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The Impact of an Innovative Reform to the South Carolina Dental Medicaid System

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Objective. To evaluate the effectiveness of an innovative reform in 2000 to the Dental Medicaid program in South Carolina.
Data Sources/Study Setting. South Carolina Medicaid enrollment data and dental services utilization data from 1998, 1999, and 2000.
Study Design. The study was observational and retrospective in nature. Quarterly data were used in general linear regression models to examine time trends in the percent of Medicaid enrollees ages 21 and younger who received dental services. Trends in the total number of dental procedures provided per Medicaid enrollee were also analyzed, with sub-analyses performed on the four most frequent categories of procedures.
Data Collection/Extraction Methods. Data were provided by the state's Quality Improvement Organization.
Principal Findings. From 1998 to 1999, there was a downward trend in the number and percent of Medicaid enrollees ages 21 and younger receiving dental services and in the total number of services provided. This trend was dramatically reversed in 2000.
Conclusions. The January 2000 dental Medicaid reform in South Carolina had marked impact on Medicaid enrollees' access to dental services.

Key Words. Medicaid, dental care for children, health care reform, insurance, health, reimbursement, health services accessibility

The Medicaid program was established in 1965 (Mitchell 1991), and amendments to the Medicaid program instituted in 1968 required all states to include dental care for individuals under 21 years of age as part of the Early and Periodic Screening, Diagnostic, and Treatment (EPSDT) service (U.S. Department of Health and Human Services 2000). Low levels of provider participation, by both physicians and dentists, have plagued the Medicaid program since its inception (U.S. Department of Health and Human Services 2000). This relative shortage of willing suppliers has persisted in the face of numerous reforms to the Medicaid program. Historically, low levels of

reimbursement have been cited as one of the main factors that lead to low volume of aggregate supply of services, as Medicaid programs around the United States have traditionally suffered from reimbursement rates dramatically lower than those of the private market (Mitchell 1991). However, research into the effect of fee changes on provider participation has yielded somewhat equivocal results regarding the ability of fee increases to change provider behavior (Fossett and Peterson 1989; Adams 1994; Perloff et al. 1997; Coburn, Long, and Marquis 1999). To date, no dental Medicaid reform has been proven in published medical literature to dramatically improve access to dental care for children; nor has any such reform been shown to increase the likelihood that a dentist provides services to Medicaid recipients.

Given the large number of families without private insurance and/or dental health insurance coverage, lack of access for children to regular dental services is an acute public health problem. Data from the National Health and Nutritional Examination III survey indicated that 17 percent of even very young children (i.e., 2–4 year olds) have dental caries (Kaste et al. 1996). By age 17, nearly 80 percent of children will have experienced tooth decay. Caries rates are even higher among rural, low income, and minority populations, and among children of less educated parents (i.e., individuals who traditionally are most likely to be covered by Medicaid) (Evans et al. 1996; Kaste et al. 1996; Vargas, Crall, and Schneider 1998).

Only a few papers in the economics and medical literature have examined the impact of Medicaid fees on dentist participation in Medicaid and supply of services to the Medicaid population (Kushman 1978; Mayer et al. 2000; Nainar 2000). While Kushman did find a small impact of fees on dentist participation, this effect was not observed in the study by Mayer et al. However, Mayer et al. did find a small and marginally significant ($p = .10$) positive effect of fees on dentist Medicaid volume, conditional on the dentist treating at least 10 enrollees per month.

South Carolina has faced many challenges with its population having access to dental treatment and prevention. The state has over 4 million people (1.2 million under age 21) and approximately 1,600 licensed dentists, yielding a ratio of 750 children per licensed dentist. A state assessment showed that EPSDT screenings identified dental caries as the number one health problem

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among South Carolina children during the 1995–1996 school year (personal communication, Raymond Lala, State Oral Health Coordinator, March 2003). A preschool health assessment performed by the South Carolina Department of Health and Environmental Control in 1997 showed that only 13 percent of children entering targeted schools (high degree of enrolled students on the reduced-fee or free lunch program) had received at least one preventive dental service (personal communication, Raymond Lala, South Carolina Oral Health Coordinator, March 2003), despite the fact that in this state, any child enrolled in the overall Medicaid program is eligible to receive dental benefits. In 1997, the Centers for Medicare and Medicaid Services reported that only 25.5 percent (83,497 of 327,424) of children eligible for EPSDT services in South Carolina actually received a dental assessment (Centers for Medicare and Medicaid Services 2000).

As a possible solution to some of these challenges, South Carolina instituted several measures as part of a reform to the dental Medicaid system. Among other measures, the reform included increasing reimbursement rates for each type of service to the 75th percentile of S.C. dentists' charges (based upon 1998 figures). Prior to 2000, dentists were receiving, on average, approximately 35 percent of their charges billed to Medicaid (personal communication, Phil Latham, Operations Manager, South Carolina Dental Association, August 2003). Table 1 lists some selected procedures, including common ones and others which experienced significant changes in reimbursement rates from 1998 to 2000. Several other initiatives were undertaken during this time frame, including the development of a children's oral health coalition, active recruitment by the state dental association to encourage dentists to participate in Medicaid, the streamlining of the Medicaid billing process, and the addition of a dental component to Family Support Services (an agency within the State Department of Health and Environmental Control [DHEC]) to address patient compliance with appointments and treatment. All changes are described in a compendium published online by the American Dental Association (American Dental Association 2003). The oral health coalition was an organized effort involving DHEC and the S.C. Dental Association, and a variety of other public and private partners that addressed oral health problems in the state and sought to secure funding from the state's General Assembly for the increased Medicaid fees for dental providers studied here. Starting in the beginning of 2000, dentists were recruited by the state dental association via mailed information packets and one-on-one phone calls. New Medicaid enrollees were educated by health department staff about their coverage options and available dental providers. Billing Medicaid for dental

Table 1: Change in Medicaid Reimbursement from 1998 to 2000 in Selected Dental Procedures

Procedure	*1998 Medicaid Reimbursement ($)*	*2000 Medicaid Reimbursement ($)*	*Percent Increase*
Periodic oral exam	13	22	69.2
Complete oral evaluation	14	38	171.4
Intraoral radiographs—full-mouth series	28	70	150.0
Posterior/anterior/lateral skull & facial bone survey film	29	92	217.2
Panoramic film	27	55	103.7
Prophylaxis—adult	17	44	158.8
Prophylaxis—child	7	31	82.4
Topical fluoride—child	9	17	88.9
Topical fluoride—adult	9	18	100.0
Sealants—through age 15—one treatment every 3 years	11	27	145.5
Amalgam—1 surface—primary	21	52	147.6
Resin—1 surface—anterior	25	69	176.0
Crown—porcelain-fused to high noble metal—anterior	295	609	106.4
Bicuspid root canal (excluding final restoration)	175	448	156.0
Obturator prosthesis—for deficient function	175	3,506	1903.4
Alveoloplasty not with extractions—per quadrant	30	647	2056.7
Vestibuloplasty—ridge extension	55	1,158	2005.5
Local anesthesia	20	15	– 25.0

procedures was made easier by a number of changes, including the introduction of electronic billing, electronic funds transfer, and the removal of a requirement that dentists first bill third-party insurance carriers prior to billing Medicaid. The purpose of this study was to evaluate the effectiveness of this reform in terms of the number of children who, as a result of the reform, received dental services covered by Medicaid as well as the number of dental services provided to those children.

METHODS

Medicaid claims data for dental services provided to children were obtained from the state's Quality Improvement Organization for services provided in

1998, 1999, and 2000. For several practical reasons, the data were provided in summary form at the county-month-age group level. There were two age groups provided: (1) children 2 years old or younger and (2) children between the ages of 3 and 21. In addition to the claims data, the aggregated data included both the total number of Medicaid enrollees and the total number of Medicaid enrollees receiving dental services for the specific age group, living in the specific county, during the specific month in question. The data were provided for all dental services as well as for certain categories of dental services, including diagnostic, dentures, emergency, endodontics, orthodontics, pain/behavioral management, periodontics, preventive, restorative, and surgical. Individual procedures were assigned to these categories by obtaining a consensus from a panel of three dentists. In all but a few cases, categories were assigned unanimously. When disagreement occurred, the majority classification was adopted.

The effect of the reform on the percent of Medicaid enrollees receiving dental Medicaid services (the dependent variable) was modeled using a generalized estimating equations (GEE) regression model, with controls for clustering at the county level and serial (AR(12)) correlation. Analyses were performed separately for each age group (i.e., 0–2 years old and 3–21 years old). The primary independent variable was an indicator for the year 2000, the year in which the reform began. A number of covariates were incorporated into the models, including the year in which the services were provided (to account for any secular trend in the volume of services provided), monthly indicators (to account for seasonal fluctuations), county-level fixed effects, and monthly varying county-specific characteristics of the Medicaid enrollees (percent of service recipients who were male; percent who were black; percent who were disabled; percent who were receiving Aid to Families with Dependent Children-Foster Care [AFDC-FC]; percent who were in elementary, middle, and high school [older age group only]; and total number of Medicaid enrollees in the particular county). The models were estimated using and autoregressive (AR) error structure with 12 lags and controlling for county-level fixed effects. AR modeling processes allow for correlation across time, which is especially important when the data reflect seasonal fluctuations. Twelve lags (corresponding to the 12 months of the year) were included in the error structure due to the results of a series of Hausman tests comparing AR(12) to lower order AR processes. The models also implemented the Huber–White correction to account for heteroskedasticity across counties. A similar model was used to examine the effect of the reform on the total number of dental procedures provided per Medicaid enrollee over time.

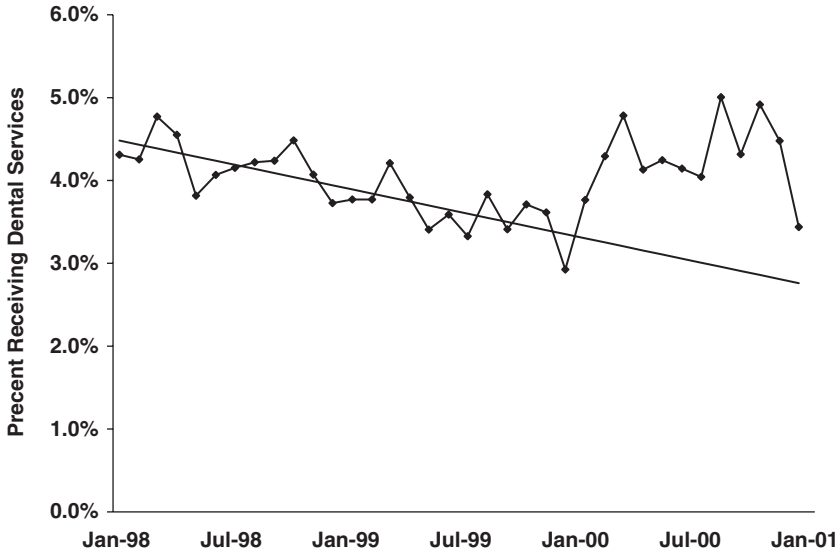
The AR(12) modeling techniques were also used to evaluate the effect of the reform in the four most frequent diagnostic categories: diagnostic, preventive, restorative, and surgical procedures. The dependent variables were the number of services of each type per enrollee in each county, by month. The primary independent variable was again an indicator for the year of reform. Covariates were identical to those for the previously described models predicting the percent of recipients receiving dental Medicaid services and total number of dental Medicaid procedures performed per enrollee. As with the earlier models, analyses were stratified by age group.

RESULTS

In an "average" month during 1998, 15,925 of 377,690 (4.2 percent) Medicaid enrollees ages 21 and under received dental services. This percentage dropped to 3.6 percent (16,133 of 447,069) in 1999, followed by an increase to 4.3 percent (21,687 of 504,642) in 2000. On an annual basis, 32.4 percent of these enrollees received at least one service in 1998, 28.5 percent in 1999, and 31.0 percent in 2000. Figure 1 demonstrates the downward trend in the monthly percentage of enrollees receiving dental services over 1998 and 1999, followed by a sharp increase in January 2000. A regression line fitted to 1998–1999 data points is also included on the graph to demonstrate what would have been expected in the year 2000, had the 1998/1999 trend continued. During this time period it was also interesting to note that the number of procedures performed per recipient changed varied little (1998: 4.3 procedures per recipient; 1999: 4.2; 2000: 4.4). Results from the GEE regression model for the younger age group confirmed that, after adjusting for the number of Medicaid enrollees and other covariates, the percent of Medicaid enrollees receiving dental services was significantly ($p<.001$) greater in the year 2000 than what would have been expected had the reform not occurred, given the trends observed in 1998 and 1999. In the older age group (ages 3–21), after adjusting for the number of Medicaid enrollees and other covariates, the percent of enrollees receiving services in each county was significantly ($p<.001$) greater in 2000 compared with what would have been expected had the reform not occurred. Both models indicated significant monthly variation.

For both age groups combined, the total number of procedures performed in each year is listed in Table 2 along with the number of procedures per Medicaid enrollee and category-specific totals. Note that while the distribution across the procedure categories did not change much over time,

Figure 1: Percent of South Carolina Medicaid Enrollees Ages 0–21 Who Received at Least One Dental Procedure during the Months of 1998, 1999, and 2000.



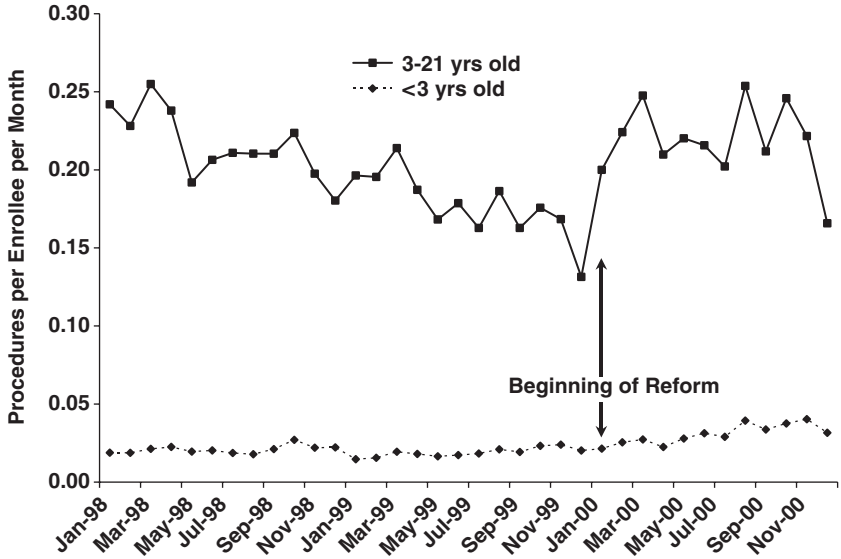
there was a dramatic increase in the number of procedures performed per Medicaid enrollee in the year 2000. Substantial increases from 1998/1999 to 2000 in the number of procedures per enrollee were observed for each category with one exception, pain/behavioral management. Figure 2 illustrates on a month-by-month basis the average number of dental procedures provided per Medicaid enrollee. A clear increase in the procedures per enrollee can be observed beginning in January of 2000. The GEE regression models again confirmed that for the younger age group, after adjusting for the number of Medicaid enrollees and other covariates, the total number of procedures performed per enrollee was significantly higher in the year 2000 ($p<.001$) compared with what would have been expected given the trends in 1998 and 1999. For the older age group, after adjusting for the number of Medicaid enrollees and other covariates, the number of procedures per enrollee was also significantly ($p<.001$) higher in 2000 than in what would have been expected.

Table 3 summarizes the results from the procedure models, indicating that for both age groups the reform had a statistically significant impact on the number of services of each type provided per Medicaid enrollee on a monthly basis in South Carolina counties. For example, in the younger age group the

Table 2: Number of Procedures and Number of Procedures per Medicaid Enrollee by Category and Year

	Year									
	1998 Procedures			*1999 Procedures*			*2000 Procedures*			
Procedure Category	*N*	*% of Yearly Total*	*Number per Medicaid Enrollee*	*N*	*% of Yearly Total*	*Number per Medicaid Enrollee*	*N*	*% of Yearly Total*	*Number Per Medicaid Enrollee*	*% Increase over 1998/1999 per Enrollee Average*
Diagnostics	294,878	35.1	0.78	297,354	35.9	0.67	398,149	33.9	0.79	9.14
Dentures	163	0.0	0.00	154	0.0	0.00	609	0.1	0.00	211.0
Emergency	735	0.1	0.00	721	0.1	0.00	1,918	0.2	0.00	113.6
Endodontics	23,521	2.8	0.06	20,568	2.5	0.05	33,800	2.9	0.07	23.7
Orthodontics	4,418	0.5	0.01	3,035	0.4	0.01	4,858	0.4	0.01	4.2
Pain/behavioral management	22,768	2.7	0.06	18,520	2.2	0.04	14,413	1.2	0.03	– 43.8
Periodontics	4,518	0.5	0.01	3,455	0.4	0.01	6,274	0.5	0.01	26.3
Preventive	272,609	32.5	0.72	272,765	32.9	0.61	372,335	31.7	0.74	10.8
Restorative	137,394	16.4	0.36	133,534	16.1	0.30	231,264	19.7	0.46	38.4
Surgical	78,845	9.4	0.21	78,625	9.5	0.18	112,262	9.6	0.22	15.7
Total	839,849	100.0	2.22	828,731	100.0	1.85	1,175,882	100.0	2.33	14.3

Figure 2: Number of Dental Procedures Provided per South Carolina Medicaid Enrollee by Age Group during the Months of 1998, 1999, and 2000.



diagnostic services rose by 0.003 units per enrollee per month in the average S.C. county in the reform year of 2000, compared with the earlier years of 1998 and 1999, representing approximately a 54.4 percent increase over 1998 and a 63.8 percent increase over 1999. Note that this effect was found while controlling for factors such as monthly time trends, year indicators, county

Table 3: Results from the AR(12) Models Examining the Reform Effects on the Number of Dental Procedures Performed Each Month per Medicaid Enrollee, by Category of Service

		Age 0–2		*Age 3–21*	
Procedure Category	*Comparison*	*Contrast Estimate* (% increase)*	*p-Value*	*Contrast Estimate* (% increase)*	*p-Value*
Diagnostic	2000 versus 1998/1999	+0.003 (61.3)	<0.001	+0.017 (24.6)	<0.001
Preventive	2000 versus 1998/1999	+0.003 (59.2)	<0.001	+0.018 (28.2)	<0.001
Restorative	2000 versus 1998/1999	+0.004 (124.2)	<0.001	+0.015 (46.3)	<0.001
Surgical	2000 versus 1998/1999	+0.003 (77.0)	<0.001	+0.004 (23.2)	<0.001

*The contrast estimate reflects the estimated change in the number of monthly services per enrollee because of reform.

characteristics (including fixed effects), and enrollee demographics. Note also that for both the younger and older age groups, there were significantly more services per enrollee in all categories provided in the year 2000 than in 1998 or 1999. In the model for the older age group comparing 2000 to 1999/1998 and adjusting for covariates, the number of diagnostic, preventive, restorative, and surgical procedures performed per enrollee was increased (significantly) by 24.6, 28.2, 46.3, and 23.2 percent, respectively. Additional results can be found in the online-only appendix available at http: www.blackwellpublishing.com/ products/journals/suppmat/HESR/HESR00405/HESR 00405 sm.htm.

CONCLUSIONS

These analyses have shown that the January 2000 dental Medicaid reform in South Carolina has had a substantial impact on children's access to dental care. From January 1998 through December 1999, there was a downward trend in both the total number of children receiving services and the percent of Medicaid enrollees who received services; the reform reversed this trend. The percentage of children receiving at least one dental service dropped from 32.4 percent in 1998 to 28.5 percent in 1999, but rose back to 31.0 percent in 2000. After multivariate adjustment, the number of services provided per enrollee was significantly greater in 2000 than what would have been expected given the trends in 1998 and 1999 for the both age groups. Substantial increases were also noted in all but one category of dental procedures, and multivariate regression analyses confirmed that the increases in the four categories with the highest volume (diagnostic, preventive, restorative, and surgical) were all highly statistically significant when comparing 2000 to what would have been expected given the trends from the prior years.

While this reform did greatly increased access to dental care for Medicaid enrollees, there clearly remains room for improvement. The reform appears to have lead to a relatively large improvement in access (compared to past reforms in other states) of Medicaid children to dental services. The fact remains, however, that approximately 65 percent of child enrollees received no dental services during the year of reform.

Although the goal of this paper was to discuss the impact of this reform on the percent of children receiving Medicaid dental services and the numbers of procedures performed per enrollee, a separate issue has to do with the experience of the dentists in South Carolina during this time frame. First, it is interesting to note that the practice type distribution (i.e. general dentistry,

pediatric dentistry, other) hardly changed at all from 1998 to 2000 period (1998: 77.1 percent general, 3.2 percent pediatric, 19.7 percent other; 1999: 77.6 percent general, 3.2 percent pediatric, 19.2 percent other; 2000: 77.7 percent general, 3.3 percent pediatric, 19.0 percent other). Results from separate analyses (to be described in more detail in a separate paper) indicated that the percent of South Carolina dentists who provided at least 10 Medicaid services per quarter went from 26.1 percent in 1998 to 25.8 percent in 1999, to 34.0 percent in 2000. After adjustment for dentist characteristics and other factors similar to the ones described for the models in the current paper, it was determined that that the reform encouraged about 160 dentists who had not serviced Medicaid recipients prior January of 2000 to begin participation. A separate model that conditional on dentists' participation in the Medicaid program found that the reform had no significant effect on the number of Medicaid services provided by the participating dentists.

Informal interviews with a number of South Carolina dentists indicate that the change in reimbursement is the primary reason for this reform's success. However, the other aspects of the reform also contributed to its success including the children's oral health coalition (which successfully lobbied to secure funding necessary for the reimbursement rate changes), the dental association's efforts (to encourage more dentists to accept Medicaid by making them aware of the reimbursement changes), and to a lesser extent the streamlining of the Medicaid billing process and the efforts by the state Family Support Services agency to address patient compliance with appointments and treatment.

Consequently, while this study did not perform a cost–benefit analysis of the January 2000 dental Medicaid fee reform (a task beyond the scope of this work), the results do strongly indicate that the reform achieved its desired results. Although the reimbursement change was not the only aspect of the reform, other states attempting to improve access to dental care for children covered by Medicaid may wish to consider emulating the South Carolina experiment of setting reimbursement rates at the 75th percentile of dentist's fees. Informal interviews with a number of South Carolina dentists indicate that the change in reimbursement is the primary reason for this reform's success.

This study has several key strengths. Month-by-month "snapshots" of both the number of enrollees receiving services and the number of various procedures performed were available for examination, clearly illustrating the trend that occurred prior to reform. Because data were available on the universe of services covered by Medicaid, no sampling error was introduced into

the analyses. Additionally, the analyses were multivariate in nature, so that they were able to adjust for any changes in the number of enrollees served and the number of services provided that could be attributed to a variety of county-specific attributes.

Several limitations should also be noted. Of primary concern is the fact that the study design was not a randomized design; nor was there any type of contemporaneous control group. The pre/postdesign used in this study is subject to biases associated with temporal trends such as those caused by other reforms. Fortunately (from the perspective of being able to interpret our findings), there were no reforms to the South Carolina Dental Medicaid program during the time period of interest, other than the reforms already outlined in this study (personal communication, Janice Tippins, Program Manager of the Medicaid Dental Program Area, May 2004). The State Children's Health Insurance Program (SCHIP) that was instituted in South Carolina in 1997 expanded the eligibility criteria for Medicaid, and the state's welfare reforms of 1995 and 1996 put significant limits on welfare benefits. Both of these policies may have had some residual effects resulting in increased numbers of Medicaid eligible children during our study's time frame. Since all of our analyses are based on a time period after both SCHIP and the welfare reforms became active, and because the statistical models account for any trends that may have been occurring throughout the 1998 to 2000 time frame due to the SCHIP and welfare reform, it is unlikely that our findings would be significantly influenced by effects from such reforms.

There are also other limitations that should be noted. For example, the costs of the entire reform were not available. Medicaid reimbursements for dental procedures totaled approximately $18.6 million for the 2 years prior to reform, and $58.6 million in 2000; however, these figures reflect payments for both children and adults, and no costs were estimated for aspects of the reform aside from the reimbursement rate increase. The study is also somewhat limited by the time frame available for analysis. For example, it is difficult to know how frequently dental services were provided to Medicaid enrollees prior to 1997 or subsequent to 2000. It is possible that the downward trends across 1998 and 1999 and the increase in 2000 in the percent of children receiving services was an artifact of transitory, cyclical changes. Correspondence with the state's Oral Health Coordinator, however, indicates that access continues to improve despite 140,000 additional children being considered Medicaid eligible since 2000 (personal communication, Raymond Lala, South Carolina Oral Health Coordinator, March 2003). The analysis is also limited by only having data available at the county-month-age group level, and thus little

information pertaining to the Medicaid enrollees (including those who received dental services) was able to be presented. Also because of this lack of data at the enrollee level, the study was limited by the available age groupings, as only 1 cut point was feasible. The age groupings were chosen based on the thought that fewer children and services would be expected in the younger category, and the fact that the reimbursement changes would not have had as great an impact in that age group.

Overall, South Carolina's dental Medicaid reform of the year 2000 had an overwhelmingly positive effect on the accessibility of dental care to children enrolled in Medicaid. Given the enormity of the problem of caries in this and other similar populations around the country, increasing reimbursement rates for dental services must be considered when addressing this type of public health problem in the future. Given that South Carolina subsequently reduced the budget of all state programs by 4.5 percent in the face of a $246 million projected deficit (Anonymous 2003), it remains to be seen whether future dental Medicaid reimbursement rates will stay high. Future research should address the sustainability of this type of reform.

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