizations paid through either the CHDP or HPSM programs, and less than one-third (27.6 percent) met our definition of full compliance with AAP recommendations for the basic series immunizations (Table 7). Some of these children who remained in the program until their first birthday caught up on their missed immunizations in the latter 6 months of the year, but most did not; 31.8 percent of AFDC infants continuously enrolled in HPSM from birth to 12 months of age were in full compliance

Table 7
Compliance With the AAP Schedule of Childhood Immunizations Among Continuously Enrolled Medi-Cal Children, by Age and Year, AFDC Enrollees: 1989-92

Year of Birth	San Mateo			Santa Barbara		
	No Immunizations	Partial Compliance	Full Compliance	No Immunizations	Partial Compliance	Full Compliance
6 Months ¹						
1989	35.9	36.9	27.2	16.9	35.9	47.2
1990	37.5	32.9	29.6	18.7	38.2	43.1
1991	38.3	33.1	28.6	19.4	32.8	47.8
1992	36.1	38.3	25.6	18.4	33.6	48.0
All Years	37.1	35.3	27.6	18.5	34.9	46.6
12 Months ²						
1989	18.8	49.4	31.8	7.2	39.0	53.8
1990	21.3	49.2	29.5	8.9	42.4	48.7
1991	19.3	49.7	31.0	7.5	42.1	50.4
1992	15.7	46.7	37.6	7.4	33.3	59.3
All Years	19.2	49.0	31.8	7.8	40.8	51.4
24 Months ³						
1989	9.7	68.2	22.1	3.3	54.0	42.7
1990	9.9	64.0	26.1	2.7	55.1	42.2
1991	11.5	72.6	15.9	1.1	66.3	32.6
All Years	10.2	67.1	22.7	2.7	55.8	41.5

¹ Full compliance at 6 months of age is considered to be 2 DTP, 2 OPV, and 0 MMR immunizations.

² Full compliance at 12 months of age is considered to be 3 DTP, 2 OPV, and 0 MMR immunizations.

³ Full compliance at 24 months of age is considered to be 4 DTP, 3 OPV, and 1 MMR immunizations.

NOTES: AAP is American Academy of Pediatrics. AFDC is Aid to Families with Dependent Children. DTP is diphtheria-tetanus-pertussis. OPV is oral-polio-vaccinations. MMR is measles-mumps-rubella.

SOURCE: Health Plan of San Mateo and Santa Barbara Health Initiative administrative records, 1989-92.

with the recommendations, but 19.2 percent still had not had a single immunization paid through the CHDP or HPSM programs.

AFDC children remaining in the program through their second birthday were more likely to have had at least one visit (89.8 percent at 24 months versus 80.8 percent at 12 months and 62.9 percent at 6 months), but they were less likely to have caught up with all immunizations and to have received the additional immunizations recommended between 12 and 24 months of age. Only 22.7 percent of AFDC infants continuously enrolled from birth to their second birthday were in full compliance with the recommendations.

Compared with HPSM beneficiaries, AFDC children continuously enrolled in SBHI were much more likely to have had an immunization through the CHDP or SBHI programs and to be in full compliance with the AAP immunization recommendations (Table 7). Like the HPSM

AFDC beneficiaries, the longer AFDC children remained in the SBHI program, the more likely they were to have had some immunizations. Nearly all (97.3 percent) of 2-year-olds who had been continuously enrolled in SBHI since birth had at least one immunization paid through CHDP or SBHI.

Also similar to the HPSM findings, compliance with the immunization guidelines improved slightly in the second half of children's first year of life but fell back somewhat in the second year of life. Among children continuously enrolled in SBHI, 46.6 percent were in full compliance at 6 months of age, 51.4 percent were in full compliance at 12 months of age, and 41.5 percent were in full compliance at 24 months of age.

Although variations occurred in the compliance rates over birth cohorts, no consistent trends were evident in the descriptive data (Table 7).

Table 8
Compliance With the AAP Schedule of Childhood Immunizations Among Continuously Enrolled Medi-Cal Children, by Age and Year, Other Non-Disabled Enrollees: 1989-92

Year of Birth	San Mateo			Santa Barbara		
	No Immunizations	Partial Compliance	Full Compliance	No Immunizations	Partial Compliance	Full Compliance
6 Months ¹						
1989	45.7	34.1	20.2	30.8	34.2	35.0
1990	33.3	36.4	30.3	23.7	39.3	37.0
1991	33.8	29.1	37.1	19.8	32.5	47.7
1992	29.4	35.0	35.6	18.2	33.0	48.8
All Years	33.6	33.1	33.3	21.4	34.1	44.5
12 Months ²						
1989	17.7	46.9	35.4	14.6	45.2	40.2
1990	15.6	50.3	34.1	7.4	42.6	50.0
1991	13.6	48.9	37.5	10.5	50.2	49.3
1992	12.5	35.4	52.1	9.4	30.2	60.4
All Years	14.4	47.0	38.6	10.2	40.6	49.2
24 Months ³						
1989	10.0	72.5	17.5	5.4	51.4	43.2
1990	5.4	63.4	31.2	1.2	64.7	34.1
1991	10.2	61.2	28.6	0.0	75.0	25.0
All Years	7.7	64.8	27.5	2.2	62.0	35.8

¹ Full compliance at 6 months of age is considered to be 2 DTP, 2 OPV, and 0 MMR immunizations.

² Full compliance at 12 months of age is considered to be 3 DTP, 2 OPV, and 0 MMR immunizations.

³ Full compliance at 24 months of age is considered to be 4 DTP, 3 OPV, and 1 MMR immunizations.

NOTES: AAP is American Academy of Pediatrics. DTP is diphtheria-tetanus-pertussis. OPV is oral-polio-vaccinations. MMR is measles-mumps-rubella.

SOURCE: Health Plan of San Mateo and Santa Barbara Health Initiative administrative records, 1989-92.

Other Non-Disabled Children

Similar to the results for well-child visits, other non-disabled infants and toddlers continuously enrolled in HPSM were slightly more likely to have had some immunizations and to have been in full compliance with the AAP immunization recommendations (Table 8). In Santa Barbara, compliance rates for other non-disabled infants and toddlers were roughly equivalent to those for AFDC recipients. The small increase in compliance experienced from 6 to 12 months of age and the subsequent decline from 12 to 24 months of age seen for AFDC beneficiaries were also evident for other non-disabled children in both San Mateo and Santa Barbara.

A trend toward increasing compliance with AAP immunization recommendations was much more obvious among other non-disabled children in the first year of life.

Among infants continuously enrolled in HPSM, compliance rose from 20.2 percent for the 1989 cohort to 35.6 percent for the 1992 cohort at 6 months of age and from 35.4 percent for the 1989 cohort to 52.1 percent for the 1992 cohort at 12 months of age. Similarly, among infants continuously enrolled in SBHI, compliance rose from 35.0 percent for the 1989 cohort to 48.8 percent for the 1992 cohort at 6 months of age and from 40.2 percent for the 1989 cohort to 60.4 percent for the 1992 cohort at 12 months of age.

Multivariate Results

The full regression results are presented in Table 9. The marginal odds ratios computed from the estimated coefficients in the multivariate logistic equations for the probability of full compliance with the AAP periodicity schedules for childhood

Table 9
Logistic Regression Results for Childhood Immunization Compliance Among Continuously Enrolled Children

Independent Variable	6 Months		12 Months		24 Months	
	San Mateo	Santa Barbara	San Mateo	Santa Barbara	San Mateo	Santa Barbara
Number	5,608	4,172	2,989	2,550	1,097	1,086
AFDC	0.394 (0.211)	0.511** (0.197)	-0.154 (0.260)	0.485* (0.246)	0.314 (0.443)	-0.019 (0.350)
AFDC 1990 x	-0.438 (0.260)	-0.250 (0.254)	-0.060 (0.318)	-0.554 (0.311)	-0.538 (0.506)	0.379 (0.428)
AFDC 1991 x	-0.781** (0.239)	-0.512* (0.228)	-0.123 (0.292)	-0.473 (0.281)	-1.051 (0.579)	0.398 (0.786)
AFDC 1992 x	-0.879** (0.239)	-0.543* (0.232)	-0.432 (0.347)	-0.555 (0.406)	—	—
Black	-0.239* (0.100)	-0.295 (0.151)	-0.369** (0.125)	-0.401* (0.181)	-0.608** (0.211)	-0.176 (0.266)
Other	-0.199* (0.081)	-0.058 (0.077)	-0.238* (0.108)	-0.240* (0.097)	-0.303 (0.188)	0.006 (0.144)
Female	0.123* (0.059)	0.072 (0.062)	0.123 (0.078)	-0.162* (0.080)	-0.045 (0.144)	-0.017 (0.124)
1990	0.553* (0.232)	0.090 (0.226)	-0.064 (0.287)	0.382 (0.284)	0.727 (0.474)	-0.397 (0.404)
1991	0.858** (0.212)	0.533** (0.201)	0.083 (0.264)	0.362 (0.255)	0.617 (0.525)	-0.841 (0.746)
1992	0.804** (0.211)	0.578** (0.204)	0.678 (0.312)	0.813* (0.361)	—	—
Constant	-1.272** (0.201)	-0.602** (0.191)	-0.437 (0.255)	-0.091 (0.245)	-1.205** (0.453)	-0.258 (0.364)

*Significance at the 0.05 level.

**Significance at the 0.01 level.

NOTES: Standard errors in parentheses. AFDC is Aid to Families With Dependent Children.

SOURCE: Health Plan of San Mateo and Santa Barbara Health Initiative administrative records, 1989-92.

immunizations are shown in Table 10. Other non-disabled children born in 1989 is the reference group.

At 6 months of age, children in the later birth cohorts had significantly higher odds ratios in both eligibility groups compared with other non-disabled children in the 1989 cohort. In San Mateo, the odds ratios for other non-disabled children were higher than those for AFDC recipients born in the 1990s, but in Santa Barbara, the odds ratios were roughly equivalent.

At 12 months of age, an increasing odds of compliance is also evident but does not

reach significance until the 1992 cohort. No significant differences among children continuously enrolled for their first 2 years of life were evident in either HPSM or SBHI.

SUMMARY AND CONCLUSION

We investigated the extent to which infants and toddlers continuously enrolled in two county-organized MMC health systems for 6, 12, and 24 months since birth received recommended well-child visits and childhood immunizations at recommended age intervals. In addition, we

Table 10
Marginal Odds Ratios for the Probability of Compliance With the AAP Immunization Recommendations Among Continuously Enrolled Medi-Cal Children:1989-92

	6 Months		12 Months		24 Months	
	AFDC	Other	AFDC	Other	AFDC	Other
San Mateo						
1989	1.483	1.000	0.857	1.000	1.369	1.000
1990	1.664*	1.738*	0.757	0.938	1.654	2.069
1991	1.601*	2.358**	0.823	1.086	0.887	1.853
1992	1.376	2.233*	1.095	1.969*	—	—
Santa Barbara						
1989	1.667**	1.000	1.624*	1.000	0.981	1.000
1990	1.420	1.094	1.367	1.465	0.963	0.672
1991	1.702**	1.704**	1.454	1.436	0.629	0.431
1992	1.727**	1.782**	2.104**	2.255*	—	—

* Significance at the 0.05 level

** Significance at the 0.01 level

NOTES: Odds ratios relative to 1989 non-AFDC non-disabled enrollees. AAP is American Academy of Pediatrics. AFDC is Aid to Families With Dependent Children.

SOURCE: Health Plan of San Mateo and Santa Barbara Health Initiative administrative records, 1989-92.

investigated differences in these measures among AFDC recipients and other non-disabled beneficiaries and whether any improvements in compliance with national guidelines for these services were evident during the period from 1989-92.

Significant proportions of infants and toddlers continuously enrolled in the managed care plans had no well-child visits or childhood immunizations paid through Medicaid. At 6 months of age, no more than 15 percent of children were receiving all recommended well-child visits at the appropriate age intervals and only one-third of infants in the HPSM program and slightly fewer than half of infants in the SBHI program were receiving all recommended immunizations on time.

While the percentage with no visits or immunizations declined with age and enrollment duration, the percentage of children who had received all their recommended well-child visits and immunizations was lower at 24 months compared with 6 months of continuous enrollment since birth. Other non-disabled enrollees in the HPSM plan were more likely than AFDC recipients to receive recommended well-child visits and childhood immuniza-

tions but the two groups of children enrolled in SBHI were equally likely to have received these preventive services.

Although our results are not directly comparable to the findings of Herz, Sredl, and Albers (1996), they suggest that rates of participation for well-child visits in HPSM and SBHI were better than the aggregate level of participation in FFS Medi-Cal.³ Herz and colleagues found a 63-percent rate of participation for well-child visits among 1- to 2-year-old children under FFS in 1989 and a 64-percent rate of participation in 1992; we observed a 85- to 93-percent rate of participation among continuously enrolled 1-year-old children in 1989 and an 86- to 96-percent rate of participation in 1992. However, for immunizations Herz and colleagues found a 66-percent completion rate for immunization among 1- to 2-year-old children in 1989 and a 70-percent completion rate in 1992; we observed a 32- to 53-percent rate of full compliance for immunizations among

³ In addition to pooling 1- and 2-year-olds together instead of viewing them separately as we do, an important difference between our measures is that we restrict our sample to continuously enrolled children, while Herz, Sredl, and Albers (1996) examined all children regardless of time enrolled and adjusted for enrollment duration in their estimate of expected visits against which they measured compliance.

continuously enrolled 1-year-old children in 1989 and 38- to 60-percent rate of full compliance in 1992.

The more mature SBHI program had greater compliance with well-child visit and childhood immunization recommendations than did the HPSM program. However, even though Santa Barbara County is a geographically larger area than San Mateo, San Mateo County has more physicians, hospitals, patients, as well as greater ethnic diversity, which could account for difficulties ensuring compliance throughout the county. Yet, from 1989-92, no gains were made among infants and toddlers in either HPSM or SBHI in terms of compliance with the AAP health supervision visit schedule. Furthermore, although a significant improvement in compliance with the AAP childhood immunization schedule was evident in both county programs, more than 40 percent of young children were not up to date in the receipt of the basic series of childhood immunizations in 1992. Our findings may indicate that carving out EPSDT services might not have been a successful course of action by the State. However, definitive conclusions are only possible with greater observation of local factors and policies in order to better structure empirical analyses.

Our findings suggest that continued vigilance is required regardless of the organization of medical care services to achieve the goal of the Secretary of Health and Human Services of 80 percent participation in EPSDT or the Healthy People 2000 goal of 90 percent of 2-year-olds up to date in their basic series childhood immunizations.

REFERENCES

- Centers for Disease Control and Prevention: Healthy People 2000: National Health Promotion, Disease Prevention Objectives for the Year 2000. *Journal of the American Medical Association* 264(16):2057-2060, 1990.
- Gavin, N.I., Adams, E.K., Herz, E.J., et al.: The Use of EPSDT and Other Health Care Services by Children Enrolled in Medicaid: The Impact of OBRA'89. *Milbank Quarterly* 76(2):207-250, 1998.
- Gavin, N.I., Farrelly, M.C., and Simpson, J.B.: Children's Use of Primary and Preventive Care Under Medicaid Managed Care. *Health Care Financing Review* 19 (4):45-68, Summer 1998.
- Griffin, M.R., Daugherty, I., Reed, G.W., et al.: Immunization Coverage among Infants Enrolled in the Tennessee Medicaid program. *Archives of Pediatric and Adolescent Medicine* 149:559-564, 1995.
- Herz, E.J., Sredl, K., and Albers, L.A.: *Trends in the Use of EPSDT and Other Health Care Services by Children under Medicaid, 1989 and 1992*. Prepared for the Office of Research and Demonstrations, under Health Care Financing Administration Contract Number 500-92-0066. March 14, 1996.
- Research Triangle Institute: *Evaluation of Medicaid Managed Care Programs with 1915(b) Waivers: Final Interim Report*. Prepared for the Office of Research and Demonstrations, Health Care Financing Administration under Health Care Financing Administration Contract Number 500-92-0033. Washington, DC. February 1997.
- Rosenbach, M.L., and Gavin, N.I.: Early and Periodic Screening, Diagnosis, and Treatment and Managed Care. *Annual Review of Public Health* 19:507-525, 1998.
- U.S. General Accounting Office: *Medicaid HealthPASS: An Evaluation of a Managed Care Program for Certain Philadelphia Recipients*. GAO/HRD-93-67. Washington, DC. May 1993.

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