School-Based Dental Disease Prevention and Oral Health Education:
Programs of the North Carolina Oral Health Section

Rebecca S. King, DDS, MPH; R. Gary Rozier, DDS, MPH

Tooth decay is the most common disease of school children and can have significantly negative impacts on them, their families, and the efficiency and effectiveness with which schools can meet their educational goals.[1] Close to 40% of children in North Carolina begin school already having evidence of tooth decay in their primary (baby) teeth.[2] Although significant advances have been made in the oral health of school children in North Carolina in the last 40 years, large disparities remain across ethnic, geographic, and income groups, particularly for very young children and for access to dental care for people of all ages. Treatment can be expensive, especially for families with modest incomes and without any dental insurance.

National estimates suggest that as many as 51 million school hours are lost annually because of dental-related illnesses.[3] In North Carolina, about 19% of parents of children in grades K-3 report that their child missed preschool or school at some point because of dental problems or dental treatments.[4] Poor oral health among children in our state seems to exacerbate the substantial impact of poor general health on school performance.[5]

For almost a century, the school-based dental program administered by the state dental public health program, now known as the Oral Health Section (OHS) of the Division of Public Health in the North Carolina Department of Health and Human Services, has addressed the oral health needs of school children. The program began in 1918 at a time when dental disease was ubiquitous, access to dental care was almost nonexistent for most children, and there were no known effective public health preventive measures to help alleviate the problem. It began with the employment of six dentists who traveled from school to school with portable equipment to extract teeth for the relief of pain and infection. Clinical care of low-income children continued in the schools for almost three-quarters of a century. However, the program has maintained an emphasis on prevention from its very beginnings. In its initial years, the program focused primarily on public education regarding the importance of good oral hygiene.

By the early 1980s, effective and practical public health preventive measures had become available. Many of these advances were the result of the National Caries Program established by the US Congress and undertaken by the National Institutes of Health (NIH) to target the dental caries (tooth decay) epidemic.[6] The program pioneered the development and dissemination of many school-based initiatives, including fluoridation of school drinking water, fluoride mouthrinse, fluoride supplements, and the placement of dental sealants.[7] Some of these NIH studies were conducted in North Carolina and thus proven school-based interventions rapidly found their way into dental public health practice across the state.[8,9]

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Rebecca S. King, DDS, MPH, is section chief of the Oral Health Section, Division of Public Health, NC Department of Health and Human Services. She can be reached at rebecca.king (at) ncmail.net.

R. Gary Rozier, DDS, MPH, is a professor in the Department of Health Policy and Management, Gillings School of Global Public Health, University of North Carolina at Chapel Hill.

This paper will review the school-based program, funded predominantly through state appropriations, that operates in 93 North Carolina counties. Although not included in estimates for the number of children affected by this program, a number of local health departments also provide varying levels of school-based services similar to those discussed, helping to provide more coverage for the state's school children. The OHS program is organized into four broad components described below. The OHS also maintains a Dental Public Health Residency program accredited by the American Dental Association. This paper does not discuss other programs administered by the OHS that operate outside of the school program, such as water fluoridation, which reaches 88% of North Carolinians served by municipal water supplies, or educational programs for adults.

Current Goals of the Program

In 1990 the OHS chose to shift its long-standing focus on prevention and clinical care to prevention and education alone. This decision was made in part because of the increasing scientific evidence for effective and efficient programs that could be easily implemented in the school setting, the increasing technologic sophistication of dentistry that could not be met using portable equipment in school settings given our limited resources, and the knowledge informed by epidemiologic surveys that the small number of public health dentists deployed in public schools by the OHS could have only a limited impact on the overall unmet dental needs among school children.

The OHS seeks to eliminate disparities in oral health by using best practices as defined by the Centers for Disease Control and Prevention (CDC) and the Association of State and Territorial Dental Directors (ASTDD).[10] The goals of the school-based program are exemplified in North Carolina's Healthy Carolinians 2010 Oral Health Objectives and include the following:

- Reduce total tooth decay (filled and unfilled) in preschool children.
- Increase the proportion of 5th grade students whose permanent teeth are free of decay.
- Increase the proportion of children younger than 19 years of age at or below 200% of the Federal Poverty Level who received any preventive dental service during the past year.

Program Resources and Activities

Programs of the OHS are implemented by a staff of 73, including six public health dentists, 54 public health dental hygienists (see Map 1), health educators, and support personnel, most of whom reside in the communities they serve, working in cooperation with local health departments. Close to 75% of the staff are public health dental hygienists providing community- and school-based services. They spend the majority of their time working in elementary schools. The OHS annually serves more than 300,000 children in its school-based program.

Health Education and Health Promotion

The program presents dental health information related to disease prevention, oral hygiene practices, nutrition, tobacco use, professional dental care practices, injury prevention, and consumerism to more than 144,000 school children each year. Dental health exhibits covering a variety of topics are used by dental public health staff for school and community promotions. Health promotion and educational materials are available on the OHS website at http://www.oralhealth.ncdhhs.gov.

Dental Caries Prevention: Dental Sealants and Fluoride Mouthrinse

Dental sealants are clear or opaque plastic coatings applied to the chewing surfaces of teeth to prevent decay. They provide a physical barrier that prevents debris and decay-causing bacteria from collecting in the pits and fissures of vulnerable teeth. About 90% of all dental caries in permanent teeth of school children occurs in pits and fissures, providing a strong justification for sealant use.[11] A systematic review by the US Task Force on Community Preventive Services found strong evidence that school-based sealant programs are effective in reducing the incidence of caries by 60% on the chewing surfaces of posterior teeth where most pit and fissure decay occurs. Based on these findings, the Task Force recommended that school sealant programs be part of a comprehensive community strategy to prevent dental caries.[12]

The OHS promotes the use of dental sealants through dental health education, health promotion, and direct clinical services. Teams of dentists and hygienists provide sealants for children in high-risk schools using portable dental equipment. Almost 2,700 children who otherwise have limited access to dental care received sealants in 2007-2008. School-based dental sealant programs also are highly effective when combined with fluoride and referral programs.

Except for a period in 2002-2004, the OHS has operated a school-based weekly fluoride mouthrinse program for elementary school children since the mid-1970s. According to systematic reviews completed by the Cochrane Collaboration, strong and consistent evidence suggests that this school-based intervention reduces tooth decay by about 26%.[13] The fluoride mouthrinse program also is an efficient use of resources because all children in a classroom rinse simultaneously under the supervision of teachers or trained volunteers, and only a few inexpensive supplies are needed to implement the program.

The fluoride mouthrinse program was discontinued in 2002 because of budget constraints; but faced with growing disparities in oral health, the 2006 North Carolina Legislature appropriated funds to reestablish this preventive dentistry program and expanded its funding in 2008. Plans are underway to provide this program annually to more than 85,000 school children at high risk for tooth decay. Children in high risk schools, which include those not drinking fluoridated water and those that have a large number of students enrolled in the free and reduced lunch program, rinse in the classroom with 10 ml of 0.2% NaF (9.0 mg F) once a week.

Map 1.
OHS Public Health Dentists and Dental Hygienists

Oral Health Status Assessments

Surveillance is one of the core functions of public health.[14] The ASTDD recommends that every state "establish and maintain a state-based oral health surveillance system for ongoing monitoring, timely communication of findings, and the use of data to initiate and evaluate interventions."[15] North Carolina has one of the most comprehensive oral health surveillance systems in the nation. It includes infrequent but comprehensive clinical surveys of probability samples of the North Carolina population of all ages or school children in all grades.[2] These surveys have been conduced in 1960-1962, 1976-1977, 1986-1987, and 2003-2004 with external grant funding.

The surveillance system also includes annual oral health status screenings of virtually all children in grades K and 5 statewide. Starting with the 1996-1997 school year, dental assessments carried out by trained and calibrated dental public health staff have provided standardized annual surveillance information on oral health. Resulting information is an essential tool for community diagnosis and vital for effective program planning, implementation, and evaluation. These assessments provide county decision makers with data to establish a reliable index to track dental disease levels over time and to compare data with other counties.

Results of the surveillance system demonstrate tremendous progress for children once they are in school. According to the 2007-2008 surveillance results, only 26% of children have experienced any caries in their permanent dentitions by the time they are in the 5th grade, 4% have untreated decay, and 45% have dental sealants. Surveillance also demonstrates the progress needed to achieve the OHS's goals for preschool children. Close to 40% of kindergarten students had a history of caries experience in their primary dentitions in 2007-2008. However, surveillance system data also point out significant geographical disparities. For example, kindergarten children in Duplin and Robeson counties, separated by only one or two counties from New Hanover County, have more than twice the caries rate, 63% and 61%, respectively, compared to 29% in New Hanover.

Access To Dental Care

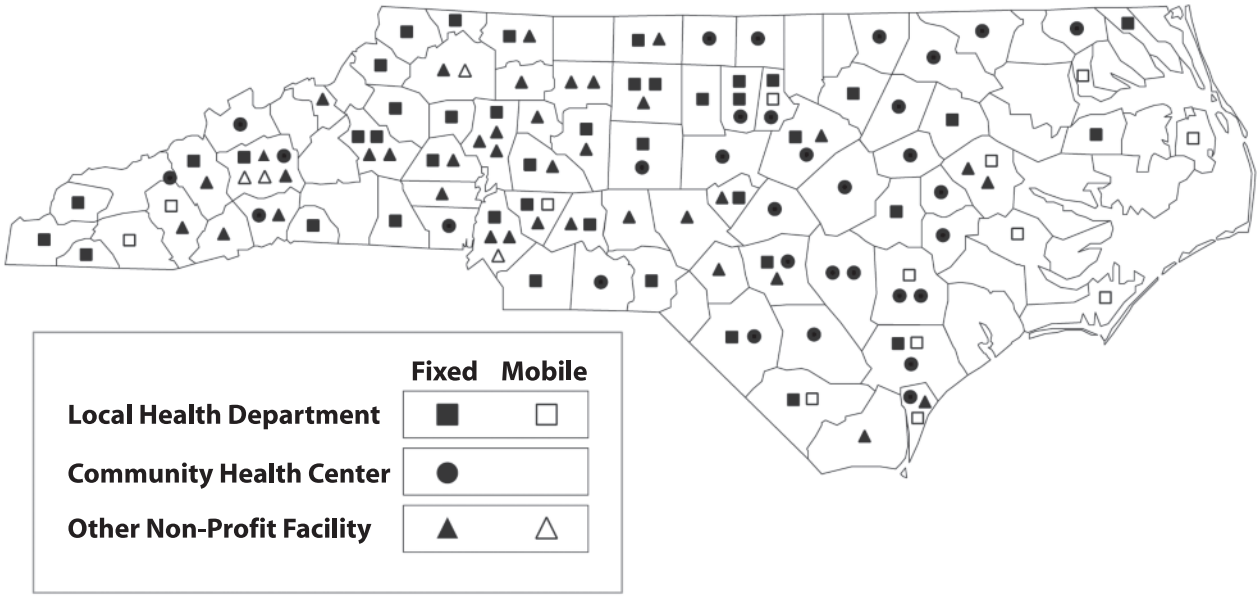
Lack of access to appropriate dental prevention and treatment services among the medically indigent is a significant problem. Current low reimbursement rates in public insurance programs need to be further increased to improve participation from the private sector. An analysis of the experience of six states showed that reimbursement rate increases can have a substantial effect on dentist participation in Medicaid and access to care for children.[16] Safety-net dental clinics have been established across the state to address this underserved population (see Map 2). These clinics are a result of the collaborative efforts of the OHS, local health departments, community organizations, and grant providers.

One purpose of the surveillance system is to provide for the early detection of untreated disease. Dental hygienists in the school-based program provide follow-up and referral to local providers for children identified during assessments as being in need of dental care. In the 2007-2008 school year, almost 190,000 children were screened, and more than 32,700 were found to be in need of dental care. OHS staff, working with school nurses, were able to find dental care for more than 12,400 or 38% of those in need. Assessment, referral, and follow-up activities are targeted primarily toward children in kindergarten and 5th grade. Based on the needs and resources of an individual county, elementary school children in selected grades other than kindergarten and grade 5 are screened for tooth decay.

Challenges and Future Directions

Dental caries begins at a very early age for high-risk children and progresses rapidly so that many, as evidenced by the surveillance results, have extensive disease by the time they

Map 2.
Dental Care Safety Net Facilities, April 2008



enroll in school. One of the biggest challenges facing dentistry is the increase in the prevalence of dental caries, also known as early childhood caries (ECC), in the preschool-aged population, both nationally and in North Carolina.[2,17] This trend is particularly striking for children in low-income families. The OHS has recently increased its emphasis on the prevention of ECC in preschool-aged children at high risk for tooth decay who are contributing, in part, to an increasing strain on our ability in North Carolina to address the needs of elementary school children.

The OHS provides training and support for physicians and local health departments for the statewide Medicaid program known as Into the Mouths of Babes. This program reimburses these non-dental primary health care providers for preventive dental services (oral health education for the caregiver and dental screening and fluoride varnish application for the child) provided for children younger than three and a half years of age. The program is designed to prevent as much disease as possible so that children start school in North Carolina healthier and better able to learn. In 2007, eligible children had more than 100,000 preventive dental visits at their physicians' offices or public health clinics.

An Early Childhood Oral Health Collaborative (ECOHC) is also working to help ensure that children start school with as little history of dental disease as possible. One project administered by the OHS is known as the Carolina Dental Home, which is designed to facilitate the referral of young children from medical offices to dental offices. Plans also are underway through another project administered by the OHS to extend this program statewide by development of evidence-based guidelines that physicians can use to refer young children to the dentist. These projects are developing models for oral health care systems in communities across the state that will improve access to preventive and treatment services for the preschool child.

As in other public health programs, the increasing North Carolina population and its growing diversity are placing a strain on school-based preventive dentistry programs. The largest percentage growth for any age category of the North Carolina population is in the youngest ages. From 2001 to 2005, Hispanic students accounted for 57% of total growth in North Carolina public schools.[18] These children are at high-risk for tooth decay. The sociodemographic changes in society are leading to major geographic disparities in the oral health status of school children.

The OHS currently has an average of one public health dental hygienist for every 13,800 elementary school children. This population estimate for hygienists' responsibilities does not include preschool children and the larger community in the geographic area of responsibility for public health dental hygienists. Additional public health dental hygienists are needed to expand prevention and education services into the preschool population and to implement a more comprehensive program in the growing number of high-risk schools and counties. The goal of the OHS is to improve the ratio of public health dental hygienist to elementary school children to 1:7,000 plus the community and preschool population in their area of coverage.

Healthy children grow up to be healthy and more productive adults. Working in North Carolina's schools, the state-funded OHS program has made tremendous strides in improving the oral health status of the state's children. Innovative programs for the preschool population have brought in new partners from the medical community, which have dramatically increased access to preventive dental services, particularly for those who need them the most. With adequate resources (dental public health staff, funding for preventive services, and increased Medicaid dental reimbursement), North Carolina can provide proven, effective preventive services for more of its children. **NCMJ**

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