TOOTH DECAY IS A COMMON DISEASE among children and adolescents. Although tooth decay can significantly affect quality of life, it often goes untreated. For example, about 24% of children aged 2 to 8 years had untreated dental caries in 1999-2004.

More than one-third of children are covered by public health insurance, primarily Medicaid and the Children’s Health Insurance Program (CHIP). Medicaid, created by Title XIX of the Social Security Act enacted in 1965, provides federal matching funds to states for the coverage of health and long-term care services for low-income individuals. Eligibility rules and services covered are determined by states within federal guidelines. CHIP was created by the Balanced Budget Act of 1997 (and reauthorized by Congress in 2009) to provide federal matching funds to states for coverage of children and some parents with incomes too high to qualify for Medicaid, but for whom private health insurance was either unavailable or unaffordable. The programs are run by states within guidelines set by the federal government. States may design their CHIP programs as independent programs separate from Medicaid (separate child health programs), use CHIP funds to expand their Medicaid programs (CHIP Medicaid expansion programs), or combine these approaches (CHIP combination programs).

Coverage of dental care for children and adolescents covered by Medicaid and CHIP is required, although states have wide latitude in setting payment levels to dentists.

Context Although Medicaid removes most financial barriers to receipt of dental care among children and adolescents, Medicaid recipients may not be able to access dental care if dentists decline to participate in Medicaid because of low payment levels or other reasons.

Objective To describe the association between state Medicaid dental fees in 2 years (2000 and 2008) and children’s receipt of dental care.

Design, Setting, and Participants Data on Medicaid dental fees in 2000 and 2008 for 42 states plus the District of Columbia were merged with data from 33,657 children and adolescents (aged 2-17 years) in the National Health Interview Survey (NHIS) for the years 2000-2001 and 2008-2009. Logit models were used to estimate the probability that children and adolescents had seen a dentist in the past 6 months as a function of the Medicaid prophylaxis fee and control variables including age group, race, poverty status, and state and year effects. The effect of fees on children with Medicaid relative to a control group, privately insured counterparts, served to separate Medicaid’s effect on access to care from any correlation between the Medicaid fee or changes in fees by state and other attributes of states.

Main Outcome Measure Whether a child or adolescent had seen a dentist in the past 6 months.

Results On average, Medicaid dental payment levels did not change significantly in inflation-adjusted terms between 2000 and 2008, although a difference existed for some states, including in 5 states plus the District of Columbia, where payments increased at least 50%. In 2008-2009, more children and adolescents covered by Medicaid (55%, 95% confidence interval [CI], 53%-57%) had seen a dentist in the past 6 months than did uninsured children (27%, 95% CI, 24%-30%), but fewer than children covered by private insurance (68%, 95% CI, 67%-70%). Changes in state Medicaid dental payment fees between 2000 and 2008 were positively associated with use of dental care among children and adolescents covered by Medicaid. For example, a $10 increase in the Medicaid prophylaxis payment level (from $20 to $30) was associated with a 3.92 percentage point (95% CI, 0.54-7.50) increase in the chance that a child or adolescent covered by Medicaid had seen a dentist.

Conclusion Higher Medicaid payment levels to dentists were associated with higher rates of receipt of dental care among children and adolescents.

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CHILDRN AND ADOLESCENT ACCESS TO DENTAL CARE

rates for providers including dentists. These rates vary greatly by state. Previous research has generally found a positive correlation between state Medicaid fees and the fraction of private physicians who treat Medicaid patients. Very little work has been done on the effect of state dental fees on participation of dentists in the Medicaid program. The research that has been done has been limited to single states, such as North Carolina, South Carolina, and California. Because low reimbursement rates have been cited as reasons for lack of participation of dentists in Medicaid in particular states, this article relies on national data to estimate the association of state Medicaid payment rates for dental care in 2 years (2000 and 2008) with the receipt of dental care among children covered by Medicaid compared with other children.

METHODS

Data on Medicaid payment levels to dentists by state were obtained for 3 dental services in 2000 from a survey of state Medicaid programs conducted by the Lewin Group and 7 dental services in 2008 from a survey of programs conducted by the Urban Institute. The child prophylaxis fee was one of the fees surveyed in 2008. The 2 services surveyed in both years were adult prophylaxis and amalgam for 2 surfaces of a permanent tooth. The Medicaid child prophylaxis fee in 2000 by state was approximated by applying the state child-to-adult prophylaxis fee ratio in 2008 (on average, 75%) to adult prophylaxis fees in 2000 by state. This approximation is not expected to introduce much error in the measurement of child prophylaxis fees in 2000 because the fees for different services are highly correlated across states, suggesting that, in general, states with relatively generous fees for 1 service (eg, child prophylaxis) also have relatively generous fees for other services (eg, adult prophylaxis and amalgam for 2 surfaces of a permanent tooth). For example, in 2008, the simple correlation coefficient between adult and child prophylaxis fees across states was 0.92, between adult prophylaxis and amalgam for 2 surfaces of a permanent tooth was 0.91, and between adult prophylaxis and extraction (erupted tooth or exposed root) was 0.83.

Medicaid fee data for child prophylaxis in 2000 and 2008 were merged with data from the National Health Interview Survey (NHIS) sample child files for the 2000-2001 and 2008-2009 years to determine whether a child had seen a dentist in the past 6 months. Previous research comparing estimates of receipt of dental care from self-reported information, such as that in the NHIS, and chart review found good concordance. The NHIS is a continuing national household survey of the civilian, noninstitutionalized population conducted by the National Center for Health Statistics (NCHS). The NHIS follows a stratified probability sample design described elsewhere. Response rates are high, ranging from 72% for the 2008 data to 81% for 2001. Sample weights reflect each individual’s probability of selection as well as adjustments for nonresponse. The conduct of the NHIS was approved by the NCHS research ethics review board. This study used NHIS data and did not require separate institutional review board approval. Because of missing fee data for at least 1 year from 8 states (Delaware, Georgia, Illinois, Maine, Mississippi, Nevada, Tennessee, and West Virginia), analysis was limited to data from the remaining 42 states and the District of Columbia. The analysis began with 37,658 children and adolescents aged 2 through 17 years in these 43 jurisdictions and ended with a sample of 33,657 after omitting records with missing information on any variable used in the analysis.

Mean receipt of dental care among children and adolescents by insurance status and state Medicaid dental fees for child prophylaxis for 2000-2001 were compared with 2008-2009 using t tests and a significance level of .05. Logit models were then used to estimate the probability that a child had seen a dentist in the past 6 months. The first analysis adjusted for only a limited number of covariates in addition to insurance status, including age and sex, in order to describe the overall difference in use of dental care for children covered by Medicaid or CHIP compared with privately insured children. The second analysis added additional controls in order to investigate the possible reasons for any difference in use for dental care for children covered by Medicaid compared with privately insured children. Additional controls in the second analysis included children’s characteristics likely to be correlated with use of dental care and consisted of child race/ethnicity, poverty status, and the state Medicaid child prophylaxis fee.

In all analyses, CHIP beneficiaries are included with Medicaid beneficiaries. This is not expected to have a substantial effect on the analysis for several reasons. First, of the 43 jurisdictions for which data are used in this study, 34 CHIP programs are either Medicaid expansion programs (13 including Washington, DC) or combination programs (16 states). Only 14 states of the 43 jurisdictions have separate child health programs. Second, even for children and adolescents, CHIP is a small program compared with Medicaid, accounting for less than 15% of total Medicaid and CHIP enrollment in 2008. Finally, it seems likely that state policy decisions would result in provider payment generosity for CHIP-only state programs being either unrelated or positively rather than negatively correlated with Medicaid payment generosity across states.

Year fixed effects were included in both models to control for any national trends in the use of dental care among children. State fixed effects were included to separate Medicaid’s effect on access to dental care from any correlation between the Medicaid fee and other attributes of the state that may affect access to dental care. The use of state fixed effects means that identification of the effect of Medicaid fees on...
use of dental care is coming from changes in fees within states over time. An interaction between the Medicaid prophylaxis fee and the dummy variable for Medicaid was included in the second model in order to test the differential effect of a change in the Medicaid payment levels to dentists on use of care among children and adolescents covered by Medicaid or CHIP compared with the reference category for payment source, private insurance. This is an example of a differences-in-differences model,\(^{17}\) for which the difference-in-difference estimator tests the difference in outcome in the treatment group (Medicaid) before and after a change in the Medicaid payment level minus the difference in outcome in the control group (the reference category of private insurance) before and after a change in the Medicaid payment level, ie, the difference of the difference. The use of a control group seeks to help identify a likely causal relationship between changes in state Medicaid dental fees and access to dental care among children and adolescents covered by Medicaid even if state Medicaid fees are changed more in states that have different existing trends in access to dental care among children.

All analyses used sample weights, and standard errors accounted for the complex design of the NHIS survey using Stata software version 11 (StataCorp, College Station, Texas). Given the difficulty in using odds ratios as estimates of effect size,\(^{18,19}\) logistic regression parameter estimates were converted to estimates of marginal effects defined as the mean change among children in the predicted probability of having seen a dentist in the past year for a 1-unit increase in each independent variable. For example, the marginal effect of the Medicaid variable is the difference in the mean predicted probability among children in the sample of having had a dental visit in the past 6 months if a child is covered by Medicaid minus the mean predicted probability for the reference category (private insurance), holding all other covariates at their observed values. To interpret the effect of the interaction term in the second model, estimated coefficients from the logit model were used to predict the mean difference in outcomes for children covered by Medicaid and for those privately insured at 2 hypothetical fee levels, $20 and $30. Standard errors around the difference were estimated using the bootstrap method.\(^{20}\) The association between the Medicaid payment level to dentists and receipt of dental care among children on Medicaid relative to privately insured children was assessed at an \(\alpha\) of .05. All hypothesis-testing was 2-sided.

**RESULTS**

**Figure 1** shows the Medicaid prophylaxis fees in 2000 and 2008, with 2000 fees expressed in 2008 US dollars using the consumer price index.\(^{21}\) Looking first at the fees for 2008 on the vertical axis, it can be seen that the Medicaid prophylaxis fee varied widely across states from a low of less than $20 in New Jersey, Florida, Minnesota, Missouri, and Michigan, to a high of over $45 in Alaska, Kentucky, District of Columbia, Connecticut, and Arizona. Of the 42 states plus the District of Columbia considered in the analyses, the 2008 Medicaid dental fees were lower than the (inflation-adjusted) 2000 fees in 23 states. Payment levels to dentists in 2008 were higher than in 2000 in 19 states plus the District of Columbia. Five of these states (Connecticut, Indiana, Montana, New York, and Texas) plus the District of Columbia chose to increase fees enough that they rose by at least 50% between 2000 and 2008.

As can be seen in **Figure 2**, data from the NHIS show that the probability that a child or adolescent had seen a dentist in the past 6 months varied by insurance source. In 2008-2009, children covered by Medicaid were less likely (55%, 95% confidence interval [CI], 53%-57%) than children with private insurance (68%, 95% CI, 67%-70%) to have seen a dentist in the past 6 months, although they were more likely to have seen one than were children or adolescents without insurance (27%, 95% CI, 24%-30%). The percentage of children and adolescents who had seen a dentist in the past 6 months increased between 2000-2001 and 2008-2009 among those

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**Figure 1. Medicaid Dental Fee Rates for Child Prophylaxis**

The dotted line represents equality between the years 2000 and 2008 in 2008 dollars.
covered by Medicaid or CHIP and private insurance.

Table 1 shows mean values for other characteristics of children in the NHIS sample. In 2008-2009, about 26% (95% CI, 24%-27%) were covered by Medicaid compared with about 65% (95% CI, 63%-66%) by private insurance, and about 10% (95% CI, 9%-11%) who were uninsured. About 13% (95% CI, 12%-14%) were non-Hispanic black, nearly 22% (95% CI, 21%-23%) Hispanic, and about 16% (95% CI, 15%-17%) had family income below the federal poverty level. The mean state Medicaid prophylaxis fee for children was $28.95 (95% CI, $29.68-$30.27) in 2000-2001 and $29.98 (95% CI, $27.11-$30.79) in 2008-2009, a difference that was not statistically significant.

Table 2 shows marginal effects from logit models predicting whether children had seen a dentist in the past 6 months. The first model controlled only for insurance source, sex, age group, year, and state effects. Older children (7-17 years) and girls were more likely to have seen a dentist (about 16% (95% CI, 15%-17%) by private insurance, and about 10% (95% CI, 9%-11%) who were uninsured. About 13% (95% CI, 12%-14%) were non-Hispanic black, nearly 22% (95% CI, 21%-23%) Hispanic, and about 16% (95% CI, 15%-17%) had family income below the federal poverty level. The mean state Medicaid prophylaxis fee for children was $28.95 (95% CI, $29.68-$30.27) in 2000-2001 and $29.98 (95% CI, $27.11-$30.79) in 2008-2009, a difference that was not statistically significant.

The second model also controlled for poverty status, race/ethnicity, the Medicaid payment level, and an interaction between the payment level and Medicaid or CHIP coverage. Poorer children were less likely to have seen a dentist. Being other than non-Hispanic white lowered the chance of having seen a dentist. Non-Hispanic black children were about 11 percentage points (95% CI, 9-14) less likely to have seen a dentist than non-Hispanic white children, and Hispanic children were nearly 6 percentage points (95% CI, 2-6) less likely.

The estimated effect of the Medicaid dental fee on children’s use of dental care is positive (0.1; 95% CI, 0.08 to 0.32; Table 2), indicating a positive correlation between increases in Medicaid payment level by state and overall improvements in access to dental care (for children with private insurance). The fee variable is, however, not statistically significant. Results from the interaction between the dummy for being on Medicaid or CHIP and the Medicaid fee for prophylaxis show that changes in Medicaid fees were differentially positively associated with changes in the chance that a child covered by Medicaid or CHIP had seen a dentist in the past 6 months relative to the chance for a child with private insurance (0.2; 95% CI, 0.11-0.44). The combination of a statistically nonsignificant effect of the Medicaid fee rate but a statistically significant effect on the interaction between Medicaid fee rate and the

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**Table 1.** Characteristics of Children in the National Health Interview Survey, 2000-2001 and 2008-2009 (Weighted Percent of Sample)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Weighted Percentage (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saw a dentist in the past 6 mo</td>
<td>55.60 (1.01)</td>
</tr>
<tr>
<td>Saw a dentist in the past 12 mo</td>
<td>73.52 (0.92)</td>
</tr>
<tr>
<td>State Medicaid child prophylaxis fee, US $ (2008)</td>
<td>28.95 (0.94)</td>
</tr>
<tr>
<td>Medicaid or CHIP</td>
<td>16.14 (0.80)</td>
</tr>
<tr>
<td>Private insurance</td>
<td>73.00 (1.30)</td>
</tr>
<tr>
<td>uninsured</td>
<td>46.85 (0.42)</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>63.89 (3.26)</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>13.78 (1.08)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>17.52 (3.07)</td>
</tr>
<tr>
<td>Non-Hispanic other race</td>
<td>4.80 (0.68)</td>
</tr>
<tr>
<td>Female</td>
<td>48.65 (0.42)</td>
</tr>
<tr>
<td>Age, y</td>
<td></td>
</tr>
<tr>
<td>2-6</td>
<td>30.67 (0.47)</td>
</tr>
<tr>
<td>7-12</td>
<td>32.11 (0.43)</td>
</tr>
<tr>
<td>13-17</td>
<td>37.21 (3.12)</td>
</tr>
</tbody>
</table>

Abbreviation: CHIP, Children’s Health Insurance Program.

*The sample size consists of 33,657 children (19,502 in 2000-2001 and 14,155 in 2008-2009).*
Medicaid or CHIP coverage indicates that increases in Medicaid fee rates had a statistically significant (positive) effect on dental care use among children covered by Medicaid but had no effect on privately insured children.

Although the interaction is statistically significant, the magnitude of the effect is hard to interpret as it is the estimated effect of a 1-unit increase in the value of the interaction term. TABLE 3 therefore uses the parameter estimates from the logit model to estimate the probability that children and adolescents had seen a dentist at 2 hypothetical Medicaid payment levels: $20 and $30. Children and adolescents covered by Medicaid or CHIP living in states that paid $20 were less likely to have seen a dentist than children with private insurance, a 2.05 (95% CI, 0.38-4.48) percentage-point difference that is statistically significant. Children and adolescents living in states that paid $30, however, were no longer statistically significantly less likely than children with private insurance to have seen a dentist. A $10 increase in the Medicaid payment level was associated with an increase in the chance that a child covered by Medicaid had seen a dentist of nearly 3.92 percentage points (95% CI, 0.54-7.50) with no statistically significant association for privately insured children. An increase in the chance that a child covered by Medicaid had seen a dentist of nearly 4 percentage points is a 7% increase relative to the average percentage (55%) of children covered by Medicaid predicted to have seen a dentist at the lower fee.

### Table 3. Association Between State Medicaid Dental Fees and the Probability That a Child Has Seen a Dentist in the Past 6 Months

<table>
<thead>
<tr>
<th>Medicaid or CHIP</th>
<th>Private Insurance</th>
<th>Difference (Private Insurance-Medicaid or CHIP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fee, US $</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>55.01 (52.58-57.44)</td>
<td>57.06 (55.45-58.66)</td>
</tr>
<tr>
<td>30</td>
<td>58.93 (56.45-61.41)</td>
<td>59.30 (57.33-61.27)</td>
</tr>
<tr>
<td>Difference, 30-20</td>
<td>3.92 (0.54-7.50)</td>
<td>2.24 (0.85-5.33)</td>
</tr>
<tr>
<td>Difference-in-difference</td>
<td>1.68 (0.71-3.77)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: CHIP, Children’s Health Insurance Program. The Table reports marginal effects from logit models controlling for all variables in Table 2, plus state fixed effects. Bootstrapped confidence intervals are in parentheses. The sample size consists of 33,657 children. National Health Interview Survey, 2000-2001 and 2008-2009. 

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COMMENT

Data on states’ Medicaid dental fees in 2000 and 2008 merged with data on children’s use of dental care from the NHIS showed that children covered by Medicaid use dental care less frequently than children with private insurance but the frequency of children covered by Medicaid receiving dental care is associated with each state’s provider payment policy for dental care.

The 2000 Surgeon General’s report on oral health documented linkages between oral diseases and ear and sinus infections, weakened immune systems, and other health conditions. Untreated dental conditions have the potential to affect children’s speech, social development, and quality of life. Children in families with income below the poverty level have higher prevalence of dental caries than children in higher-income families, and their disease is more likely to be untreated.

Medicaid spent $3.2 billion dollars on dental care in 2007, which should have helped address oral health problems of low-income individuals. As the share of children and adolescents covered by Medicaid has increased—from 16% to 26% from 2000-2001 to 2008-2009—the share of low-income children with dental insurance should also have increased. However, providing children with Medicaid coverage does not cause them to see a dentist as frequently as privately insured children, even though Medicaid coverage for dental care for children is likely to be more comprehensive than at least some private dental insurance plans.

Among the reasons that children and adolescents covered by Medicaid do not receive care are low payments to dentists for service, burdensome program administration requirements that are not required by other insurance carriers, and lack of patient education that can lead to frequently missed appointments. The results of this study support the claim that low Medicaid payment rates are associated with children and adolescents’ receiving less dental care than children covered by private insurance.

In the current economic climate, many states are looking for ways to control costs in the Medicaid and CHIP programs. Results from a 2010 survey by the Kaiser Family Foundation and Health Management Associates indicate that more states (37) are considering changes in provider payment rates to contain costs than any other health policy, including pharmacy controls (30), benefit reductions (14), patient co-pays (5), and eligibility cuts (1). Although the federal government requires that Medicaid provider payment rates be “sufficient to enlist enough providers so that care and services are available,” this requirement generally has not been enforced. Although the federal government has always strongly influenced state Medicaid and CHIP eligibility rules and services covered throughout the history of the programs, it has intervened much less in provider payment policies. However, the Patient Protection and Affordable Care Act legislation, signed into law on March 23, 2010, called for increasing Medicaid fees for some primary care services performed by primary care physicians to Medicare levels for 2013-2014. This legislation is evidence of newly increased attention to the issue of provider payment rates under Medicaid, even though there has as yet been no policy initiative aimed at dental care.

Although this study examined the relationship of Medicaid reimbursement and dental care received by children and adolescents using a fixed-effects model and compared care between Medicaid and private insurance, there are limits to the study. First, the state Medicaid fee for child prophylaxis for 2000 had to be estimated from the state adult prophylaxis fee in 2000 and the ratio of child-to-adult prophylaxis fees by state in 2008. However, this is not expected to substantially affect the analysis because the fees for different services are highly correlated across states, suggesting that states with relatively generous fees for one service also tend to have relatively generous fees for other services. Second, information on how the generosity of dental fees for children with private insurance varied across states and over the 2000-2001 and 2008-2009 periods was not available. Therefore, this study relied on changes in state Medicaid fees over time relative to general inflation, rather than changes relative to the generosity of private insurance fees, which would have been preferred. Third, the comparison to privately insured children may be conservative because not all children with private health insurance have dental insurance. In fact, the 2008-2009 NHIS indicates that only about 77% of children covered by private health insurance had dental insurance, about 60% through a supplemental plan, and 40% through their main health insurance plan (author’s calculations using the NHIS). A comparison to care among children with private dental insurance was not possible because the NHIS did not ask whether one’s main health insurance plan covered dental care until 2004. Finally, children are not randomly assigned to states with different levels of Medicaid dental fees. It is possible that children in states with different Medicaid dental fees have different levels of access to dental care for reasons other than the fees. This study controlled for that possibility by using state fixed effects to consider how changes in children and adolescents’ use of dental care were associated with changes in state Medicaid dental fees. Changes in use of dental care among children covered by Medicaid and CHIP were also compared with changes for a control group—children with private insurance. Results indicated that increases in Medicaid fees increased use of dental care among children and adolescents covered by Medicaid but did not affect use of dental care among privately insured children. However, the caveat that the conclusions in this study were obtained from ecological data should still be acknowledged.

This study found that changes in state Medicaid dental fees between 2000 and
2008 were positively associated with changes in use of dental care among children covered by Medicaid. As future expansions in Medicaid eligibility and insurance coverage more generally are contemplated and possibly implemented, more attention to the effects of provider payment policies on access to care, quality of care, and health outcomes may be warranted.

Author Contributions: Dr Decker had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Conflict of Interest Disclosures: Dr Decker completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

Disclaimer: The findings and conclusions in this article are those of the author and do not necessarily represent the views of the Centers for Disease Control and Prevention.

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