

Extending Oral Health Care Services to Underserved Children through a School-Based Collaboration: Part 1 – A Descriptive Overview

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Introduction

The landmark publication *Oral Health in America: A Report of the Surgeon General* brought national attention to the fact that in the United States, the public infrastructure for oral health care services is insufficient to meet the needs of all Americans.¹ The report highlighted the extent of unserved and underserved populations where race, ethnicity and socioeconomic status factored significantly into the unequal distribution of services. Chronic dental disease is a concern for unserved and underserved populations of all ages, but especially in young children, where it is more prevalent than asthma and hay fever.¹ The National Call to Action to Promote Oral Health, a follow-up report to the Surgeon General's *Oral Health in America*, seeks to bring multiple stake holders together with 3 common goals: promote oral health, improve quality of life and eliminate oral health disparities.² The report noted that school children should not be unable to concentrate as a result of pain from untreated dental infections. Of the action items in the report, only 1 of the 5 specifically called for an "increase in the oral health workforce diversity, capacity and flexibility."² This paper will describe the implementation and initial outcomes of a school-based oral health program directed at children in need.

Abstract

Purpose: The purpose of this report is to describe the process and outcomes of a collaborative, comprehensive preventive oral health program between the University of Missouri-Kansas City School of Dentistry, the Olathe School District and an Extended Care Permit I dental hygienist. The report describes the programs collectively working to provide school-based services to disadvantaged children in 4 Title I schools using the community collaborative practice oral health model and tele-dentistry.

Methods: The "Miles of Smiles" clinic was assembled in 4 elementary schools using portable dental equipment. Dental hygiene students, supervised by a dental hygiene faculty member with an extended care permit, provided comprehensive preventive oral health care to unserved and underserved children.

Results: Twenty-eight dental hygiene students provided prophylaxis, radiographs, sealants, fluoride varnish, oral health education and nutritional counseling to 339 children in the Miles of Smiles clinic during the 2008 to 2009 academic year. Sixty-three percent of children had decay and were referred to a dentist. Upon re-evaluating at the end of the school year, 11% had begun the transition process of seeking restorative care at a safety net clinic or from a local dentist.

Conclusion: School based oral health models, using dental hygienists with expanded scopes of practice to provide preventive oral health services and referrals, can serve as one approach to overcoming barriers and reaching vulnerable children that desperately need oral health care. However, transitioning children outside of their school to a safety net clinic or local dentist to receive restorative care was found to be problematic.

Key words: access to care, dental hygiene education, community-based dental education, dental care for children, oral healthcare for the underserved, portable equipment, teledentistry, school-based oral health

This study supports the NDHRA priority area, **Health Services Research:** Investigate how alternative models of dental hygiene care delivery can reduce health care inequities.

Background

There is growing consensus among governmental and professional organizations that changing the profile of dental hygienists to increase their involvement in public health can help improve access to oral health care.³⁻⁶ Currently, 29 states allow dental hygienists:

- Direct access to initiate treatment based upon their assessment of a patient's needs without specific authorization of a dentist
- Treatment of a patient without the presence of a dentist
- Maintaining a provider-patient relationship⁷

In 2003, Kansas became one of these states when legislature passed a bill that expanded the scope of practice allowing dental hygienists with an Extended Care Permit I (ECP-I) to provide screening, education, preventive dental hygiene services (such as apply fluoride varnish) and topical anesthesia application in certain community based sites under the sponsorship of a dentist.⁸ The parameters of the ECP-I are delineated in Figure 1.

Kansas Dental Practice Act 2009⁸

As a result of this change in the dental practice act, the "hub and spoke" model of service delivery (Figure 2) has evolved in Kansas, allowing the ECP-I dental hygienist to provide dental hygiene services to people where they live, work, go to school or receive social services. It has also allowed hygienists to refer patients back to safety net clinics or dentists willing to provide care in traditional private dental practices for care beyond the scope of practice for an ECP-I dental hygienist.^{8,9} Safety net dental clinics are generally community based oral health providers located in low income locales. These clinics provide care to diverse populations that lack access to care, and are usually sponsored or situated in public health departments, community health centers, Indian Health Service Clinics, non-for profit agencies, dental schools, dental hygiene programs, school-based clinics and mobile dental vans.¹⁰ This change in legislation, combined with implementation of the dental hub program, allowed Kansas to improve their overall grade of a D+ from Oral Health America in 2003 to a B in 2009.^{11,12} The grades provided by

Figure 1: Extended Care Permit I

- Tasks and procedures preventive in nature may be performed by a dental hygienist with and Extended Care Permit I with consent of the parent or legal guardian of children birth to five and children in public and nonpublic schools kindergarten through grade 12 regardless of the time of year and children participating in youth organizations, so long as such children birth to five, in public or nonpublic schools or participating in youth organizations also meet the requirements of medicaid, healthwave, or free or reduced lunch programs or Indian health services
- Tasks and procedures are limited to:
 - Removal of extraneous deposits, stains and debris from the teeth and the rendering of smooth surfaces of the teeth to the depths of the gingival sulci
 - The application of topical anesthetic if the dental hygienist has completed the required course of instruction approved by the dental board
 - The application of fluoride
 - Dental hygiene instruction
 - Assessment of the patient's apparent need for further evaluation by a dentist to diagnose the presence of dental caries and other abnormalities
 - Other duties as may be delegated verbally or in writing by the sponsoring dentists consistent with this act
- Dental hygienist must have performed 1,200 hours of dental hygiene care within the past three years or have been an instructor at an accredited dental hygiene program for two academic years within the past three years
- Dental hygienist must have proof of professional liability insurance
- Dental hygienist must be sponsored by a dentist licensed in the state of Kansas, including a signed agreement stating that the dentist shall monitor the dental hygienist's activities
- Dental hygienist must advise the patient and legal guardian that the services are preventive

Oral Health America offers a snap shot of the oral health in Kansas by looking at factors that contribute to good oral health.

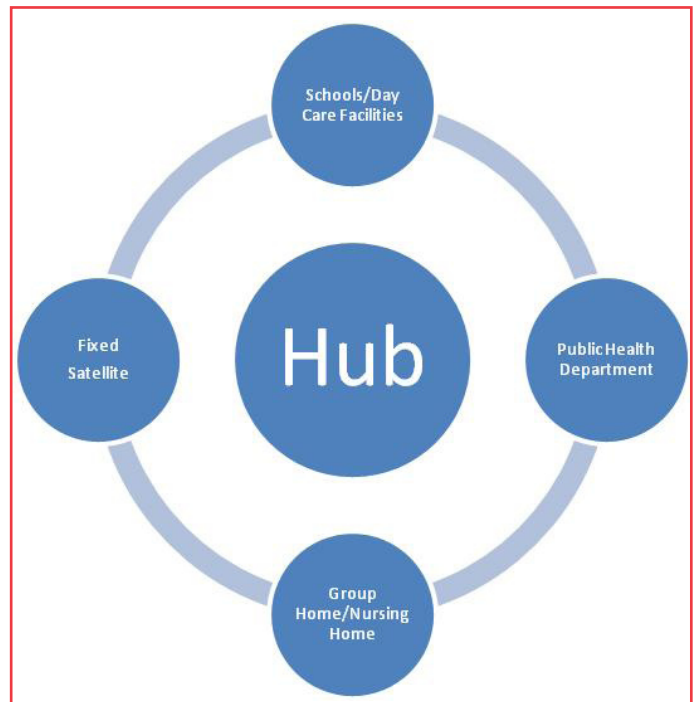
Although the infrastructure in Kansas has changed to improve access to care, the financial aspects required to access care are still problematic. The State Children's Health Insurance Program (SCHIP) was enacted in 1997 to expand health care services to low income children and pregnant women from families who do not qualify for Medicaid and are unable to afford private insurance. Until February 4, 2009, dental coverage was optional under the SCHIP program. The SCHIP reauthorization includes oral health provisions, as well as a dental wrap provision, where children of families that meet income and other eligibility SCHIP requirements that also have medical benefits through an employer-sponsored medical insurance plan can still access dental care through SCHIP.¹³ Medicaid's Early Periodic Screening, Diag-

nostic and Treatment Program has always included comprehensive dental coverage for low income children, however, the numbers of participating dentists falls far below that needed to provide necessary services in a timely manner.¹⁴ Deterrents reported by dentists include low reimbursement rates, administrative hassles and frequent broken appointments.¹³ This was tragically illustrated in 2007 when 12 year old Deamonte Driver of Maryland died as a result of complications from an acute dental infection that spread to his brain. On January 11, 2007, Deamonte came home from school with a terrible headache. Eventually, he was rushed to Children’s Hospital, where he underwent emergency brain surgery and subsequently died on February 25, 2007. Deamonte never received routine dental care. The Driver family, like many others, experienced systemic problems with the Medicaid system, compounded by barriers such as lack of transportation, bouts of homelessness and erratic telephone and mail service.¹⁵ This case exemplifies the severity of dental access problems facing children in low income families and blatantly highlights the importance of publically funded dental programs for children.

While one could argue about the responsibility and role of the adults in Deamonte’s life (mother, absent father, Medicaid administrators, dentists, etc.), the child was the innocent victim in this circumstance. On February 14, 2008, *One Year Later: Medicaid’s Response to Systemic Problems Revealed by the Death of Deamonte Driver* was presented to the Domestic Policy Subcommittee of the House Oversight and Government Reform.¹⁶ Burton L. Edlestein, DDS, MPH, Chairman of the Board of Children’s Dental Health Project, an independent non-profit organization committed to improving children’s access to oral health, testified about the federal government’s roles and responsibilities in ensuring that children with Medicaid have access to dental care which is promised to them by federal law. Edlestein stated that “a new and concerted effort to reduce disease burden, focus care on children at greatest risk, and maximize the capacity of dental Medicaid programs is essential.”¹⁶ The 2010 PEW report, *The Cost of Delay: State Dental Policies Fail One in Five Children*, noted the national crisis of poor dental health and lack of access to care among disadvantaged children is a result of 3 broad systemic factors:¹⁷

1. Too few children have access to proven preventive measures, including sealants and fluoridation
2. Too few dentists are willing to treat Medicaid-enrolled children
3. In some communities, there are simply not enough dentists to provide care

Figure 2: Hub and Spoke Model⁹



Policymakers are called to address the oral health access to care problems and must address workforce capacity to find innovative solutions that will meet the needs of all sectors of the United States population.^{3,17}

With this background surrounding access and disparity of oral health care services, this report describes an innovative workforce model that involves a collaborative program between the University of Missouri-Kansas City (UMKC) School of Dentistry, the Olathe School District and an ECP-I dental hygienist, collectively working to provide school-based, comprehensive preventive oral health services to disadvantaged children. The program takes place in 4 Title I schools (defined as exceeding 40% poverty based upon the number of students that qualify for free or reduced lunches) located in Olathe, Kansas, a suburb of Kansas City. This program, called “Miles of Smiles,” began in January 2008 and is an extremely timely and important project. Aspects of the project include:

- Increasing access to oral health care and appropriateness of care for unserved and underserved persons (Health People 2010 Objective, National Call to Action)^{1,2}
- Providing a much needed oral component (dental home) in school based health centers (Healthy People 2010, National Call to Action, Kansas Oral Health Plan)^{1,2,18}
- Providing a channel for collaboration between caregivers, educators and social service providers (National Call to Action)²

- Mentoring dental hygiene students in their role of addressing access to care utilizing tele-health technology and an extended care permit (National Call to Action, Center for Health Workforce Studies, Kansas Oral Health Plan)^{2,5,18}
- Providing the necessary infrastructure and demonstrating the value of using a dental hygienist as a mid-level provider (National Call to Action, Center for Health Workforce Studies)^{2,5}

All Miles of Smiles participants receive comprehensive preventive oral health services (radiographs, prophylaxis, sealants, fluoride varnish, oral health education and nutritional counseling) directly in their elementary school during normal school hours. Approximately 30 to 60 minutes on average was taken out of their learning time. Services are provided by dental hygiene students supervised by a UMKC faculty holding an ECP-I. Medicaid was billed if the child had it. There were no out-of-pocket costs for participants if they did not have Medicaid. The first year of this program resulted in 339 children receiving comprehensive preventive oral health care.

Dental Home

The American Academy of Pediatric Dentistry's definition of a dental home is derived from the American Academy of Pediatrics' definition of the medical home. The dental home is a relationship with an oral health care provider that has beneficial consequences of early professional dental care, appropriate care, periodic supervision, reduced treatment costs and access to otherwise unavailable services which can reduce disparities. Establishment of a dental home is initiated by the identification and interactions of the patient, parents, non-dental professionals and dental professionals in heightened awareness of all aspects of oral health.¹⁹

Methods and Materials

Model

Miles of Smiles is a hybrid replication of the "Community Collaborative Practice" (CCP) model developed by Apple Tree Dental, a not-for-profit organization in Minnesota.²⁰ The CCP model increases access to oral health care by expanding the role of dental hygienists in the delivery of preventive care services and establishing tele-dentistry links with dentists.²⁰ This was a fitting model for Miles of Smiles due to the legislative changes made to the Kansas Dental Practice Act that targeted improved access to oral health care by allowing dental hygienists less restrictive supervision using an Extended Care Permit (ECP).⁸ As suggested by the U.S. Department of Health and Human Services,

the infrastructure of this program integrated health care providers with the intent to fully treat disease.¹ Partnerships were developed with local dentists, school nurses, translators, educators, school district administrators, social service providers, caregivers and parents to promote holistic care. The development and nurturing of these partnerships was critical to the success of the program. Comprehensive preventive oral health care was provided on-site, directly in the child's school, enhancing child access.

Funding

Start-up funding to develop and pilot the project, hire a program manager and purchase equipment and supplies was provided through a grant from The REACH Healthcare Foundation in 2008. Additional equipment and supplies were donated from A-DEC, Ultradent, Hu-Friedy and Premier Dental. The REACH Healthcare Foundation awarded a second grant to continue the project for the 2009 to 2010 academic year. Additional support for the project was provided by the National Children's Oral Health Foundation and the American Dental Hygienists' Association.

Target Population

Low income children in 4 Title I schools in the Olathe School District were targeted to receive comprehensive preventive oral health services in a school-based setting during the first year of the program. Table I describes the target population's demographics and tremendous diversity. A significant portion of the target population qualified for free or reduced lunches, resulting in 816 disadvantaged children being eligible to participate in the program. Nearly 27% of the children attending target schools were English Language Learners, with Spanish being the most common primary language.

Inclusion Criteria

Miles of Smiles was promoted in the target schools during the enrollment and registration period of the 2008 to 2009 school year. In accordance with the Kansas Dental Practice Act,⁸ all children that qualified for free or reduced lunches were eligible to participate in the program. Parents or guardians were required to complete appropriate paperwork in order for the child to participate. Children treated in the Miles of Smiles clinic were considered patients of record at the UMKC School of Dentistry, and they completed the same registration, consent for treatment, health history and HIPPA forms as patients at the School of Dentistry. These forms were available in English and Spanish. Spanish transla-

Table I: Target Population Demographics

Elementary School	Total number of children	Percent free or reduced lunches	Total number eligible for services	Total number of ELL	Number of languages spoken
Fairview*	348	66%	230	135	9
Ridgeview*	227	74%	168	120	7
Washington*	441	66%	291	114	8
Havencroft**	318	40%	127	22	6
Total	1473	n/a	816	393	n/a

*ELL center

**foreign language center

Table II: Summary of Tele-dentistry Technology

Hardware for CMS	<ul style="list-style-type: none"> • Server: Dell Optiplex 755, Core2 Duo, 4gb RAM and 250GB HD with (encrypted) redundant local back up disks system. This supports both the clinical record and pacs (imaging) functions. • Dell Latitude D830 Notebooks with 15.4" WXGA displays, Core2 Duo Processors, 4gb RAM and 200GB hard disks • Secugen BioMouse – for biometric authentication/approvals • Topaz – signature capture pads
Software for CMS	<ul style="list-style-type: none"> • Sever – Operating System – Windows Server 2003 • SQL Database – Interbase from Borland/Code Gear/Embarcadero
Network	<ul style="list-style-type: none"> • Local Network at Outreach site – All devices are wired 100mb Ethernet • Connection from outreach sites (schools) to dental school host system server farm – Direct (point-to-point) encrypted/secured VPN Connection over SSL (tunneled) using Cisco technology; estimated (dedicated) connection ~5-10mb over DSL.
Technologies	<ul style="list-style-type: none"> • MiPACS Storage Server & MiPACS Client – Medcor Imaging • MS SQL Server • Client – Operating System – Windows XP Pro • Application Environment – Paradox – Corel Software • Nomad Portable X-ray (source) with stand and remote release* • Size 0, 1, & 2 Phosphor Storage Plates (PSP) • Scan-X 12 DVM Digital X-Ray Processor (Images stored in MiPACS)** • Sopro 717 Intraoral Camera Handpiece with Sopro Camera Dock Station (analog and USB2) • Canon Rebel Digital camera (~12megapixel) with 100mm macro lens & ring light source. Capable of I/O/ 1:1 as well as extraoral images

*Required to be in compliance with the Kansas Dental Practice Act

** Dicom compliant

tors were provided by the Olathe School District to assist with completing the forms. The same HIPPA privacy and security guidelines that govern activity at the school of dentistry applied to the project. All children, regardless of their ability to qualify for free or reduced lunches, were eligible to receive the comprehensive oral health screenings. A separate consent was collected for the screening aspect of the program.

Data Collection

The computer management system (CMS), or electronic record, in place at UMKC School of Den-

tistry was modified in 2008 to collect data specific to project outcomes. Researchers used SPSS to create a large database to track and report service utilization. Comprehensive screening data was collected by dental hygiene students and the supervising faculty in October 2007 to gather preliminary (baseline) data. In 2008, the data was used for the evaluation of the program. A full mouth charting was completed on each child noting present decay, sealants, oral hygiene, gingival health and urgency of care. Report cards, identifying the child's oral health condition and referral needs, were completed and sent home to parents and/or guardians.

Data to identify oral health needs and ability to access oral health care were collected during school enrollment by surveying a convenience sample of 876 parents and/or guardians (59% of parents and/or guardians) in the 4 target schools regarding their child's oral health needs and ability to access oral health care. The survey replicated the access to care questions asked during Smiles Across Kansas 2004,²¹ which sought consent to screen third grade children to allow comparison of the data to state norms.

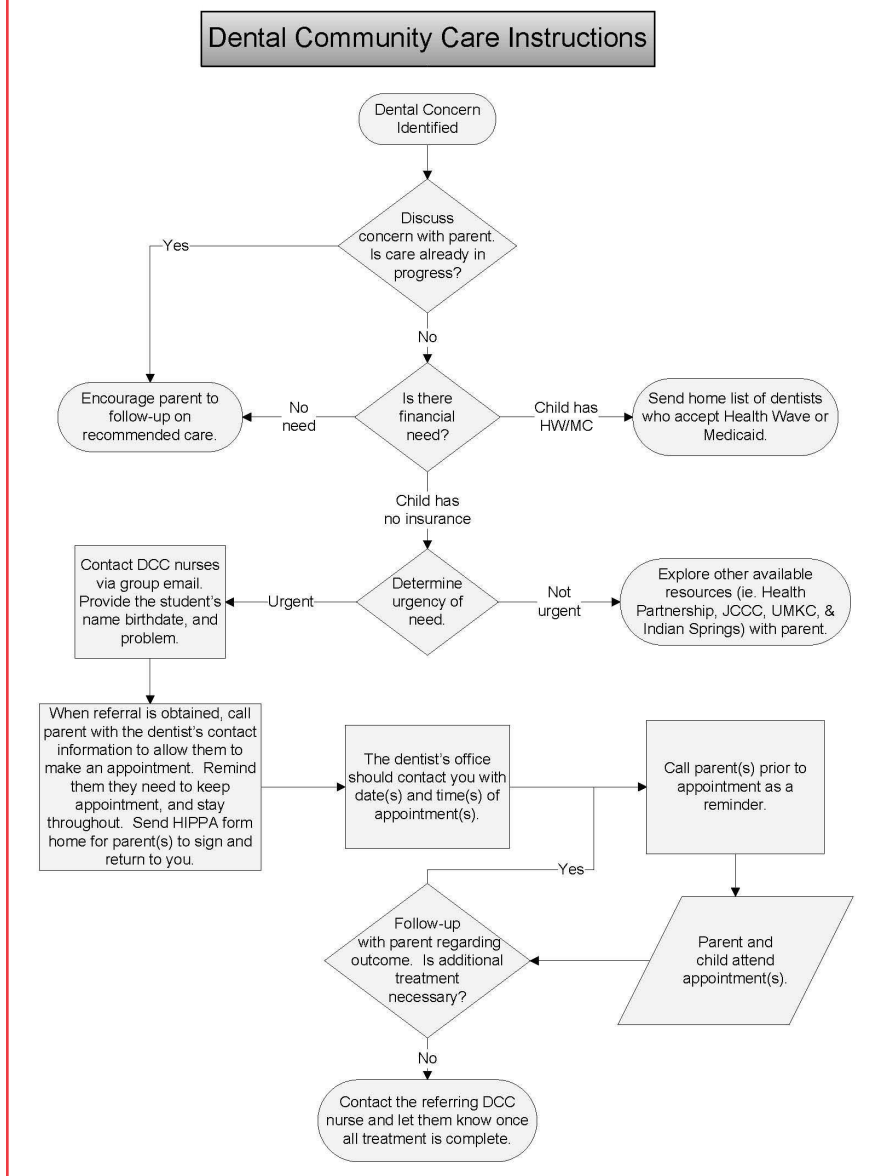
Supplies and Equipment

The Miles of Smiles clinic utilizes the A-Dec Pac 1 Portable System (Model 3420) for portable dental hygiene equipment. The clinic is equipped with the Pac 1 Self-Contained Unit, which does not require an outside air supply, and the adjustable Porta-Chair. The clinic uses the store and forward method to exchange clinical information. The CMS is a full-featured SQL-based client-server electronic patient record, developed in house to document, store and transmit comprehensive clinical patient care, including radiographs and digital intra- and extra-oral images. Table II outlines the technology used.

Care Provided

A dental hygienist with an ECP-I provided care to children enrolled in this program 1 to 2 days a week, and served as the faculty member who supervised 28 dental hygiene students as they provided care to children in the clinic 2 to 3 days a week. The Director of Quality Assurance at UMKC School of Dentistry performed a random quality assurance audit on 10% of the patient records using measures of service use.²² In anticipation of having a large number of uninsured children with a need for restorative care, the school district's Student Health Services Coordinator organized a referral network, Dentists Community Cares, for children without insurance or the resources to pay for care. Ten community dentists volunteered to provide free care for 1 child a month through the program. The referral protocol, created in collaboration with the Olathe School District Director of Health Services, is outlined in Figure 3.

Figure 3: Dentists Community Care Referral Protocol



Results

Table III provides demographic information about the 389 children who enrolled in Miles of Smiles. The majority of children were 9 to 14 years old, with slightly more males presenting. Nearly half of the children that enrolled were Hispanic, therefore, all written materials were available in Spanish as well as English.

Table IV summarizes the initial oral health status of the 637 students screened in the 4 target schools. The screenings revealed a significant amount of hard and soft tissue disease, and children needing urgent care within 24 hours. This data was used to substantiate the children's oral health need and attain grant funding to start the Miles of Smiles clinic.

Table III: Demographic information of children enrolled in Miles of Smiles (n=389)

Category		n(%)
Age	0-5	4 (1.0)
	6-8	165(42.4)
	9-14	215(55.3)
	Unknown	5 (1.3)
Gender	Male	213(54.8)
	Female	176(45.2)
Ethnicity	Hispanic	193(49.6)
	Caucasian	117(30.1)
	Black	49(12.6)
	Asian/Pacific Islander	19(4.9)
	Two or More	9(2.3)
	Unknown	2(.5)

Nurses at each school reported seeing children due to tooth pain and referring children to a dentist each week. The Smiles Across Kansas 2007 Update, a comprehensive oral health survey of Kansas third graders, reported 21% of children had untreated decay and 36% had dental sealants.²³ Table V compares the data in our target population to Healthy People 2010, NHANES and state norms.²³⁻²⁵

The comparison of the study screening data with national and state data reveals that the overall oral health condition of children in the 4 participating elementary schools was worse than comparable data in all but 1 instance. Considerable improvements in the oral health of the target population were clearly necessary to meet the goals of Healthy People 2010.²⁴ Results of the oral health needs and ability to access oral health care survey revealed 37% of the families had not been to the dentist within the last year. Of those, 24% reported there were times they needed dental care but could not get it due to limited financial resources and lack of dentists accepting Medicaid. Eighteen percent reported they had never been to the dentist. Barriers for the target population included such things as cost, transportation, language, lack of providers and inability for parents to take off work.

Care was provided to a total of 339 of the 389 children that enrolled during the first year of the program (2008 to 2009 academic year), using an ECP-I dental hygienist, senior dental hygiene students and volunteer dentists in the community who delivered restorative care. Table VI outlines the collective sum of services and referrals provided in all 4 schools during the first year of the program. The care provided for the Miles of Smiles program was

Table IV: Comprehensive Oral Health Screening Outcomes for Miles of Smiles Fall 2007

Oral Health Screening	Results
Number screened	637
Unsatisfactory oral hygiene	44%
Gingivitis	32%
Percent untreated decay	28%
Need treatment	23%
Percent of sealants	17%
Urgent care	3%

Table V: Comparison of Data to National and State Norms

	Untreated decay	Sealants
Miles of Smiles ages 5-12	28%	17%
Healthy People 2010 Target ages 6-8 (1988-1994)	21%	50%
Healthy People 2010 Baseline ages 6-8 (1988-1994)	29%	23%
NHANES 6-11 years	22%	32%
Smiles Across Kansas (third graders)	21%	36%

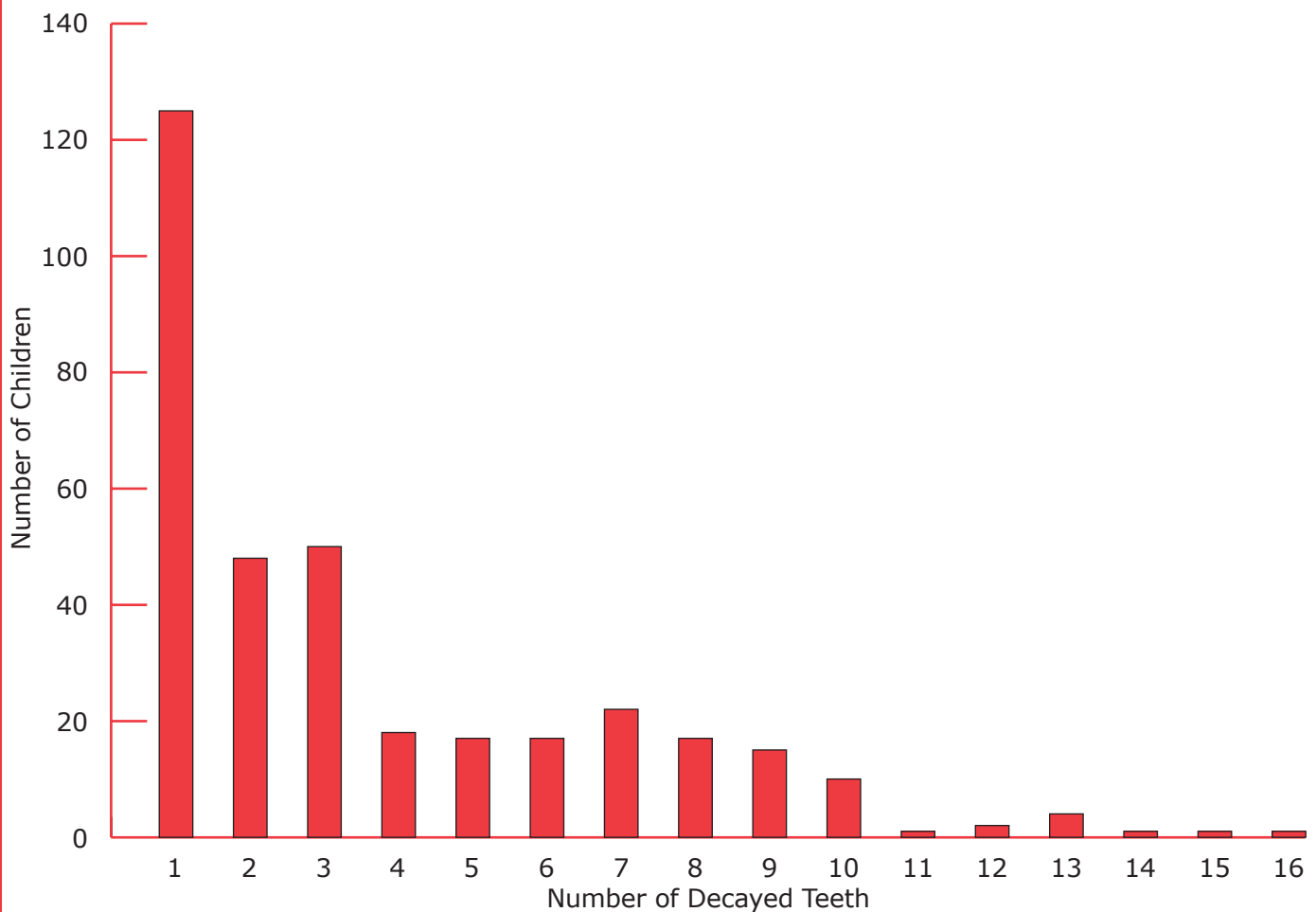
Table VI: Summary of Preventive Procedures Completed

Procedure	Number Completed (%)
Prophylaxis	350
Bitewing Radiographs (2)	272
Fluoride Varnish	342
Number of Children that had at least one sealant placed	110
Total Number of Sealants Placed	302
Decay Present and Referral to Dentist	214 (63%)
Referral Initiated by Parent/Guardian	23 (11%)

documented in patient records, and a quality assurance audit revealed that the care provided was consistent with the care provided in the general clinic at the School of Dentistry.

Sixty-three percent of the children had active decay and were referred to a local dentist. Upon re-evaluating the children at the end of the school year, only 11% of the children that had been re-

Figure 4: Summary of Decayed Teeth



ferred to a dentist initiated the transition process of seeking restorative care at a dental hub/safety net clinic or dental office. Figure 4 outlines the wide range of decay (0 to 20 teeth) found in each child.

In 2008, there were 1,233 persons per dentist in Johnson County (this stands in contrast to 2,013 persons per dentist in Kansas).²⁶ Resources were virtually non-existent for uninsured children, with only 1 clinic for uninsured low income persons in the county. Resources were equally limited for children that qualified for Medicaid or Healthwave. The Kansas Medical Assistance website listed 7 Medicaid dental providers in Olathe, Kansas.²⁷ Calling these providers on September 24, 2008 revealed only 4 of the providers routinely accepted new cases. A pediatric dentist who was not accepting new Medicaid patients agreed to provide restorative care to all of the children with Medicaid participating in Miles of Smiles, and also agreed to provide additional care to other children in need, suggesting to the researchers that increasing awareness surrounding unmet need may have a positive effect on participation in programs such as Miles of Smiles.

Discussion

As an outcome of the U.S. Surgeon General's initial report discussing health care disparities in 2000, the academic dental community has been charged with the responsibility to "anticipate and prepare for curriculum changes that these new workforce models will demand."¹ Dental educators, including those in dental schools, allied dental programs and advanced education programs, are encouraged to "strengthen and build partnerships within these communities to ensure a seat at the table as broader discussion about the nation's health care workforce ensue."²⁸ The American Dental Education Association, the American Dental Hygienists' Association and other workforce groups support expanding the scope of an allied dental professional's employment as one mechanism to improve access to oral health care.^{2,5-7,17}

The Miles of Smiles program is an example of a solution that addresses these recommendations through building partnerships with communities while educating dental hygiene students and expanding the scope of allied dental professionals. It has been well documented that students who are

exposed to alternative practice settings and patients that lack access to care are more likely to seek out employment opportunities in those areas once they enter the workforce.²⁹⁻³³ Dental hygiene education is one means to influence dental hygiene students to seek a career in public health by exposing dental hygiene students to alternative practice settings and patients that lack access to care using an academic service learning model. It also helps to create an awareness of the needs within their own communities, exposing dental hygiene students to diversity and disparity, and it gives a sense of civic responsibility as a health care professional.^{29,34-36}

The children targeted for the Miles of Smiles program had tremendous difficulties accessing dental care in the metropolitan area. The study showed the unmet oral health needs and inability to access oral health care resulting from limited financial resources and lack of dentists accepting Medicaid. The Smiles Across Kansas 2007 Update reported 14% of Kansas children could not get dental care within the last 12 months, and Hispanic children were more frequently uninsured, faced barriers to care and may have never seen a dentist.²³ Barriers identified by our target population were very similar to the barriers identified in the Smiles Across Kansas 2007 Update: cost, transportation, language, lack of providers, inability for parents to take off work and lack of information. In a recent publication about another school-based oral health care program, Niederman et al listed comparable barriers and noted that the community-based delivery model circumvents many of these barriers by bringing the providers to the patient rather than the patient to the providers.³⁷

More recently, the PEW Center on the States assessed and graded all 50 states and the District of Columbia, using an A to F scale, on their ability to employ 8 proven and promising policy approaches that ensure dental health and access to care for disadvantaged children. Kansas earned a C. Less than 25% of high-risk schools were reached by school sealant programs, and more than half of Kansas Medicaid-enrolled children received no dental service in 2007. In spite of Kansas's Medicaid utilization rate rising for several consecutive years and the state reimbursing medical providers for basic preventive dental care for Medicaid-enrolled children, more than 16% of the population was still left unserved for dental care. The PEW Center on the States estimated that Kansas needs at least 90 dentists to meet the needs of these residents.¹⁷

During the course of this program, the researchers became aware of several disconcerting situations. For example, one young girl had 20 severely

decayed primary teeth and was malnourished due to pain and sensitivity when eating. This child was significantly underweight. The dentist that diagnosed this child and restored her teeth deemed her case an emergency because of the pain and malnourishment. This patient had to be treated in the hospital under general anesthesia. She had 1 tooth extracted and a space maintainer placed to retain the open contact to allow the permanent tooth to erupt, 15 pulpotomies and 19 crowns. The total cost of the hospital facility fees, anesthesia and restorative charges were over \$20,000. This care was provided at no cost to the family. Another sixth grade student had his permanent teeth erupt without the primary teeth exfoliating. His parents and teachers thought he had 2 rows of teeth. His maxillary lateral incisors were malpositioned so far lingually that they were directly behind the centrals, and his teeth were crowded due to a narrow arch. He had closed contacts, so it appeared to the untrained eye that this child had 2 rows of teeth. This condition has resulted in the child receiving extensive speech therapy. What he truly needed, however, was an orthodontic consult. This child was put in contact with Smiles Change Lives (a non-profit organization) to receive a complimentary consultation from an area orthodontist.

Many children presented with severe decay, abscesses and subgingival calculus. The examples discussed above demonstrate that a lack of oral health care resulted in increased costs, more invasive care and poor health outcomes.

As the number of dental hygiene graduates increase and the number of dental graduates decrease, it makes sense that expanding the scope of practice for dental hygienists is a reasonable and economical solution to address access to care disparities. The legislative changes expanding the scope of practice for dental hygienists in Kansas, allowing an ECP-I dental hygienist to provide care in public health settings, has provided the opportunity for programs, such as Miles of Smiles, to reach populations that lack access. The positive effects of implementing contemporary workforce models can be seen in the most recent Keep Kansas Smiling – Kansas Oral Health Grading Project, where Kansas was noted as being a leader in making oral health a priority.¹¹ The Miles of Smiles collaboration demonstrated that a school based oral health care program can reach those who need care the most. Almost two-thirds of the children that received preventive care in the Miles of Smiles clinic had decay present, which is more than twice the published national and state norms.²³⁻²⁵ This report, along with Niederman's findings, show very similar findings in regards to children with decay transitioning to a dental prac-

tice to receive restorative care, with only 10 to 11% transitioning despite notifying the parents and/or guardians and offering referrals.³⁷ Future school-based delivery models should seek to find ways to improve these statistics and analyze the cost analysis of programs such as these.

The Director of Quality and Assurance noted that dental referrals need to be better documented in the patient record. As a result of this, the CMS system was modified in July 2009 to ask specific questions about dental referrals and treatment urgency. This additional data will provide improved information on outcomes and appropriateness of referrals.

The outcomes of the current project support Niederman's conclusions that a school-based oral health care model can overcome barriers to accessing care and improve children's oral health.³⁷ Both the findings from the Niederman study and this study demonstrate that community-based oral health programs are mutually beneficial for the university, students and the community.

Conclusion

Addressing access to oral health care is a multi-faceted issue that will take a multi-faceted approach. School based oral health models, using dental hygienists with expanded scopes-of-practice to provide comprehensive preventive oral health services and referrals, can serve as one approach to overcoming barriers and reaching vulnerable chil-

dren that desperately need oral health care. However, transitioning children outside of their school to a safety net clinic or local dentist to receive restorative care was found to be problematic. Expanded scopes of practice that allow for simple restorative procedures could address this problem.

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Acknowledgments

The Miles of Smiles program was supported by grants from the REACH Healthcare Foundation and we thank them for believing in our vision. We would also like to thank the Olathe School District administration and school nurses for recognizing oral health impacts learning and for sharing our vision.

References

1. Office of the Surgeon General. Oral health in America: a report of the surgeon general. U.S. Department of Health and Human Services [Internet]. 2000 [cited 2010 March 10]. Available from: <http://www.surgeongeneral.gov/library/oralhealth/>
2. Office of the Surgeon General. National Call to Action to Promote Oral Health. U.S. Department of Health and Human Services [Internet]. 2003 [cited 2010 March 10]. Available from: <http://www.surgeongeneral.gov/topics/oralhealth/nationalcalltoaction.html>
3. Moskowitz, MC. State actions and the health workforce crisis. Association of Academic Health Centers [Internet]. 2007 [cited 2010 March 10]. Available from: http://www.aahcdc.org/policy/reddot/AAHC_Workforce_State_Actions.pdf
4. Professional roles of the Dental Hygienists. American Dental Hygienists' Association [Internet]. [cited 2006 December 29]. Available from: <http://www.adha.org/careerinfo/dhcareers.htm>
5. Center for Health Workforce Studies. The Professional Practice Environment of Dental Hygienists in the Fifty States and the District of Columbia, 2001. Health Resources and Services Administration [Internet]. 2004 April [cited 2010 March 10]. Available from: <http://bhpr.hrsa.gov/healthworkforce/reports/dentalhygiene50statesdc.pdf>
6. Haden NK, Catalanotto FA, Alexander CJ, et al. Improving the oral health status of all Americans: roles and responsibilities of academic dental institutions. The report of the ADEA President's Commission. *J Dent Educ*. 2003;67(5):563-583.
7. Direct access states. American Dental Hygienists' Association [Internet]. [cited 2010 March 10]. Available from: http://www.adha.org/governmental_affairs/downloads/direct_access.pdf
8. Kansas Dental Board. Kansas dental practices act statutes and regulations and related law relating to dentists and dental hygienists. Kansas Dental Board [Internet]. 2009 January [cited 2010 March 10]. Available from: http://www.kansas.gov/kdb/Documents/Denta%20practicesactregsandrelatedlaws406_files/DENTALPRACTICESACTJANUARY2009.pdf
9. Finnell KJ. Primary Care Safety-Net Clinics Serving as "Dental Hubs" A Viable Model for Access for Oral Health Services. Kansas Association for the Medically Underserved. 2007.
10. Rogers E. Keep Kansas Smiling The Oral Health America National Grading Project - 2009. Oral Health America [Internet]. 2009 [cited 2010 March 10]. Available from: http://www.oralhealthamerica.org/Kansas_Report_LowRes_Spreads.pdf
11. Keep America Smiling The Oral Health America National Grading Project - 2003. Oral Health America [Internet]. 2003 [cited 2010 March 10]. Available from: <http://www.oralhealthamerica.org/pdf/2003ReportCard.pdf>
12. Byck GR, Cooksey JA, Russinof H. Safety-net dental clinics. *J Am Dent Assoc*. 2005;136(7):1013-1021.
13. CHIP Reauthorization: Renewed Support for Children's Oral Health. CHIPRA [Internet]. 2009 February. Available from: http://www.cdhp.org/resource/chip_reauthorization_renewed_support_children%E2%80%99s_oral_health
14. U.S. General Accounting Office. Oral Health: Factors Contributing to Low Use of Dental Services by Low-Income Populations. U.S. General Accounting Office [Internet]. 2000 [cited 2010 March 10]. Available from: <http://www.gao.gov/archive/2000/he00149.pdf>
15. Otto, M. For want of a dentist. Washington Post [Internet]. 2007 February. Available from: <http://www.washingtonpost.com/wp-dyn/content/article/2007/02/27/AR2007022702116.html>.
16. One year later: Medicaid's response to systemic problems revealed by the death of Deamonte Driver. Domestic Policy Subcommittee, House Oversight and Government Reform [Internet]. 2008 [cited 2010 March 10]. Available from: <http://www.cdhp.org/system/files/CDHP%20Testimony%20to%20House%20Oversight%20and%20Government%20Reform,%20Subcommittee%20on%20Domestic%20Policy%202.pdf>
17. The Costs of Delay - State Dental Policies Fail One in Five Children. PEW Center of the States [Internet]. 2009 [cited 2010 May 17]. Available from: http://www.pewcenteronthestates.org/uploadedFiles/Cost_of_Delay_web.pdf
18. Kansas Department of Health and Environment and Oral Health Kansas. Kansas oral health plan. Office of Oral Health [Internet]. 2009 [cited 2009 November 10]. Available from: http://www.kdheks.gov/ohi/download/Kansas_Oral_Health_Plan.pdf

19. American Academy of Pediatric Dentistry Council on Clinical Affairs. Policy on the Dental Home. American Academy of Pediatric Dentistry [Internet]. 2004. Available from: http://www.aapd.org/media/policies_guidelines/p_dentalhome.pdf
20. Apple tree dental improving the lives of people with special access needs. Apple Tree Dental [Internet]. [cited 2009 July 10]. Available from: <http://www.appletreedental.org/AboutUs/AnnualReports.aspx>
21. Kimminau KS, Huang CC, McGlasson D, Kim J. Smiles Across Kansas 2004 – the Oral Health of Kansas Children. Kansas Health Institute [Internet]. 2004 [cited 2010 March 12]. Available from: http://www.kdheks.gov/ohi/download/smiles_across_kansas_2004.pdf
22. Harris TA, Institute of Medicine. The U.S. oral health workforce in the coming decade: Workshop summary. Institute of Medicine [Internet]. 2009 [cited 2009 November 12]. Available from: <http://www.nap.edu/catalog/12669.html>
23. Kimminau KS, Greiner KA. Smiles Across Kansas 2007 Update. Kansas Health Institute and Kansas Department of Health and Environment [Internet]. 2007 [cited 2010 March 12]. Available from: http://www.kdheks.gov/ohi/download/Smiles_Across_Kansas.pdf
24. Office of Disease Prevention and Health Promotion. Healthy people 2010 Volume II – Oral Health. U.S. Department of Health and Human Services [Internet]. 2000 [cited 2010 March 12]. Available from: <http://www.healthypeople.gov/2010/data/mid-course/html/default.htm?visit=1>
25. Dye BA, Tan S, Smith V, et al. Trends in oral health status: United States, 1988–1994 and 1999–2004. National Center for Health Statistics. *Vital Health Stat 11*. 2007;(248):1–92.
26. Kansas Statistical Abstract 2008. Institute for Policy & Social Research [Internet]. 2009 September [cited 2009 November 12]. Available from: <http://www.ipsr.ku.edu/ksdata/ksah/KSA43.pdf>
27. Kansas Medical Assistance Provider Directory. Kansas Health Policy Authority [Internet]. 2008 [cited 2008 September 12]. Available from: <https://www.kmap-state-ks.us/hcp2/member/Resources/SearchProviders/tabid/93/Default.aspx>
28. McKinnon M, Luke G, Bresch J, Moss M, Valachovic RW. Emerging allied dental workforce models: considerations for academic dental institutions. *J Dent Educ*. 2007;71(11):1476–1491.
29. Keselyak NT, Simmer–Beck M, Bray KK, Gadbury–Amyot CC. Evaluation of an Academic Service Learning Course on Special Needs Patients for Dental Hygiene Students: A Qualitative Study. *J Dent Educ*. 2007;71(3):378–392.
30. Casamassimo PS, Seale NS, Ruehs K. General dentists' perceptions of education and treatment issues affecting access to care for children with special health care need. *J Dent Educ*. 2004;68(1):23–28.
31. Weaver RG, Haden NK, Valachovic RW; American Dental Education Association. Annual ADEA survey of dental school seniors: 2002 graduation class. *J of Dent Educ*. 2002;66(12):1388–1404.
32. Dao LP, Zwetchkenbaum S, Inglehart MR. General dentists and special needs patients: does dental education matter? *J Dent Educ*. 2005;69(10):1107–1115.
33. Seale NS, Casamassimo PS. Access to dental care for children in the United States: a survey of general practitioners. *J Am Dent Assoc*. 2003;134(12):1630–1640.
34. Gadbury–Amyot CC, Simmer–Beck M, McCunniff M, Williams KB. Using a multifaceted approach including community–based service–learning to enrich formal ethics instruction in a dental school setting. *J Dent Educ*. 2006;70(6):652–661.
35. Elyer J, Giles DW. Where's the learning in service–learning? 1st ed. San Francisco: Jossey–Bass; 1999.
36. Erlich T. Service–learning in undergraduate education: where is it going? Carnegie Perspectives [Internet] 2005 July [cited 2010 March 12]. Available from: <http://www.carnegiefoundation.org/perspectives/service-learning-undergraduate-education-where-it-going>
37. Niederman R, Gould E, Soncini J, Tavares M, Osborn V, Goodson JM. A model for extending the reach of the traditional dental practice: the ForsythKids Program. *J Am Dent Assoc*. 2008;139(8):1040–1050.