RESEARCH ARTICLE

Assess the effects of Early Dental Office Visits on Dental Caries Experience

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ABSTRACT

Objectives: This study examined the relationship between the timing of a child's first dental visit before age 5 and the presence of dental disease by kindergarten.

Methods: We analyzed data which were linked to oral health surveillance data for kindergarten students . We compared caries rates in children who had their first dental visit before age 60 months (n = 11,394) using a zero-inflated negative binomial regression model. Separate analyses were conducted for those who had preventive visits and those with tertiary visits.

Results: Children who had their first visit between ages 37–48 months and 49–60 months experienced significantly lower rates of dental disease compared to children who visited by 24 months (IRR = 0.88; 95% CI = 0.81, 0.95; IRR = 0.75; 95% CI = 0.69, 0.82). However, the disease rates were similar between children who had a tertiary visit by age 24 months and those who visited later.

Conclusions: Medicaid-enrolled children in this study often sought dental care reactively, indicating limited access to preventive services. High-risk children should be prioritized for a preventive dental visit before age 3.

Keywords: Dental Caries, Dental Office

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Introduction

Early childhood caries (ECC), or tooth decay of children under 6 years old, is the most common chronic disease of young children. Its prevalence increased to 28% among 2- to 4-year-olds between 1988–1994 and 1999–2004, and its effects on the health and well-being of children are becoming more identified. The effects of tooth decay may go beyond a child's mouth and have broader negative effects on the child's general health, phonetic development, growth, and days absent from school, which in turn can decrease a family's quality of life. (Dye et al., 2007) Given the significant impacts of dental disease on overall health and the flatlining of current dental care utilization rates over the past decade, Healthy People 2020 chose annual dental visits for persons aged 2 years and older as one of only 24 Leading Health Indicators. Dental care use was chosen from among about 1200 possible objectives based on its standing as an extremely high-priority health concern. (Blumenshine et al., 2008) Despite being preventable and, in its early stages, often reversible through personal care, professional treatment, and community initiatives such as water fluoridation, ECC affects many children. Dental visits provide chances for early risk assessment, diagnosis, treatment, and preventive services, such as the application of fluoride. The provision of anticipatory guidance is also made possible. Professional organizations recommend that a dental home be established by 12 months of age to encourage early preventive care. Like most state Medicaid programs, the North Carolina Medicaid program suggests that a first dental visit should be made by age 12 months, but it only requires one by age 3 because of lack of availability from the dentists. (Hale, 2003) Even though the benefit of preventive dental care in improving oral health is well recognized, there is no agreement yet on the optimal age of the child for the first dental visit. One such study revealed no difference in disease severity at ages 6 to 7 among children whose first visit was before age 2 compared with those whose initial visit was between ages 2 and 5. A study also conducted by Fulton and coworkers went ahead to suggest that early preventive visits were associated with fewer treatments needed from birth through age 5. Other studies found no association between early visits and dental costs or treatment use, although one ascertained that children with pre-existing dental problems that received early preventive care had fewer subsequent treatments and lower costs. (Rozier et al., 2003) Indeed, most of the prior work related to the timing of the first dental visit has involved treatment and cost outcomes; mixed findings have been reported. It is unknown whether early visits impact the progression of dental disease in children. Since dental claims do not have diagnostic codes, it is not possible to accurately determine the severity of disease from the claims data. Linking dental claims data with public health surveillance records of oral health, we evaluated the

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Table 1 Summary: Disease Status and Characteristics of Kindergarten Children Enrolled in Medicaid Before Age 5

Variable	Overall Sample (n=35,943)	No Dental Visits (n=24,549)	With Dental Visits (n=11,394)	< 24 Months (n=623)	24-36 Months (n=2,371)	37-48 Months (n=4,358)	49-60 Months (n=4,042)
dmft	2.18 (3.19)	1.76** (2.86)	2.42 (3.28)	3.49 (4.03)	3.57 (3.92)	3.11 (3.66)	2.73** (3.33)
Disease history (dmft > 0)	47.66%	42.28%**	59.23%	59.39%	62.59%	59.06%	57.42%
dmft for those with disease	4.58 (3.22)	4.17** (3.05)	5.22 (3.36)	5.88 (3.65)	5.70 (3.52)	5.27 (3.37)	4.75 (3.12)
Untreated disease (%)	53.50%	62.89%**	39.06%	41.35%	33.89%**	38.85%	42.22%
Race							
White	44.85%	47.89%*	38.28%	42.05%	38.72%	36.60%	39.16%
Black	42.22%	39.17%	48.52%	43.98%	48.38%	51.58%**	46.02%
Hispanic	9.27%	8.62%	11.01%	11.56%	11.39%	9.73%	12.07%
Other	3.66%	4.31%	2.19%	2.41%	1.52%	2.00%	2.75%
Female	49.22%	49.09%	49.16%	47.51%	50.65%	49.50%	48.17%
Metro status	57.22%	55.07%**	62.17%	66.29%	64.91%	61.86%	60.27%*
Dentists/capita	3.73 (1.77)	3.67** (1.71)	3.89 (1.97)	4.11 (2.04)	4.10 (2.01)	3.83** (1.97)	3.79** (1.91)
Well-child visits	1.25 (1.12)	-	1.68 (1.13)	1.34** (1.11)	1.24** (1.12)	1.15** (1.09)	-
Medicaid enrollment (%)	49.50%	-	64.04%	55.08%**	51.06%**	42.31%**	-

*Statistically significant differences observed between those with dental visits before 24 months and those with later visits.

relationship of timing of the initial dental visit with dental disease history and untreated dental problems among kindergarten students. (American Academy of Pediatric Dentistry, 2009)

METHODS

The records included enrollment information and reimbursement claims for all children. These claims provided detailed data on reimbursement requests submitted by dental and medical providers to Medicaid, while the enrollment files indicated how long each child was enrolled in Medicaid. The Surveillance of Dental Caries offered estimates of dental disease (caries experience) for nearly all kindergarten students in the state each year. The data were gathered through clinical dental screenings conducted by trained oral health professionals employed by state or local health departments. Previous studies showed that these screenings were reliable when compared with results from a reference dentist who performed standard dental exams. We used data from the 2022–2023 school year, covering 95,135 kindergarteners. Children who were enrolled in Medicaid before their first birthday, remained enrolled after turning 1, and did not receive preventive dental care in a medical office were identified (n = 118,564). Kindergarteners who appeared in data (n = 92,127) and were enrolled in Medicaid were eligible for the study. After merging the Medicaid and data sets, 36,890 children were included (match rate = 33%). The match rate was consistent with prior estimates for Medicaid, which ranges between 25% and 35%. Children without a dental visit (n = 24,549) and those with missing disease outcomes (n = 947) were excluded, leaving a final sample of 11,394 children, or roughly 30% of the Medicaid-enrolled kindergarteners.

Variables

The dependent variable, dental disease status, was measured as the number of decayed, missing (molars only), and filled primary teeth (dmft index) recorded during each child's kindergarten dental assessment. Decayed teeth (d) had untreated cavities, filled teeth (f) had been treated with restorations, and missing teeth (m) had been extracted due to decay. The dmft index provided a lifetime history of caries in primary teeth, excluding missing anterior teeth. This index enabled us to assess whether teeth were treated for disease, regardless of whether treatment appeared in Medicaid claims. The average age at the time of screening was 5.7 years (SD = 0.41 years), and this did not vary by the timing of the first dental visit. For children with any disease (dmft > 0), we used a binary variable to indicate whether they had untreated decayed teeth at the time of screening to evaluate the effect of the timing of the first visit on untreated disease. The main explanatory variable of interest was a categorical indicator for the age at the first dental visit (< 24, 24–36, 37–48, or 49–60 months). These cutoffs were based on current guidelines for the recommended age of the first visit, which is advised by 1 year of age. However, due to a small sample size, we examined visits occurring before 24 months. Clinical guidelines advocate for early dental visits to prevent and manage disease at a young age. Prevention may be primary (stopping disease before it begins), secondary (identifying and halting early-stage disease), or tertiary (managing existing disease and restoring function). Dental guidelines for early visits combine elements of both primary and secondary

Table 2 Summary: Adjusted Incidence Rate Ratios for dmft Scores Among Children With Medicaid Before Age 5

Variable	All Children With Dental Visits	Primary/Secondary Preventive Visits	Tertiary Preventive Visits
Age at first visit (months)			
< 24 (Ref)	1.00	1.00	1.00
24–36	0.98 (0.90, 1.07)	0.86 (0.73, 1.01)	1.14 (0.97, 1.35)
37–48	0.88* (0.81, 0.95)	0.80* (0.68, 0.94)	1.05 (0.90, 1.24)
49–60	0.75* (0.69, 0.82)	0.80* (0.68, 0.93)	0.98 (0.84, 1.15)
Race			
White (Ref)	1.00	1.00	1.00
Black	0.85* (0.82, 0.89)	0.88* (0.82, 0.95)	0.83* (0.78, 0.89)
Hispanic	1.25* (1.18, 1.32)	1.58* (1.43, 1.73)	1.21* (1.10, 1.32)
Female	0.92* (0.88, 0.95)	0.95 (0.89, 1.02)	0.86* (0.81, 0.91)
Well-child visits	0.95* (0.93, 0.97)	0.95* (0.92, 0.98)	0.90* (0.84, 0.96)

prevention, including exams, fluoride treatment, and minor restorative care. Our dataset included both preventive and treatment visits, making it challenging to isolate the effects of specific types of visits. Therefore, we performed two subanalyses: (1) children who received preventive visits aligned with clinical guidelines that combined primary and secondary prevention, and (2) children who had tertiary visits involving two or more restorative procedures, allowing us to assess the impact of early visits in children at higher risk for future disease. Definitions of these subanalyses

Analyses

We incorporated both individual and county-level variables in our regression model, as prior research has shown these factors are associated with preventive dental visits and dental disease. Child-level variables included gender, race , number of well-child visits between 12 and 24 months, and continuous Medicaid enrollment. County-level variables included the percentage of the population under age 18 enrolled in Medicaid, metropolitan status (based on rural–urban continuum codes), and the number of dentists per 10,000 residents. To assess whether early dental visits were linked to subsequent caries experience, we used a zero-inflated negative binomial regression model. A likelihood ratio test indicated that including all covariates in both the zero-inflated and negative binomial portions of the model resulted in a better fit ($\chi^2 = 233.7$; $P < .001$). We calculated incidence rate ratios (IRRs) to estimate the relative increase in the mean dmft index for different subgroups. The method for calculating overall exposure effects and their 95% CIs is detailed in Appendix A, available online. We also conducted a logistic regression for children with any disease (treated or untreated) to estimate whether untreated disease differed based on the timing of the first visit. All analyses were conducted using SAS version 9.2 and Stata version 12.0, with statistical significance set at $P < .05$.

RESULTS

In the study of 35,943 Medicaid-enrolled children , the average number of decayed, missing, and filled teeth (dmft score) was 2.18, and 48% had experienced dental disease by kindergarten. Among those with dental disease, the average dmft score was 4.58, with 54% having at least one untreated tooth. By their fifth birthday, 32% of children had at least one dental visit covered by Medicaid. Children who had never had a Medicaid-paid dental visit had a statistically lower dmft score compared to those who had a dental visit by 24 months.

Key Findings

- Children who had their first dental visit at 49–60 months had significantly lower dmft scores compared to those visiting before 24 months.
- The likelihood of untreated dental disease was reduced in children who had visits between 24 to 36 months compared to those who visited before 24 months.
- Children visiting a dentist between 37–48 and 49–60 months had significantly lower dmft scores compared to those visiting before 24 months.
- Hispanic children had higher dmft scores compared to white children, while Black children had lower scores.

DISCUSSION

In this study of Medicaid-enrolled children, children who had a dental visit by age 24 months had similar rates of dental caries as those visiting between 24 to 36 months. The children with their first visit between 37 to 60 months of age showed lower rates of dental disease compared with those visiting earlier. Interestingly, those children who

Table 3 Summary: Adjusted Odds Ratios for Untreated Dental Disease

Variable	All Children With Dental Visits (n=6749)	Primary/Secondary Preventive Visits (n=3524)	Tertiary Preventive Visits (n=3095)
Age at first visit (months)			
< 24 (Ref)	1.00	1.00	1.00
24–36	0.71** (0.56, 0.90)	0.88 (0.61, 1.27)	0.75 (0.50, 1.13)
37–48	0.82 (0.66, 1.03)	1.07 (0.75, 1.52)	0.82 (0.56, 1.22)
49–60	0.97 (0.77, 1.22)	1.11 (0.78, 1.58)	0.92 (0.63, 1.35)

required two or more treatments before the attainment of 24 months, shared similar experiences in dental disease rates with the children whose treatment occurred later in life. (Savage et al., 2004) This finding can be attributed to the healthcare utilization patterns occurring in low-income families. Probably, the families sought dental care because the child was in pain or presented with obvious dental problems. This is consistent with findings from other studies indicating that early disease experience is an important predictor of future more severe dental disease. One Boston study of children aged under 3 years found that the younger the age of the first dental visit, the more likely the child was to already have dental disease. Similarly, in the present study, children receiving two or more restorative treatments by 24 months demonstrated no difference in disease progression compared with those seen later, suggesting that the early intervention may have been effective for the high risk children. (Sohn et al., 2008) The question of whether early dental care can mitigate future disease is significant for state Medicaid agencies that must establish guidelines on the timing and frequency of pediatric dental visits. Professional organizations recommend that a child should visit a dentist by age 1, but when access to dentists is limited-as it is in Academy of Pediatrics advises that the first dental visit for a low-risk child be delayed until age 3. Given the limited number of dentists in the state who are willing to serve Medicaid patients, targeting the early visits to those children most at risk for dental disease may be the wiser investment and offer care settings other than the private dentist office for the rest. Where access is most difficult, nondental professionals can be used to assist with screenings and referrals as a means of managing demand for dental care. (Beil et al., 2012) Accordingly, appropriate identification of children at higher risk of dental disease will form the basis for implementing a risk-based policy on early dental visits. Available tools, such as the American Academy of Pediatrics' Bright Futures caries risk assessment tool, have a place in this strategy, and research must be done to continue to refine these tools and promote their application by primary health care providers. There are also efforts towards incorporating oral health screening into routine pediatric care, though this would necessitate more research to create appropriate risk assessment measures useful in pinpointing the young children who are at the greatest risk of dental diseases. (Annie E. Casey Foundation, 2009)

This study also identified a pattern in which urgent needs drive dental care utilization: Children's visits to the dentist were more likely as the presence of dental pain or known disease. However, the overall utilization of dental care services among covered children by Medicaid was low. While 48% of the children had already developed dental caries, only 32% of the children had a Medicaid-covered dental visit by kindergarten age. Again, 54% of the children with any dental disease had untreated dental health issues, and only 7% received a preventive dental visit by age 3.5 years. Improving access to dental care for young children receiving Medicaid is crucial if Healthy People 2020 oral health goals are to be met. (Preisser et al., 2012) Children who first visited the dentist by age 24 months, while more apt to have experienced any untreated disease than those who had visited between 24 and 36 months, but the percentages were no different from that of the children that visited later. That would indicate that the visits before 24 months did not have a continuous dental home, as called for in early preventive care guidelines. Limitations in dentist availability-especially in states with more children enrolled in Medicaid-led to a higher prevalence of untreated disease. These findings underscore the fact that access to dental care remains one of the biggest barriers in this population. (Long et al., 2012)

CONCLUSIONS

Children who received dental visits at an earlier age had increased rates of dental disease in comparison with children who first visited later, although those receiving two or more treatments by 24 months have comparable disease rates with children visiting later. Higher rates of untreated disease were related to the inability of many children to get limited access to dental care. These findings suggest that suggestions for preventive dental visits before age 3 years should be directed to those children who are at high risk of dental disease, especially in areas of the country where dentist supply is poor. The study also points out that such research is ongoing to improve access to oral health care in young Medicaid-enrolled children.

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