

# Effectiveness of an Alternative Dental Workforce Model on the Oral Health of Low-Income Children in a School-Based Setting

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In 2000, the landmark report *Oral Health in America: A Report of the Surgeon General*, brought attention to the need for oral health care; the impact of poor oral health on individuals, communities, and society at large; and the disproportionate burden of oral disease among certain segments of the US population.<sup>1</sup> More than a decade later, oral health disparities continue to exist.<sup>2-12</sup> An estimated 1 out of 5 children go without dental care each year and 1 out of 6 experience toothache.<sup>5,13</sup> Children experience unnecessary pain, are absent from school, are less engaged in class, and have low self-esteem from a disease that is largely preventable.<sup>7,14,15</sup> The long-term consequences of poor oral health may lead to difficulties finding a job, other health problems such as diabetes and heart disease, and large dental bills.<sup>7,14,16</sup>

Lack of access to oral health care is a complex problem resulting from socioeconomic, environmental, and delivery system barriers that do not provide access for individuals who are uninsured, low income, or living in dental health provider shortage areas.<sup>1</sup> Dental providers are frequently located in metropolitan areas and deliver care in private offices, resulting in a disproportionate number of vulnerable and underserved populations with barriers to care.<sup>17</sup> Geographic maldistribution of clinicians, inadequate numbers of oral health professionals treating Medicaid-eligible children, few pediatric dentists, poor population knowledge and attitudes about oral health, lack of dental insurance, and difficulties interacting with culturally diverse populations contribute to difficulties accessing oral health care.<sup>4,9,18</sup>

A notable difference between the structure of medical and dental practices in the United States is the lack of midlevel dental providers. The medical model uses nurse practitioners and physician assistants, but dentistry has been reluctant to embrace a similar independent provider system that could expand access to

**Objectives.** We evaluated the effect of an alternative dental workforce program—Kansas’s Extended Care Permit (ECP) program—as a function of changes in oral health.

**Methods.** We examined data from the 2008 to 2012 electronic medical records of children ( $n=295$ ) in a Midwestern US suburb who participated in a school-based oral health program in which preventive oral health care was delivered by ECP dental hygienists. We examined changes in oral health status as a function of sealants, caries, restorations, and treatment urgency with descriptive statistics, multivariate analysis of variance, Kruskal–Wallis test, and Pearson correlations.

**Results.** The number of encounters with the ECP dental hygienist had a statistically significant effect on changes in decay ( $P=.014$ ), restorations ( $P=.002$ ), and treatment urgency ( $P=.038$ ). Based on Pearson correlations, as encounters increased, there was a significant decrease in decay ( $-0.12$ ), increase in restorations (0.21), and decrease in treatment urgency ( $-0.15$ ).

**Conclusions.** Increasing numbers of encounters with alternative providers (ECP dental hygienists), such as with school-based oral health programs, can improve the oral health status of low-income children who would not otherwise have received oral health services. (*Am J Public Health*. 2015;105:1763–1769. doi: 10.2105/AJPH.2015.302714)

dental care.<sup>19</sup> Midlevel dental provider models have been employed in other industrialized and nonindustrialized countries for decades and have a long history of providing access and reducing oral health disparities.<sup>20-23</sup> Despite the existence of national accreditation standards on education of midlevel oral health care professionals, numerous regulations and policies delineating supervision levels and scope of practice exist and vary widely from state to state.

The Health Resources Services Administration estimates a current shortage of 10 000 dentists in the United States.<sup>24</sup> Deficiencies in the structure of the oral health work force and shortage of providers have been a chronic problem. In 2012, the former Surgeon General, David Satcher, issued a “renewed call for action to expand access to oral health care.”<sup>25</sup> Satcher accentuated how the Affordable Care Act provides an opportunity to increase dental benefits coverage to more than 5 million children. However, he added, “Adding dental benefits will

not translate into access to care if we do not have providers in place to offer treatment.”<sup>25</sup>

Dental providers; medical, dental, and other health organizations; advocacy organizations; policymakers; private and public insurers; researchers; and local, state, and federal agencies acknowledge that pockets of the US population have poor oral health and lack access to oral health care. The solution to resolving this problem, however, is highly disputed.<sup>14,26-36</sup> Numerous alternative dental workforce models have been proposed and, in some circumstances, implemented, to expand the dental workforce. The models vary in types of care that can be provided, supervision, work setting, education, and certification or licensure.

In 2003, Kansas established an alternative workforce model by altering dental hygiene scope of practice and supervision regulations through the creation of Extended Care Permit (ECP) Dental Hygienists.<sup>37</sup> This model permits dental hygienists to have direct patient access,

in a variety of settings, to the “full extent of their education and training” as recommended by the National Research Council and the Institute of Medicine.<sup>17</sup> The ECP dental hygienists can provide preventive services and assess the patient’s need to be further evaluated by a dentist for “dentally underserved” children aged birth to 5 years, children in public and nonpublic schools kindergarten through grade 12 regardless of the time of year, and children participating in youth organizations. The ECP dental hygienists are sponsored by a dentist, licensed in the state of Kansas, who is willing to monitor their activities. To qualify for an ECP, the dental hygienist must have performed 1200 hours of dental hygiene care within the past 3 years or have been an instructor at an accredited dental hygiene program for 2 of the past 3 academic years.<sup>37,38</sup>

As health care expenditures continue to rise, assessing the effectiveness of care has become a national priority.<sup>17,39–49</sup> Multiple stakeholders have necessitated the need for well-defined oral health measures of quality to ascertain patient-centered, cost-effective care is being consistently delivered throughout the health care system. Dental Quality Alliance, an organization formed by the American Dental Association to develop performance measures that assess the quality of oral health care, declared that the most accurate predictor of quality is measuring the patient’s health status.<sup>39</sup> Despite these recommendations, there is minimal research that examines the relative effectiveness of oral health care provided by auxiliaries or dentists. Most of the published studies are more than 20 years old and have methodological shortcomings.<sup>50</sup>

The objective of this study was to evaluate the effect of an alternative dental workforce model, the ECP dental hygienist, as a function of changes in oral health in low-income children in a school-based setting. We examined the following research questions: (1) How did the number of encounters with the ECP dental hygienist affect the oral health status of children? (2) How did the number of fluoride varnish applications affect the oral health status of children?

## METHODS

We used an ex post facto repeated measures design to longitudinally examine secondary

data from electronic medical records (EMRs) of children (n = 295) who participated in a school-based oral health program lead by an ECP dental hygienist. The ex post facto repeated measures design allowed participants to serve as their own control, isolated between-participant variability, and minimized selection bias.

### Participants

Low-income children who attended Title I elementary schools (defined as exceeding 40% poverty based upon the number of students that qualify for free or reduced-price lunches) located in a Midwestern suburb participated in this intervention (n = 986). Two hundred ninety-five children were provided care 2 or more times during the first 5 years of the program and served as the sample for this study. Inclusion criteria were that children must be enrolled in the elementary school and qualify for the free or reduced-price lunch program, and informed consent must be provided. Exclusion criteria were that children could not have a dental home. These criteria meet the conditions outlined in the Kansas Dental Practice Act for treatment by an ECP dental hygienist.<sup>37,38</sup>

Children from a low socioeconomic status have been shown to have a high risk of dental caries.<sup>51</sup> More than half of students in the schools were English language learners, with Spanish being the most common primary language. Hispanic children have a caries rate 2 to 3 times greater than their non-Hispanic White peers.<sup>51,52</sup> Because of this, all children who participated in this program were considered to be at elevated or high caries risk.

### Intervention

The intervention for this study was a school-based oral health ECP program that began in 2008. The intervention replicates a nationally recognized community oral health model, called community collaborative practice, established in 2004 by Apple Tree Dental, a not-for-profit organization in Minnesota. The Apple Tree model provides place-based care by rolling full-scale dental offices into a convenient place that is comfortable and familiar to the patient. This model increases access to oral health care by expanding the role of dental hygienists in the delivery of preventive care

services and establishing telehealth links with dentists.<sup>53,54</sup>

During the first year, the intervention was piloted in 1 elementary school. The intervention expanded to 4 schools the second year, 6 schools the third and fourth years, and 7 schools the final year. Comprehensive evidence-based preventive oral health care, appropriate for children at high caries risk (prophylaxis, radiographs, topical fluoride application, sealants, oral health education and supplies, nutritional counseling, and dentist referral coordination), was delivered with portable dental equipment.<sup>55</sup>

Senior dental hygiene students from a nearby educational program rotated through the clinic as part of the clinical curriculum and provided preventive services under the license of an ECP dental hygienist who was also faculty at the dental hygiene program. The same ECP dental hygienist delivered care and supervised the dental hygiene students throughout the duration of this program to control for reporting and measurement biases. This individual also entered all patient data into the EMR.

At the initial assessment and subsequent assessments, sealants were documented as being present even if a sealant was only partially retained, restorations were documented as being present even if they were only partially retained or if recurrent decay was present, and decay was documented when demineralization was visible clinically or radiographically through the tooth enamel and into the dentin. Treatment urgency was recorded as “immediate referral within 24 hours” when a child had unmet dental needs resulting in pain or an abscess, “referral” when the child had unmet dental needs such as decay or a retained deciduous tooth, and “no referral” when the child did not have any unmet dental needs.

### Measurement

We analyzed secondary data from the first 5 years of the intervention to evaluate the effects of this alternative dental workforce model.

We used the following independent variables: (1) number of encounters with the ECP dental hygienists (encounters) and (2) number of fluoride varnish applications (fluoride).

We used the following dependent variables: (1) sealants, (2) changes in the number of teeth with at least 1 decayed surface (decay status),

(3) changes in the number of restorations (restorations), and (4) changes in treatment urgency (treatment urgency).

The number of sealants, decayed teeth, restorations, and level of treatment urgency at the initial encounter with the dental hygienist served as the baseline measurement.<sup>56</sup> The same factors at the final encounter served as the endpoint measurement. We used ratio scales, at the tooth level, to measure sealants, decay status, and restorations. We calculated the differences between baseline and endpoint to determine changes in sealants, decay, and restorations. We used ordinal scales, at the participant level, to measure treatment urgency (immediate referral within 24 hours, referral, and no referral). We coded changes in treatment urgency with a 5-point ordinal scale: 1 = change from no referral to immediate referral, 2 = change from no referral to referral or referral to immediate referral, 3 = no change in treatment urgency, 4 = change from immediate referral to referral or referral to no referral, and 5 = change from immediate referral to no referral.

**Statistical Analysis**

We extracted data from the EMR into an Excel 2010 database (Microsoft, Redmond, WA) and analyzed the data in IBM SPSS version 22 (IBM, Somers, NY). We used descriptive statistics to report changes in each dependent variable. We only reported sealants with descriptive statistics because the relationship between sealants and encounters can be assumed and a relationship between sealants and fluoride is not plausible. We used multivariate analysis of variance (MANOVA) to investigate the effect of encounters on the change in decay and restorations and the effect of fluoride varnish applications on the change in decay. We conducted tests at the significance level of  $\alpha = .05$ . We calculated confidence intervals (CIs), power, and effect size ( $\eta^2$ ).

If we found significant differences, we used the Bonferroni correction in the subsequent post hoc test. We used a Kruskal–Wallis test, conducted at the significance level of  $\alpha = .05$ , to examine the number of encounters in relation to treatment urgency. When we found significant differences, we used the Mann–Whitney post hoc test to identify where differences existed. We used Pearson correlations

to measure the strength of associations between encounters and changes in decay, restorations, and treatment urgency and between fluoride varnish and changes in decay.

**RESULTS**

Table 1 provides the demographic characteristics of the participants (n = 295). Gender was evenly split and the majority of participants (69.5%) were Hispanic. The age entering the program varied with the largest percentage of children (43.1%) being aged 6 to 7 years.

Table 2 provides a descriptive summary of the oral health status of the participants, in relation to the ratio-dependent variables at the initial encounter and final encounter, by examining the number of teeth (0–≥ 10) with sealants, decay (caries), and restorations. At the initial encounter, the majority of children did not have sealants, a small percentage of the children had zero caries, and the majority of children did not have restorations (83.4%, 35.9%, and 70.5%, respectively). At the final encounter, the percentage of children who did not have sealants decreased, a larger percentage of children had zero caries, and the number of children who did not have restorations decreased (14.5%, 40.7%, and 50.2%, respectively). Whereas we performed measures related to decay and restorations at the tooth level, we also examined the data with participant-level measures. The amount of decay decreased in 107 (36.3%) children, increased in 87 (29.5%) children, and remained the same in 36 (12.2%) children; 66 (22.0%) children entered the program decay-free and remained decay-free.

Table 3 describes the MANOVA results. There was a statistically significant association of the number of encounters on decay ( $P = .014$ ) and restorations ( $P = .002$ ). The mean reduction on decay was  $-0.54$  (95% CI =  $-1.06, -0.01$ ). The mean increase in restorations was  $1.08$  (95% CI =  $0.74, 1.4$ ). Power for decay (0.88) and restorations (0.96) was adequate.<sup>57</sup> The  $\eta^2$  effect size was medium for decay ( $\eta^2 = 0.06$ ) and restorations ( $\eta^2 = 0.08$ ). Effect size was interpreted with Miles and Shevlin recommendations for social science (0.01 = small, 0.06 = medium, 0.14 = large).<sup>58</sup> There was not a statistically significant association of fluoride varnish application on decay.

Table 4 describes changes in the number of decayed teeth, and number of restorations present, in relation to the number of encounters. With the exception of having 2 or 9 encounters, an inverse relationship occurred between decay and restorations; as the number of teeth with decay decreased the number of teeth with restorations increased. Table 4 also identifies significant comparisons. There was a statistically significant difference between 2 and 3 encounters for decreasing the number of teeth with decay ( $P = .035$ ). There was also a statistically significant difference between 2 and 6 encounters ( $P = .003$ ) and between 2 and 7 encounters ( $P = .049$ ) for increases in the number of restorations.

Regarding treatment urgency, at the initial encounter, the number of children who presented with urgent needs that required an immediate referral was 19 (6.4%), unmet dental needs that required a dentist referral was 124 (42.0%), and no referral needs was 152 (51.5%). At the final encounter, the number of children who presented with urgent needs that required immediate care from

**TABLE 1—Participant Demographic Characteristics of Low-Income Children (n = 295) in a Midwestern US Suburb: February 2008–May 2012**

Characteristic	No. (%)
<b>Gender</b>	
Female	142 (48.1)
Male	153 (51.9)
<b>Racial/ethnicity</b>	
Hispanic	205 (69.5)
White	51 (17.3)
Black	23 (7.8)
Asian	5 (1.7)
≥ 2 reported	8 (2.7)
Native American	1 (0.3)
Not identified	2 (0.7)
<b>Age entering program, y<sup>a</sup></b>	
≤ 5	69 (23.4)
6–7	127 (43.1)
8–9	84 (28.5)
10–11	15 (5.1)
≥ 12	0 (0.0)

<sup>a</sup>May not add to 100% because of rounding.

**TABLE 2—Oral Health Status of Low-Income Children (n = 295) in a Midwestern US Suburb Before School-Based Intervention Delivered by Dental Hygienists: February 2008–May 2012**

No. of Teeth With Condition	Initial Encounter Sealants, No. (%)	Final Encounter Sealants, No. (%)	Initial Encounter Decay (Caries), No. (%)	Final Encounter Decay (Caries), No. (%)	Initial Encounter Restorations, No. (%)	Final Encounter Restorations, No. (%)
0	245 (83.1)	43 (14.5)	106 (35.9)	120 (40.7)	208 (70.5)	148 (50.2)
1	14 (4.7)	28 (9.5)	42 (14.2)	47 (15.9)	27 (9.2)	29 (9.8)
2	13 (4.4)	33 (11.1)	38 (12.9)	37 (12.5)	18 (6.1)	23 (7.8)
3	6 (2.0)	40 (13.5)	19 (6.4)	19 (6.4)	12 (4.1)	17 (5.8)
4	13 (4.4)	106 (35.9)	11 (3.7)	16 (5.4)	7 (2.4)	11 (3.7)
5	3 (1.0)	17 (5.8)	14 (4.7)	11 (3.7)	12 (4.1)	15 (5.1)
6	0 (0.0)	11 (3.7)	20 (6.8)	15 (5.1)	5 (1.7)	8 (2.7)
7	1 (0.3)	3 (1.0)	15 (5.1)	11 (3.7)	5 (1.7)	14 (4.7)
8	0 (0.0)	6 (2.0)	12 (4.1)	9 (3.0)	1 (0.3)	13 (4.4)
9	0 (0.0)	3 (1.0)	10 (3.4)	5 (1.7)	0 (0.0)	10 (3.4)
≥ 10	0 (0.0)	5 (1.7)	8 (2.7)	5 (1.7)	0 (0.0)	8 (2.7)

Note. Columns may not add to 100% because of rounding.

a dentist was 15 (5.1%), unmet needs that required a dentist referral was 160 (54.2%), and no referral needs was 120 (40.7%). Out of the 19 immediate referrals, 17 (89.5%) completed the recommended referral. Out of the 124 referrals, 70 (56.5%) completed the recommended referral. Based on the Kruskal–Wallis test, there was a statistically significant difference between the number of encounters and treatment urgency ( $P=.038$ ). The Mann–Whitney test revealed significant differences between 2 and 4 encounters ( $P=.047$ ), 2 and 6 encounters ( $P=.006$ ), and 3 and 6 encounters ( $P=.006$ ). As the number of encounters increased, the need for treatment referrals became less urgent.

Based on Pearson correlations, as encounters increased, there was a significant decrease in decay (−0.12), increase in restorations (0.21), and

decrease in treatment urgency (−0.15). Although the strength of these associations is small, the correlations supported the MANOVA outcomes. There was no significant correlation between fluoride varnish applications and change in decay, again supporting MANOVA outcomes. Association strengths were interpreted with Miles and Shevlin recommendations: 0.1 = small, 0.3 = medium, and 0.5 = large.<sup>58</sup>

### DISCUSSION

Quality assessment in dentistry has been criticized for not evaluating the effectiveness of care and patient-oriented outcomes.<sup>41,59,60</sup> A recent Cochrane Review examined the relative effectiveness of oral health care provided by auxiliaries or dentists and could not draw any firm conclusions because of a lack of high-quality

evidence.<sup>50</sup> This is one of the first studies to examine the effectiveness of an alternative workforce model to which the results of subsequent research can be compared and built upon. Findings from this study provide an important initial step in addressing an important gap in the oral health literature.

The setting for this project was a metropolitan suburb that is known for being one of the best places to live in the United States.<sup>61</sup> Sixty-four percent of the children participating in this program had decayed teeth. This rate is significantly higher than that reported in the state, county, and school district where the program was located (16.2%, 10.6%, and 13.9%, respectively).<sup>62</sup> The rate also significantly exceeded the *Healthy People 2020* baseline (23.8%) and target (21.4%) decay rates.<sup>63</sup>

It appears that encounters with alternative providers play a large role in the oral health status of children. In the present study, we used complementary approaches of testing effects (MANOVA and Kruskal–Wallis) and examining associations (Pearson correlation) to evaluate the data. Collectively, these 2 approaches illustrated consistency between the direction of outcomes and the strength of effect size and associations. Adequate power was present for all statistically significant findings. In addition, the range of 95% CIs was relatively narrow and did not equal zero. This indicates that the study provided a plausible range of values for the true effect. The mean reduction of decay

**TABLE 3—Summary of Multivariate Analysis of Variance Results in Study of School-Based Intervention Delivered by Dental Hygienists to Low-Income Children in a Midwestern US Suburb: February 2008–May 2012**

Variables	P	Partial $\eta^2$	Observed Power	Mean (95% CI)
No. of encounters				
Change in decay	.014	0.06	0.88	−0.54 (−1.06, −0.01)
Change in restorations	.002	0.08	0.96	1.08 (0.74, 1.40)
No. of fluoride applications: change in decay	.643	0.02	0.35	−0.52 (−1.38, 0.35)

Note. CI = confidence interval.



**TABLE 4—Changes in Decay and Restorations in Relation to the Number of Extended Care Permit Dental Hygienist Encounters and Number of Fluoride Applications: Low-Income Children in a Midwestern US Suburb, February 2008–May 2012**

Total No. of Encounters	No.	Mean (SD) Change in Decayed Teeth	Mean (SD) Change in Restored Teeth
2	73	0.51 <sup>a</sup> (1.94)	0.30 <sup>b,c</sup> (0.95)
3	64	-1.09 <sup>a</sup> (2.92)	0.83 (1.86)
4	73	-0.66 (2.64)	1.10 (2.18)
5	32	-0.59 (3.78)	0.97 (1.73)
6	25	-1.16 (4.06)	2.00 <sup>b</sup> (2.71)
7	16	-1.56 (3.54)	1.94 <sup>c</sup> (2.24)
8	8	-1.25 (1.28)	1.50 (2.45)
9	4	1.50 (2.38)	0.00 (0.00)
Total	295	-0.54 (2.92)	0.95 (1.93)

<sup>a,b,c</sup>Values with the same superscript letters were statistically significantly different from each other ( $P \leq .05$ ).

(-0.54) and increase in restorations (1.08) is a clinically worthwhile benefit to children when one considers the impact of poor oral health in relation to overall health, self-esteem, quality of life, school performance, and school attendance.<sup>2,4-12,15,64</sup>

### Limitations

Effectiveness research assesses the degree of beneficial effect of a real-world intervention on a target population.<sup>39</sup> The pragmatic nature of these sorts of studies do not allow for tight controls, which could result in biases affecting the outcomes. The research team sought to minimize this by having a single ECP dental hygienist supervise care and enter patient information into the EMR. We defined the criteria for charting dental sealants, restorations, decay, and treatment urgency before beginning the intervention.

The ex post facto repeated measures design attempted to minimize selection bias. However, there was tremendous diversity in the target population that could not be controlled for and was not measured. Children had different levels of ability for their personal oral self-care, diets were wide-ranging, the target population was transient, and home environments were unpredictable. These confounding variables could have affected the outcomes. They also explain the medium effect size ( $\eta^2$ ) and small correlation values. Future studies should consider capturing these data and conducting a stratified analysis. There was also diversity

within the data set. The entire cohort did not have consecutive visits from year to year, some of the children had 2 or 3 years between visits, and the number of participants in each group was not equal. Although these are not ideal contexts for conducting research, they reflect the realities of conducting research on real-world interventions.

A randomized controlled trial would have been a more robust design for this study; however, that was not feasible because of the transient nature of our target population. It was not unusual for children to attend more than 1 school during a single school year. In addition, there would have been ethical concerns if the intervention was only offered to a portion of the children who desperately needed care.

Another stronger design to evaluate health care interventions would have been an interrupted time-series design. This design would use population-level data to control for secular trends and intended or unintended consequences. Data collection must occur at multiple time points before and after an intervention, which would also be difficult to achieve with our transient target population.<sup>65</sup> This design would also have required students to miss a significant amount of classroom time to collect the pre- and postintervention data at multiple points, which brings forth ethical concerns. A drawback for both of these study designs is the length of time it takes to develop caries. Children would need to be followed for multiple school years to observe meaningful

changes, a data collection strategy difficult to achieve in this target population.

The number of fluoride varnish applications in the present study did not affect decay. This is inconsistent with the literature. The relationship between topical fluoride applications and caries reduction has been firmly established and published in several Cochrane Reviews.<sup>66-69</sup> The design of this study was not optimum for capturing this relationship. Future studies should have the baseline measurement start with decay-free teeth and use a randomized controlled trial design.

This study did not capture how the inter-professional relationships among the ECP dental hygienists, dental hygiene students, school nurses, speech pathologists, occupational therapists, teachers, and translators affected the outcomes of care. Future research should examine the effects of these relationships. The body of knowledge would also benefit from future research examining costs associated with the provision of care and determining whether models such as these are a cost-effective way to provide high-quality care.

The amount of care delivered may have been influenced by the dental hygiene student rotations. The student workforce added additional providers to deliver care, which potentially increased productivity. However, the student workforce functioned at a much slower pace than experienced dental hygienists, which most likely offset any increased productivity that may have occurred. Student providers delivered care on average to 3 or 4 children daily depending on the child's age, complexity of oral health findings, and number of sealants that were placed. The student workforce was supervised by, and delivered under the license of, an ECP dental hygienist who was also faculty at the school. The quality of care was monitored and maintained for every patient.

A potential threat to external validity was the interaction of setting and treatment. Generalizing the findings of this study to alternative workforce models in different states and in different settings may be problematic. Future research is needed to examine participants' changes in oral health status on a larger scale and in other settings, such as skilled nursing facilities and using alternative workforce

models in other states, to ultimately use the results to guide dental workforce policy changes that will improve the oral health of underserved populations.

## Conclusions

The results of this study suggest that increasing numbers of encounters with alternative providers (ECP dental hygienists) yielded a decrease in decay, an increase in restorations, and a decrease in the level of treatment urgency, all at statistically significant levels, for children who would not otherwise have received oral health services. School-based oral health programs that deliver care via alternative workforce models, such as the one described in this article, may be an effective way to improve the oral health status of low-income children. ■

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This article was accepted April 9, 2015.

## Contributors

M. Simmer-Beck contributed to the conceptualization and design of the study, methodology, and data analysis, and was the project director of several grants that funded the school-based oral health program. M. Walker contributed to the conceptualization and design of the study, methodology, and data analysis, and assisted M. Simmer-Beck in securing a National Institute of Dental and Craniofacial Research T-32 grant to support this study through her role as associate dean for research and graduate programs. C. Gadbury-Amyot contributed to the conceptualization and the design of the study and methodology, and was chair of the Division of Dental Hygiene at the inception of the school-based program. Y. Liu contributed to data analysis and served as statistician. P. J. Kelly and B. Branson contributed to the conceptualization and the design of the study and methodology. All authors contributed to drafting and revising article content, and participated in final approval of the article.

## Acknowledgments

Funding for this project and M. Simmer-Beck's advanced degree was through National Institute of Dental and

Craniofacial Research (T32-DE007294). Funding for the school-based oral health program evaluated in this study was from the REACH Healthcare Foundation and Kansas Health Foundation.

The authors would also like to acknowledge the Olathe School District for its efforts in implementing the school-based oral health program and its ongoing support for oral health.

## Human Participant Protection

The study was approved by the University of Missouri–Kansas City Adult Health Sciences Institutional Review Board Protocol 13-420.

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