A school-based public health model to reduce oral health disparities

Rebecca N. Dudovitz, MD, MS[1]; Jonathan E. Valiente, MS[2]; Gloria Espinosa, MEd[3]; Claudia Yepes, MSN[3]; Cesar Padilla, MS[1]; Maryjane Puffer, MPA[2]; Harold C. Slavkin, DDS[4]; Paul J. Chung, MD, MS[1,5,6]

1 Department of Pediatrics, David Geffen School of Medicine, Children's Discovery & Innovation Institute, Mattel Children's Hospital, University of California Los Angeles
2 The Los Angeles Trust for Children's Health
3 Los Angeles Unified School District
4 Ostrow School of Dentistry, University of Southern California, Los Angeles
5 RAND Health, RAND Corporation
6 Fielding School of Public Health, University of California, Los Angeles

Keywords
dental caries; school health services; oral health; community participation.

Correspondence
Dr. Rebecca Dudovitz, Department of Pediatrics, David Geffen School of Medicine at UCLA, 10833 Le Conte Ave., 12-358 CHS, Los Angeles, CA 90095.
Tel.: 310-794-8833; Fax: 310-206-4855;
e-mail: rdudovitz@mednet.ucla.edu.
Rebecca Dudovitz, Cesar Padilla, and Paul J. Chung are with the Department of Pediatrics, David Geffen School of Medicine, Children's Discovery & Innovation Institute, Mattel Children's Hospital, University of California Los Angeles. Jonathan E. Valiente and Maryjane Puffer are with The LA Trust for Children's Health. Gloria Espinosa and Claudia Yepes are with the Los Angeles Unified School District. Harold C. Slavkin is with the Ostrow School of Dentistry, University of Southern California. Paul J. Chung is with the RAND Health, RAND Corporation and Fielding School of Public Health, University of California.

Received: 8/24/2016; accepted: 3/08/2017.

doi: 10.1111/jphd.12216

Journal of Public Health Dentistry **00** (2017) 00–00

Abstract

Objectives: Although dental decay is preventable, it remains the most common pediatric chronic disease. We describe a public health approach to implementing a scalable and sustainable school-based oral health program for low-income urban children.
Methods: The Los Angeles Trust for Children's Health, a nonprofit affiliated with the Los Angeles Unified School District, applied a public health model and developed a broad-based community-coalition to a) establish a District Oral Health Nurse position to coordinate oral health services, and b) implement a universal school-based oral health screening and fluoride varnishing program, with referral to a dental home. Key informant interviews and focus groups informed program development. Parent surveys assessed preventative oral health behaviors and access to oral health services. Results from screening exams, program costs and rates of reimbursement were recorded.
Results: From 2012 to 2015, six elementary schools and three dental provider groups participated. Four hundred ninety-one parents received oral health education and 89 served as community oral health volunteers; 3,399 screenings and fluoride applications were performed on 2,776 children. Sixty-six percent of children had active dental disease, 27 percent had visible tooth decay, and 6 percent required emergent care. Of the 623 students who participated for two consecutive years, 56 percent had fewer or no visible caries at follow-up, while only 17 percent had additional disease. Annual program cost was $69.57 per child.
Conclusions: Using a broad based, oral health coalition, a school-based universal screening and fluoride varnishing program can improve the oral health of children with a high burden of untreated dental diseases.

Introduction

Although tooth decay is preventable, it remains the most common pediatric chronic disease, and disproportionately affects low-income, minority children (1-4). Limited access to dental care, poor oral health (OH) behaviors, low health literacy, and limited use of fluoridated water are thought to be key factors driving this health disparity (3,5). Risk factors associated with tooth decay include soda beverage consumption (6), elevated BMI, fewer dental visits, previous dental caries in children and their caregivers, dental "fatalism," or the perception that tooth decay is inevitable (7), and

economic disadvantage (3,8), Aside from impacting a student's ability to eat, speak, and sleep, untreated cavities and dental pain are associated with more school absenteeism and lower academic achievement (9-11). Given the well-documented association between academic performance and long-term health outcomes, preventing dental disease in school-age children may be an important part of addressing overall health disparities (12).

School-based OH services have the potential to overcome many of the logistical barriers to accessing primary preventive OH services that disproportionately affect vulnerable populations (13,14). In addition, schools have the potential to link families to systems of care and to impact the social norms regarding health behaviors (13). Given the critical role schools might play in supporting population health, many programs attempt to harness schools to address OH disparities (13,15-18).

Community context

The Los Angeles Unified School District (LAUSD) is the second largest in the nation, serving approximately 650,000 students each year. Seventy-three percent of LAUSD students are Latino, 10 percent are African American, 9 percent are Caucasian (19), and 77 percent are eligible to receive free or reduced-price lunch (20). LAUSD students are at high risk for untreated dental diseases. While tap water in the County is largely fluoridated, many families choose to drink bottled nonfluoridated drinking water (21).

The Los Angeles Trust for Children's Health (L.A. Trust) is a nonprofit organization associated with LAUSD working to address the health needs of children served by the district, and was founded on the principle that students' health is critical to their ability to achieve in school. Although LAUSD has hosted school-based dental providers since 1960, these partnerships developed ad hoc, and varied in scope and service area depending on provider capacity. Further, there was a lack of infrastructure to coordinate oral health care across the District, to standardize OH programming, and to improve OH literacy and preventative OH behaviors.

To address these issues, The L.A. Trust established the oral health initiative (OHI) in 2012, with the goal of reducing dental caries in LAUSD students by 25 percent over 5 years. Specific strategies included integrating OH care into LAUSD's health services programs and establishing an oral health advisory board (OHAB) to include dental experts, community providers, parents, school personnel, district nursing, and pediatric health services researchers so that the program could respond to stakeholders inside and outside of the education system. The purpose of the OHAB was to inform the development and continuous improvement of the OHI, to enhance the participation of OH providers in school-based dental programs, and to ensure the program meets the needs of students and their families.

Methods

The L.A. Trust partnered with LAUSD District Nursing Services to assess resources for oral health care and determine where both the need for services and capacity for partnership were greatest. The team, which included one school nurse and two public health practitioners, researched school-based models for oral health care and identified dental providers with the capacity to participate in a tiered program that included public health education, universal school-wide OH screening, and linkage to a school-based or community-based dental home where children can receive full-scope preventative and restorative care. The L.A. Trust then engaged academic research partners at the University of California, Los Angeles (UCLA) who, with guidance from the OHAB, conducted key informant interviews with parents, school staff, and community providers to identify OH access barriers, successful strategies for community engagement, and program elements necessary to achieve school and student participation. These activities were reviewed and approved by the UCLA and LAUSD IRBs.

To expand and strengthen LAUSD's capacity to support OH throughout the district, the OHI offered annual OH assessment training by a pediatric dentist to all school nurses and a District Oral Health Nurse position was created. The District Oral Health Nurse coordinates OH services across the district, ensures that school-based OH education is consistent with the goals and standards of the larger OHI, and interfaces between dental providers, school personnel, and parents.

A tiered public health approach for the OHI was developed, as is reflected in Figure 1, with community-wide OH education (bottom of the triangle), direct preventive care and early intervention on school campuses (middle) and linking children in need to more intensive restorative care (peak).

To address all three tiers, training, and education programs and a universal screening and fluoride varnishing program were adapted from previous models based on stakeholder feedback. The universal screening and fluoride varnish program was primarily modeled after the low-cost and scalable Rady Children's Hospital for Healthier Communities Dental Care Healthy Smiles Curriculum and model (Fidler C, Lovelace SE. School-based fluoride varnish program manual. Anderson Center for Dental Care.), which utilized community/parent volunteers working under the guidance of a pediatric dentist to apply fluoride varnish in school. However, because LAUSD requires active parental consent for all services, in order to achieve broad participation, we needed to ensure families and schools would find the program both acceptable and feasible. Hence, key

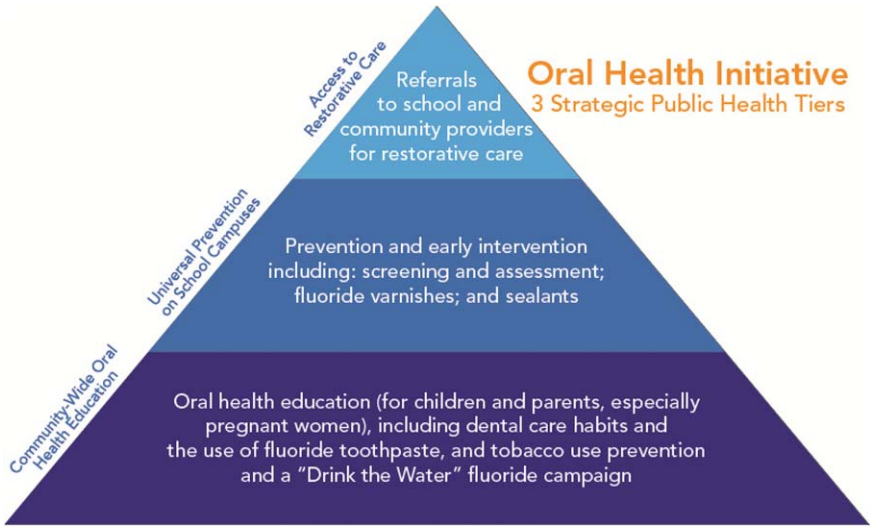

Figure 1 Three strategic public health tiers of the oral health initiative.

informant interview were conducted with parents, oral health providers, and school personnel to inform program development and implementation.

Universal screening and fluoride varnishing program

Under the program developed after stakeholder input, pilot schools were recruited by the District Oral Health Nurse and matched with a dental provider. The Oral Health Nurse provided OH education and introduced the program to school staff, parents and students through presentations at professional development meeting, parent groups, and student assemblies. Reimbursement claims for care provided to publically insured children was submitted by the dental provider but all care was delivered at no cost to participating families. Consent forms were sent home with students and a local school champion was identified (such as a Healthy Start Coordinator, teacher, parent representative, or school nurse) to encourage families to return the forms. By working closely with the school district, the program uses existing infrastructure, like automated parent phone calls, to encourage participation.

On the day of the event, parent volunteers and school nurses worked with the District Oral Health Nurse to support the event. Schools provide space on campus and custodial support. The L.A. Trust provided lunch, parent incentives, and student education kits including toothbrushes and educational coloring books. Students who returned a signed consent form received OH education in a small group setting, a dental screening exam by a licensed pediatric dentist and fluoride varnish application by a licensed member of the dental team.

Each child took home a one-page report on their OH status, recommended follow-up care, and a list of local low-cost dental providers who accept publically and uninsured patients. The dental providers participating in the OHI were included in this list, when applicable. Children with an emergent need for dental care (e.g., abscesses, severe pain, rampant decay) received direct case management from the Oral Health Nurse to ensure the child received follow-up care.

Data collection and evaluation

The program consent form included items regarding student demographics, access to and utilization of dental care, and OH behaviors. Parents were asked to indicate their child's age, whether their child was male or female, whether their child had a dentist, whether their child had been to the dentist in the previous 6 months, whether their child had a dental problem, their child's insurance status, and the types of beverages their child consumed in the previous 7 days.

Screening exam results were collected using a standardized protocol to identify the number of white spots, brown spots, fillings, and caries visualized as well as an overall assessment of the child's dental disease as determined by the dental provider. Each participant was assigned by the dentist to one of four categories: a) no active disease requiring routine OH maintenance; b) early reversible disease requiring enhanced caries prevention; c) visible decay requiring restorative care; d) severe disease requiring emergent dental care. For those placed in category 4, the indication for urgent dental care was collected.

Program costs (personnel, supplies) and reimbursement data was collected from the school district and dental provider. We considered the cost of maintaining a full-time oral health nurse position, in addition to the school and dental provider costs associated with each individual screening event. School enrollment information was collected from

Table 1 Participating Elementary Schools

	Eastman	Hooper	Murchison	Nevin	Rowan	San Pedro
School Enrollment	1,049	939	514	632	1,007	729
Participants	475	274	347	469	654	557
% of school participating	45.3%	28.9%	67.3%	74.1%	65.2%	76.4%
% Economically disadvantaged*	86%	88%	94%	84%	89%	96%
% Latino	99%	94%	98%	96%	100%	99%
% English learners	50%	60%	31%	66%	42%	64%

*Data obtained for the 2013–2014 school year. Economically disadvantaged refers to students who qualify for free or reduced price lunch.

publically available data via the Los Angeles Unified School District website (16).

In Year 1 of the program, the OHI was piloted in two elementary schools with a single dental provider. In Year 2, the program was expanded to serve six elementary schools with three different dental providers (private, nonprofit, and university based).

Data analysis

Key informant interviews were recorded, translated into English and transcribed for analysis by two members of the research team, both of whom had experience conducting qualitative research in bilingual communities. All quantitative data was entered into Excel and analyzed using STATA (STATA Corp. Version 12). *T*-test and Chi-Square analyses were performed to compare baseline and follow-up screening exam results for students who participated both times; and to compare demographic characteristics, OH behaviors, and screening exam results at baseline for students who did and did not participate at follow up. Finally, based on research demonstrating the efficacy of fluoride varnishing in preventing caries (11) and impact of dental disease on school attendance (8), we estimated the potential dollars saved by both the health and school system and compared this with program costs. Analysis of the data by academic partners was reviewed by the UCLA IRB and determined to be exempt.

Results

We conducted interviews with eight parents, two school nurses, two dental providers, and one school administrator. Key informant interviews revealed that, although parents generally welcomed a fluoride varnishing program, they were concerned about using community health workers or parents rather than licensed OH providers to apply the fluoride. Additionally, provider reimbursement was perceived as critical for the financial sustainability of the program which, in California, necessitated that licensed dentists administer the program. Hence, we elected to have licensed dental providers to apply the fluoride varnish in our program rather than parent volunteers. All stakeholder groups echoed the need for community-wide education regarding the importance of OH to ensure that parents, students, and school personnel would support the program. Further, the program had to ensure that students with urgent dental problems were connected to care, and that all participants in need were referred to a dental home. Finally, the program needed to minimize disruptions to instructional time by limiting the intervention to 1–2 school days every 6 months and avoiding keeping students out of class for long periods of time. Hence, dental providers needed the capacity to serve a large student body over just a few days.

Based on this feedback, the universal screening and fluoride varnishing program was piloted in two schools during 2012–2014 and in four additional schools during 2013–2015. As a result of the program 3,399 screenings and fluoride varnish applications were performed on 2,776 children from six schools from 2012 to 2015 (Table 1). Schools largely served low-income Latino families, with the vast majority of students qualifying for free or reduced price lunch (definition of economically disadvantaged) and a high proportion of English language learners. Student participation varied by school (29–76 percent), but on average 60 percent of the student body participated in the program over the course of two school years. In addition, as part of the work to enhance LAUSD's capacity to support oral health, 37 District Nurses and 491 parents were trained in oral health promotion, and 89 parents served as community oral health volunteers, facilitating the screening and fluoride varnishing program by preparing materials, supervising participants, and assisting with educational instruction.

Participant student demographics (Table 2) are consistent with the overall school population and reflect a high rate of poverty, with 73 percent reporting MediCaid insurance. At baseline, 41 percent of participating students had not been to the dentist in the previous 6 months. Although 15 percent of families indicated that their child had a known dental problem, these children were no more likely to have had a dental visit. In general, OH behaviors were poor with 86 percent of parents reporting that their child consumed sugar sweetened beverages in last 7 days and only 38 percent drinking tap water. Of those screened, at their initial visit, 20 percent had a normal exam with no visible evidence of current or previous decay. Two-thirds of participants had active dental disease (white spots, brown spots, or visible caries): 49 percent with early, reversible signs of tooth decay (white spots or brown

Table 2 Baseline Descriptive Statistics of Participants

	Overall	Single-time participants	Repeat participants	*P*-value
Number of participants	2,776	2,153 (77.6%)	623 (22.4%)	
Male	47.5%	47.8%	46.5%	0.56
Mean age in years (range)	8.3 (3.2–13.9)	8.4 (3.2–13.9)	8.3 (4.3–12.0)	0.27
Insurance type				
MediCaid	73.4%	74.1%	71.4%	0.20
Private	9.7%	9.8%	9.3%	0.70
None	10.1%	10.0%	10.6%	0.63
Unknown	5.0%	5.0%	5.0%	0.96
Oral health behaviors				
Has a dentist	79.1%	78.9%	79.9%	0.59
Dental visit in last 6 months	58.5%	58.2%	59.6%	0.53
Known dental problem	15.0%	**14.1%**	**17.7%**	**0.03**
Beverages consumed last 7 days				
Tap water	37.5%	38.1%	35.7%	0.28
Bottled water	86.7%	86.4%	87.8%	0.38
Juice	77.1%	76.8%	78.2%	0.47
Soda	44.9%	45.3%	43.3%	0.38
Sports drink	23.2%	23.3%	22.8%	0.82
Any sugar-sweetened beverage	85.5%	85.3%	86.5%	0.45
Screening results				
No active disease (Level 1)	34.0%	33.4%	36.0%	0.24
Early reversible disease (Level 2)	33.9%	34.1%	33.4%	0.75
Visible decay (Level 3)	26.5%	26.3%	27.0%	0.74
Emergent dental needs (Level 4)	5.6%	**6.2%**	**3.7%**	**0.02**
Mean # of caries among those with decay (range)	2.7 (1–13)	2.7 (1–13)	2.6 (1–10)	0.61

Bold values indicate $P < 0.05$.

spots), 31 percent with visible caries, and 6 percent with severe dental disease requiring emergent attention. Among the 166 students who were referred for emergent (same day) dental care, 46 had a dental abscess, 25 had severe decay, 25 had other infections, 13 had significant pain, 8 had broken teeth, and 49 had other reasons for urgent referrals.

Effects on oral health

As seen in Table 2, 623 students (22 percent) participated both years the program was offered at their school. Compared to year 1 participants who did not return to the program the following year, at baseline, repeat participants were more likely to report a dental problem (17.7 versus 14.1 percent, $P = 0.03$) but were less likely to need emergent care (3.7 versus 6.2 percent, $P = 0.02$).

When re-screened approximately 9 months later (Table 3), on average, students had improved exams, with more students showing no active dental disease (48 versus 36 percent, $P < 0.001$) and fewer students with visible decay (20 versus 27 percent, $P = 0.003$). Additionally, students had 0.4 fewer white or brown spots ($P = 0.001$) and 0.2 fewer caries ($P = 0.002$) on follow up. Overall, 56 percent of repeat participants had improved exams or maintained normal exams, 27 percent saw no worsening of their existing dental disease, and 17 percent had more disease on follow-up. No significant changes in OH behaviors were observed.

Costs, reimbursements, and other savings

The total expenses, taking into account personnel and supplies, for an OH screening exam and fluoride varnish averaged $16,233.87 per school event or approximately $69.57

Table 3 Changes in Oral Health from Baseline to Follow-Up

Oral health behaviors	Baseline	Follow-up	*P*-value
Has a dentist	79.9%	79.5%	0.86
Dental visit in last 6 months	59.6%	60.5%	0.76
Known dental problem	17.7%	16.6%	0.61
Beverages consumed last 7 days			
Tap water	35.7%	33.6%	0.44
Bottled water	87.8%	88.5%	0.70
Juice	78.2%	75.5%	0.27
Soda	43.3%	44.9%	0.58
Sports drink	22.8%	25.5%	0.27
Any sugar-sweetened beverage	86.5%	84.2%	0.26
Screening results			
No active disease (Level 1)	**36.0%**	**47.6%**	**<0.001**
Early reversible disease (Level 2)	33.3%	29.9%	0.18
Visible decay (Level 3)	**27.0%**	**19.8%**	**0.003**
Emergent dental needs (Level 4)	3.4%	2.7%	0.33
Mean white/brown sports	**1.7**	**1.3**	**0.001**
Mean # of caries	**0.8**	**0.6**	**0.002**
Mean # of caries among those with initial decay	**2.6**	**1.2**	**<0.001**

Bold values indicate $P < 0.05$.

per child, but varied by the fixed costs of the dental provider (range = $1,017.58–$4,901.62 per school event and $5.22–$25.13 per child) and the number of children screened per day.

On average, care for 29 percent of students was reimbursed to the dental provider, but this varied dramatically by school and provider type. Although the percent of students reporting Medicaid coverage ranged from 66 to 77 percent, the percent of students for whom Medicaid actually reimbursed care ranged from 13 to 49 percent. Thus, the cost of unreimbursed care ranged from $0–$3,944 per school.

Based on published estimates regarding the efficacy of twice yearly fluoride varnishing for reducing caries incidence we estimate that 0.74 caries per child could be averted each year (22). The cost of filling those caries is estimated at $369.60/child (23), compared to approximately $41/child to support the entire fluoride varnishing program. Further, based on estimates that untreated dental disease cause approximately 2.1 missed school days per child (9), we estimate that preventing 0.74 caries per child has the potential to save 1.6 school days per child per year. Given LAUSD's Average Daily Attendance funding for 2014–2015 of $51.59 per student per day, this amounts to a potential savings of $82.54 per child to the school district.

Developing sustainability

Finally, as part of the OHI, The L.A. Trust in partnership with the Center for Oral Health successfully advocated for the school district to adopt a coordinated OH policy. In addition, a manual for the program has been developed describing key program components such as the procedure for conducting school-based OH screenings; guidelines for OH Nursing training; operating requirements for all OH providers working in district schools; expectations for annual referral system updates; and procedures for ensuring OH exams are part of all Child Health and Disability Prevention exams performed by Student Health Services. Since the initial pilot, the program has been disseminated to 25 schools, including early education centers, elementary schools, middle schools, and high schools.

Discussion

We found a high burden of untreated dental disease among children in Los Angeles, which is consistent with previous studies of low-income, public school children (9). This project demonstrates the potential for creating broad-based school-community partnerships to address oral health disparities. Our finding that 56 percent of repeat participants had normal or improved oral exams on follow up coupled with the fact that, of the 62 percent of repeat participants who had untreated caries on initial presentation, 44 percent had improved exams at follow-up, suggests that for a substantial portion of families, the combination of a school-based fluoride varnishing, identifying unmet dental needs, and providing referrals to community-based, accessible dental providers might significantly reduce untreated dental disease. In general, the effectiveness of school-based screening and referral programs has not been established but most published studies focus on populations outside of the United States (24). However, a similar screening program in Ohio found that only 19 percent of children referred for follow-up care had improved exams 9 months later (25). Participation in our program required active consent, which may have selected for more responsive and engaged families (26). In addition, the list of dental providers given to parents in our program typically included options for school-based dental care, where families may experience lower access barriers (27). While these results are encouraging, there remains an important population of students who failed to access restorative care despite these services and for whom additional case management or access to school-based and community-based restorative dental care may be needed. Understanding how to improve the effectiveness of screening and referral programs (28) and address barriers to accessing a dental home (29), are critical to addressing the substantial unmet oral health needs of low-income children.

The success of this program depended on engaging a backbone organization to serve as a trusted convener, bringing both school district and community partners and providers to the table, helping to articulate a common agenda, ensuring that the program is consistent with oral health expertise and parent perspectives, and providing real-time data for continued performance improvement. This strategy is based on a collective impact model (30), which is has been recently recognized as a promising strategy to address complex problems such as oral health disparities (31).

Achieving sufficient program participation, in the setting of active parent consent to reach the most vulnerable children, was also critical to program success. In our experience, having a local champion at each school who understands the value of the program and is trusted by both parents and school personnel is a critical factor in generating broad participation. Building sustained relationships with those individuals is especially challenging when staff turnover is high, and hence requires attention not just in the initial phase, but throughout the length of the program.

Making a meaningful impact on health behaviors is also a difficult task (32). Studies suggests that education alone is not likely to substantially reduce caries (33,34). Various behavior change theories have been applied to oral health (28,35), but it remains unknown how to most effectively target and successfully change the drivers of oral health behaviors. Achieving a deeper understanding of this issue will be

critical to reducing the overall burden of disease among vulnerable children.

Finally, successful program expansion depends on funding for the proportion of care that remains unreimbursed, while building health provider capacity to meet the large demand for services. Currently, the costs of the program are born by both the school district and dental providers which helps to diminish the burden on a single entity. Although average program costs exceeded reimbursement, widespread implementation of the model may ultimately result in cost savings to both the healthcare and education systems. In addition, dental providers may see a downstream benefit from strengthening their relationship with schools and recruiting additional patients into their practice. Program sustainability might also be enhanced by using alternative district employees, such as dental hygienists or Healthy Start Coordinators rather than school nurses to administer the program. Through these efforts, we believe the OHI has the potential to be fully scalable, and might serve as a model for other school-based oral health programs designed to improve access to preventative oral health care for vulnerable school-children and their families.

Acknowledgments

We would like to thank the DentaQuest Foundation for providing grant support for this project and the parents, students, and staff at our partner schools. Additional support was received from Patterson Dental Company, First 5 of Los Angeles, and the volunteers from the USC Ostrow School of Dentistry (Dental Hygiene and the DDS Predoctoral Programs) for screenings at the Tooth Fairy Celebration for the community. In particular, we are grateful for the dedicated parent volunteers ("Tooth Fairies") who make this program possible. In addition, we would like to thank the Los Angeles Unified School District's Student Health and Human Services, the Center for Oral Health, Western University, Big Smiles Dental, and Eisner Pediatric & Family Medical Center's Dental Program for their enthusiasm and support of the Oral Health Initiative. Thank you to LAUSD Nursing Services for your contributions and continued support.

References

1. Evans CA, Kleinman DV. The surgeon general's report on America's oral health: opportunities for the dental profession. *J Am Dent Assoc.* 2000;**131**(12):1721-8.
2. Mouradian WE, Wehr E, Crall JJ. Disparities in children's oral health and access to dental care. *JAMA.* 2000;**284**(20): 2625-31.
3. Edelstein BL, Chinn CH. Update on disparities in oral health and access to dental care for America's children. *Acad Pediatr.* 2009;**9**(6):415-9.
4. Flores G, Lin H. Trends in racial/ethnic disparities in medical and oral health, access to care, and use of services in US children: has anything changed over the years? *Int J Equity Health.* 2013;**12**(1):10.
5. Kenney GM, McFeeters JR, Yee JY. Preventive dental care and unmet dental needs among low-income children. *Am J Public Health* 2005;**95**(8):1360-6.
6. Wilder JR, Kaste LM, Handler A, Chapple-McGruder T, Rankin KM. The association between sugar-sweetened beverages and dental caries among third-grade students in Georgia. *J Public Health Dent.* 2016;**76**(1):76-84.
7. Ismail AI, Sohn W, Lim S, Willem JM. Predictors of dental caries progression in primary teeth. *J Dent Res.* 2009;**88**(3): 270-5.
8. Kandel EA, Richards JM, Binkley CJ. Childhood caries in the state of Kentucky, USA: a cross-sectional study. *BMC Oral Health.* 2012;**12**(1):38.
9. Seirawan H, Faust S, Mulligan R. The impact of oral health on the academic performance of disadvantaged children. *Am J Public Health.* 2012;**102**(9):1729-34.
10. Detty AMR, Oza-Frank R. Oral health status and academic performance among Ohio third-graders, 2009-2010. *J Public Health Dent.* 2014;**74**(4):336-42.
11. Blumenshine SL, Vann WF, Gizlice Z, Lee JY. Children's school performance: impact of general and oral health. *J Public Health Dent.* 2008;**68**(2):82-7.
12. Cutler DM, Lleras-Muney A. *Education and health: evaluating theories and evidence* (no. w12352). Cambridge, MA: National Bureau of Economic Research; 2006.
13. Bailit H, D'adamo J. State case studies: improving access to dental care for the underserved. *J Public Health Dent.* 2012; **72**(3):221-34.
14. Fine JI, Isman RE, Grant CB. A comprehensive school-based/ linked dental program: an essential piece of the California access to care puzzle. *J Calif Dent Assoc.* 2012;**40**(3):229-37.
15. Jurgensen NPP. Promoting oral health of children through schools–results from a WHO global survey 2012. *Community Dent Health.* 2013 Dec;**30**(4):204-18.
16. Nash DA, Mathu-Muju KR, Friedman JW. Ensuring access to oral health care for children: school-based care by dental therapists—a commentary. *J School Health.* 2015;**85**(10):659-62.
17. Simmer-Beck M, Gadbury-Amyot CC, Ferris H, Voelker MA, Keselyak NT, Eplee H, Parkinson J, Marse B, Galemore C. Extending oral health care services to underserved children through a school–based collaboration: part 1—a descriptive overview. *Am Dent Hyg.* 2011 June 1;**85**(3):181-92.
18. Siegal MD, Detty AMR. Do school-based dental sealant programs reach higher risk children? *J Public Health Dent.* 2010;**70**(3):181-7.
19. Los Angeles Unified School District Fingertip Facts 2011-2012. Los Angeles [cited 2015 June 15]. Available from: http://notebook.lausd.net/pls/ptl/docs/PAGE/CA_LAUSD/LAUSDNET/OFFICES/COMMUNICATIONS/COMMUNICATIONS_FACTS/11-12FINGERTIPFACTSREVISED.PDF

20. kidsdata.org. California Dept. of Education, Free/Reduced Price Meals Program & CalWORKS Data Files (Feb. 2015); U.S. Dept. of Education, NCES Digest of Education Statistics and NCES Online Query System (Feb. 2015). [cited 2015 Feb 7]; Available from: http://www.kidsdata.org/topic/518/free-school-meals-eligible/table#fmt=675&loc=804&tf=79,67&sortColumnId=0&sortType=ascjj
21. Bogart LM, Cowgill BO, Sharma AJ, Uyeda K, Sticklor LA, Alijewicz KE, Schuster MA. Parental and home environmental facilitators of sugar-sweetened beverage consumption among overweight and obese Latino youth. *Acad Pediatr.* 2013;**13**(4):348-55.
22. Marinho V, Higgins J, Logan S, Sheiham A. Fluoride varnishes for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev.* 2002;**3**.
23. Hirsch GB, Edelstein BL, Frosh M, Anselmo T. A simulation model for designing effective interventions in early childhood caries. *Prev Chronic Dis.* 2012;**9**:E66.
24. Joury E, Bernabe E, Sabbah W, Nakhleh K, Gurusamy K. Systematic review and meta-analysis of randomised controlled trials on the effectiveness of school-based dental screening versus no screening on improving oral health in children. *J Dent.* 2017;**58**:1-10.
25. Nelson S, Mandelaris J, Ferretti G, Heima M, Spiekerman C, Milgrom P. School screening and parental reminders in increasing dental care for children in need: a retrospective cohort study. *J Public Health Dent.* 2012;**72**(1):45-52.
26. Kramer MS, Wilkins R, Goulet L, Séguin L, Lydon J, Kahn SR, McNamara H, Dassa C, Dahhou M, Masse A, Miner L, Asselin G, Gauthier H, Ghanem A, Benjamin A, Platt RW, Montreal Prematurity Study Group. Investigating socio-economic disparities in preterm birth: evidence for selective study participation and selection bias. *Paediatr Perinat Epidemiol.* 2009;**23**(4):301-9.
27. Carpino R, Walker MP, Liu Y, Simmer-Beck M. Assessing the effectiveness of a school-based dental clinic on the oral health of children who lack access to dental care: a program evaluation. *J School Nurs.* 2016. doi:1059840516671784.
28. Nelson S, Riedy C, Albert JM, Lee W, Slusar MB, Curtan S, Ferretti G, Cunha-Cruz J, Milgrom P. Family Access to a Dentist Study (FADS): a multi-center randomized controlled trial. *Contemp Clin Trials.* 2015;**45**:177-83.
29. Crall JJ, Pourat N, Inkelas M, Lampron C, Scoville R. Improving the oral health care capacity of federally qualified health centers. *Health Aff.* 2016 December 1; **35**(12):2216-23.
30. Turner S, Merchant K, Kania J, Martin E. Understanding the value of backbone organizations in collective impact: part 2. *Stanford Social Innov Rev.* 2012;25-32.
31. Gwynne K, Irving MJ, McCowen D, Rambaldini B, Skinner J, Naoum S, Blinkhorn A. Developing a sustainable model of oral health care for disadvantaged aboriginal people living in rural and remote communities in NSW, using collective impact methodology. *J Health Care Poor Underserved.* 2016; **27**(1):46-53.
32. Albino J, Tiwari T. Preventing childhood caries: a review of recent behavioral research. *J Dent Res.* 2016;**95**(1):35-42.
33. de Silva-Sanigorski A, Prosser L, Hegde S, Gussy MG, Calache H, Boak R, Nasser M, Carpenter L, Barrow S. Community-based population-level interventions for promoting child oral health. *Cochrane Database Syst Rev.* 2012;(5):CD009837. doi:10.1002/14651858
34. Cooper AM, O'malley LA, Elison SN, Armstrong R, Burnside G, Adair P, Dugdill L, Pine C. Primary school-based behavioural interventions for preventing caries. *Cochrane Database Syst Rev.* 2013;(5):CD009378.
35. Hollister MC, Anema MG. Health behavior models and oral health: a review. *Am Dent Hyg* 2004 June 1;**78**(3):6.

