

Prevention of Early Childhood Caries in North Carolina Medical Practices: Implications for Research and Practice

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Abstract: Early childhood caries is a significant public health problem in low-income children, with important negative consequences for the child and the family. The purpose of this paper is to describe the development, implementation, and preliminary outcomes of preventive dentistry programs in North Carolina that target low-income children from birth to thirty-five months of age. The focus is on Into the Mouths of Babes, a statewide program in which pediatricians, family physicians, and providers in community health clinics are reimbursed by Medicaid to provide preventive dental services for children (risk assessment, screening, referral, fluoride varnish application) and caregivers (counseling). The provider intervention includes continuing medical education lectures and interactive sessions, practice guidelines for the patient interventions, case-based problems, practical strategies for implementation, a toolkit with resource materials, and follow-up training. In the first two years of the statewide program, 1,595 medical providers have been trained. The number of providers billing for these services has steadily increased, and by the last quarter of 2002, the number of visits in which preventive dental services were provided in medical offices reached 10,875. A total of 38,056 preventive dental visits occurred in medical offices in 2002. By the end of 2002, only sixteen of the state's one hundred counties had no pediatrician, family physician, or local health department participating. The preliminary results from this program demonstrate that nondental professionals can integrate preventive dental services into their practices. The program has increased access to preventive dental services for young Medicaid children whose access to dentists is restricted. Assessments of effectiveness and cost-effectiveness of both the provider and patient interventions are under way.

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Great strides were made in the last half of the twentieth century in reducing the high prevalence of dental disease.¹ But initial excitement over the accomplishments that resulted in close to one-half of schoolchildren being caries free by the 1980s² was replaced by growing concerns about certain segments of society being left behind.³ Expressions of concern about the high prevalence of oral disease became widespread, particularly among the poor, racial and ethnic minorities, recent immigrants, medically compromised, and those living in remote geographic locations or otherwise having difficulty in gaining access to dental services.⁴ More impor-

tantly, numerous proposals for addressing disparities were developed and local, state, and national initiatives were undertaken or are under development.⁵⁻⁷

Dental caries in young children has been the focus of much of this attention. Early childhood caries (ECC) can begin early in life, progresses rapidly in those who are at high risk, and often goes untreated.^{8,9} Its consequences can affect the immediate- and long-term quality of life of the child and family and can have significant social and economic consequences beyond the immediate family as well.¹⁰ These problems express themselves in North Caro-

lina as in the rest of the nation, with some of the factors contributing to the risk of ECC being more severe and widespread than elsewhere. The state ranks in the bottom tier of states on the extent to which it provides access to dental care for its citizens,¹¹ and nearly 40 percent of children statewide have experienced dental caries by the time they are in kindergarten.¹²

A significant aspect of the problem is the difficulty families have in accessing dental services for their children. But many supply-side initiatives such as increasing the number of dentists provide only long-term prospects of meeting the dental health care needs of the population. Primary prevention is the most immediate and realistic approach to reducing the prevalence of dental disease. In North Carolina, well-documented and severe disparities in children's oral health motivated broad-based coalitions to address these issues. The goals of the resulting intervention programs were to reduce the prevalence of early childhood caries in low-income children and ultimately reduce the burden of treatment needs on a dental care system already stretched beyond its capacity to serve young children.

The purpose of this paper is to describe the development, operation, and preliminary outcomes of two preventive dentistry programs in North Carolina: Smart Smiles and Into the Mouth of Babes. These two programs target low-income children from birth to thirty-five months of age and their primary caregivers and rely on nondental personnel to provide services. We will also discuss several research and practice issues involved in collaboration of the medical and dental communities in providing oral health services. This discussion is intended to serve as a case study of our experiences with the medical model of pediatric dental caries control in this one state.

North Carolina Initiatives to Address ECC

Smart Smiles: Initial Regional Efforts

Initial efforts to integrate dental services into medical practice were undertaken in the Appalachian region of the state, long known to have poor oral

health.¹³ In the mid-1990s, local partnerships of Smart Start, a statewide initiative designed to ensure that every child begins school ready to succeed, recognized that poor oral health was one of the most serious problems faced by the agency and children and their families. The North Carolina Partnership for Children, the nonprofit agency responsible for Smart Start, and the state dental public health program secured a grant to develop a demonstration program, which came to be known as Smart Smiles, to address these oral health problems among preschool children in the western part of the state.

In this program, a dental hygienist in each of five regions developed collaborations in her communities, identified the most appropriate strategies for addressing the oral health needs of young children, and coordinated interventions. Recognizing that low-income children had substantially better access to primary medical care than dental care, the resulting projects engaged primary medical care practitioners to provide oral health preventive services for children younger than three years of age who were considered to be at elevated risk for caries. Screening for oral problems, fluoride varnish application, and counseling of caregivers on oral health childcare practices were delivered in more than 3,000 visits by trained medical providers in their private offices or in local health departments before the project ended in September 2001. Services for these children were incorporated into the subsequent statewide initiative.

Smart Smiles had a number of key features that are important in any consideration of broader adoption. A multifaceted partnership was used to develop, implement, and oversee the project, thus adhering to current principles of community health development.¹⁴ The partnership consisted of representatives from nearly a dozen organizations, which brought together expertise in medicine, dentistry, community organization, health education, public health, child health and development, social services, and program evaluation. It was community-based and used established networks in each of the involved communities to reach children who were at high risk for dental disease. Service delivery was integrated into the existing medical care delivery system where most infants and toddlers obtain their health care services. Project dental hygienists conducted community outreach to families of high-risk children to ensure broad coverage in the community.

Into the Mouths of Babes: Expansion of ECC Prevention Efforts Statewide

We perceived that several aspects of the Smart Smiles model had broad application. The preventive dental package was conveniently added to medical visits. Like physicians nationally, those participating in Smart Smiles perceived themselves as having an important role in identifying and preventing dental problems among young children.¹⁵ This program was based in medical offices and thus had the potential to reach large numbers of children. At the time of statewide program initiation, approximately 200,000 children of the age group targeted by the program were enrolled in Medicaid, most of whom made medical visits but not dental visits.

Pilot Study for Statewide Implementation.

Recognizing that a statewide program would need to reach large numbers of medical providers, the NC Division of Medical Assistance (NC-DMA), the agency that administers Medicaid in the state, tested a pilot continuing medical education (CME) intervention over six months beginning in late 1999 in fifteen locations with practitioners from sixty-six medical offices. These practices were chosen to participate because they were part of an existing network of medical practices with a commitment to providing care for low-income patients. Providers working in these practices can be considered as innovators or early adopters because they collaborate with Medicaid on an ongoing basis to test new initiatives and provide feedback on ways in which a particular initiative can best be adapted for statewide implementation.¹⁶ In addition, these practices operate under a Medicaid waiver that permits NC-DMA to provide innovative services that are not funded statewide. Feedback obtained from a number of these practices was used to revise training materials. Their comments also were used to develop a set of practical strategies for use in implementing the program.

Into the Mouths of Babes Intervention.

Based on the successful pilot, the initiative was expanded statewide in early 2001 after a major investment from the NC Medicaid program and additional funding from the Centers for Medicare and Medicaid Services, the Health Resources and Services Administration, and the Centers for Disease Control and Prevention. As designed, Medicaid provides reimbursements for up to six medical visits in which pre-

ventive dental services are provided for children during their first three years of life.

The medical intervention consists of three primary components: 1) a risk assessment for dental disease, oral screening of the child's mouth, and referral to a dentist when problems are detected; 2) application of fluoride varnish to the child's teeth; and 3) health education of the primary caregivers regarding the care of their child's oral health. All three must be done at a visit for the provider to be reimbursed. The risk assessment is conducted using a patient encounter form that guides the provider through a series of major risk factors for ECC such as family history of dental disease, dietary practices, oral hygiene behaviors, and fluoride exposures. This assessment also can be used to individualize counseling of the primary caregiver and for a determination of the need for dietary fluoride supplements. Printed, age-specific oral health education materials are available for distribution to primary caregivers during well child visits. The oral health screening comprises a visual inspection of the hard and soft tissues of the mouth. A physician and other medical providers who have undergone training in the dental procedures provide these preventive dental services.

Provider Education. NC-DMA requires that physicians and other medical personnel complete an AMA-approved CME course offered by the North Carolina Society of Pediatrics and North Carolina Academy of Family Physicians before they are eligible for reimbursement. During this course, participants learn to: 1) describe the early childhood caries problem and its causes; 2) conduct a caries risk assessment for infants and toddlers and identify risk factors for dental disease; 3) perform a dental screening and identify deviations from normal; 4) describe the role of fluorides in the prevention of tooth decay and apply fluoride varnish to the teeth of high-risk infants and toddlers; and 5) counsel caregivers on methods for attaining oral health for their children. In addition to content directed toward these objectives, instruction in administrative aspects of the program, such as completing and filing Medicaid claims, is provided.

The educational strategies for the one-and-a-half-hour CME course use a lecture with slides, case-based presentations, and discussions of the clinical interventions. The application of fluoride varnish is demonstrated with a video and with a patient or dentoform, depending on whether training is in a classroom or clinic. Emphasis is placed on drying

the teeth with a gauze sponge before the clinical screening and fluoride application. The use of a directed light source and mouth mirror for the screening is demonstrated.

CME Course Enhancements. Written course materials are packaged in a toolkit, which consists of practical information for office implementation. It includes the CME presentation; age-specific parent educational materials in both English and Spanish ready for photocopying; sources for additional oral health education materials; practice guidelines on risk assessment, screening, and referral; information on the fluoride varnish product itself; and a poster that outlines the protocol for use in the exam room. Written instructions on coding, billing, and completing the Medicaid patient encounter form are included, along with a list of necessary supplies and vendors from whom they can be purchased.

Each practice receives a fluoride varnish starter kit, which contains sufficient fluoride varnish, brushes, and mouth mirrors for ten visits. Providers thus have the opportunity to try the procedure before making a decision about adoption. A periodic newsletter provides reinforcement of information in the CME course and also provides a mechanism to notify providers about new oral health information. The instructor for the course, a dental hygienist, is available for in-office visits to provide further instruction or train new providers.

Current Status and Preliminary Outcomes for Into the Mouths of Babes

The North Carolina Academy of Family Physicians (NCAFP) and the NC-DMA provide statistics to monitor the program. In the analysis subsequently reported in this paper, we use statistics through 2002 provided by the NCAFP to report the number of health care workers trained and the geographic distribution of those who decided to participate. The number of practices that have billed for one or more preventive dental services after training and the number of visits in which preventive dental services were provided in each quarter are derived from NC-DMA statistics.

Between the start of the statewide project in 2001 and December 2002, 1,595 medical professionals were trained. Approximately one-half of those trained were pediatricians or family physicians, another one-third were registered nurses, and the re-

mainder were physician assistants, nurse practitioners, or other health care professionals working in medical clinics. Trainees came from 310 practices including 116 pediatric practices, 93 family physician practices, and 101 community health agencies or residency programs. The program has achieved wide geographic coverage of the state with practices providing services (Figure 1). Only sixteen of the state's one hundred counties had no pediatrician, family physician, or local health department participating during the last quarter of 2002.

The number of medical visits in which preventive dental services were provided since the start of activities in 2000 is presented by quarter in Figure 2. As a result of Smart Smiles and the Medicaid pilot, and prior to statewide implementation of Into the Mouths of Babes, participating practices submitted claims totaling 6,259 visits in 2000. The number of practices submitting claims for reimbursement of visits increased 2.8 times from the time statewide training began through the end of 2002: from 67 in the first quarter of 2001 (3,183 visits) to 190 by the fourth quarter of 2002 (10,875 visits). In 2002, a total of 38,056 visits occurred in which preventive dental services were provided. As the program has matured, the number of follow-up visits also has increased, from 24 percent of all visits in the first quarter of 2001 to 41 percent in the last quarter of 2002.

Discussion

The epidemiological characteristics of ECC suggest that use of professional preventive dental services in children prone to dental caries should begin immediately after the primary teeth erupt. Recent reports have highlighted the need for the integration of the dental and medical professions and for the involvement of nondental professionals in providing for the oral health of the public as a means to help achieve this goal.^{1,4,17-19} This approach long has been appealing, particularly for very young children because of their substantial differences in access to dentists and physicians.²⁰ Nationally, fewer than two out of every 1,000 children younger than two years of age had a dental visit in a typical month in 1996 compared to 362 per 1,000 who made a visit to a physician's office. Only 37 children per 1,000 who were two to five years of age made a dental visit, compared to 193 who made medical visits.²¹

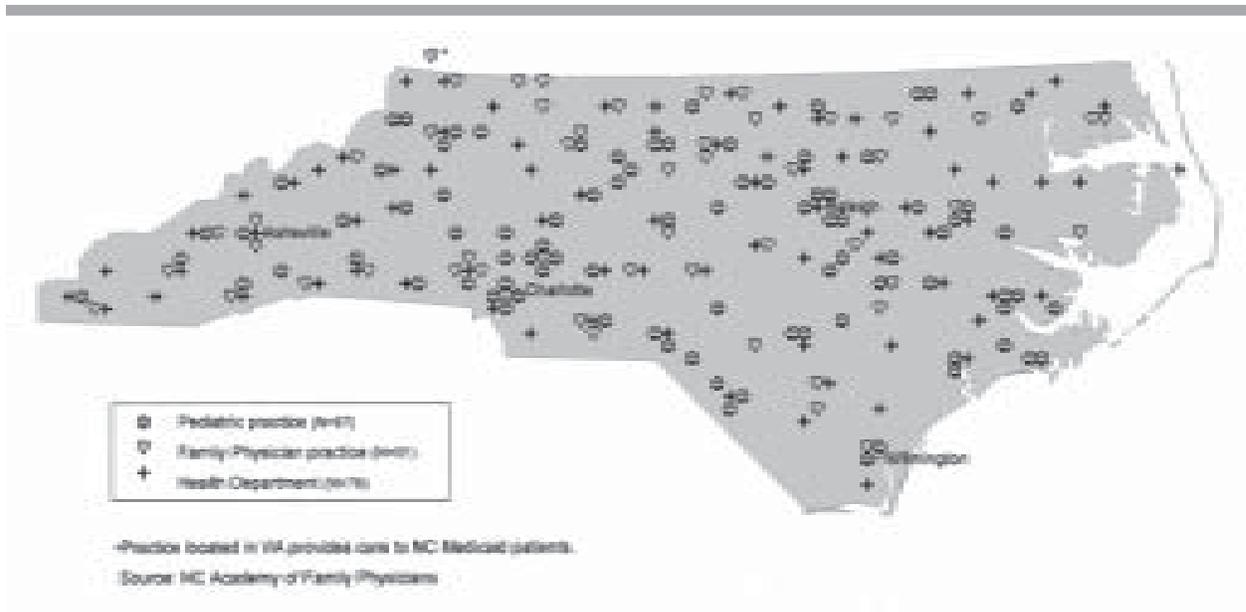


Figure 1. Medical practices providing preventive dental services, North Carolina Medicaid program Into the Mouths of Babes, 2002

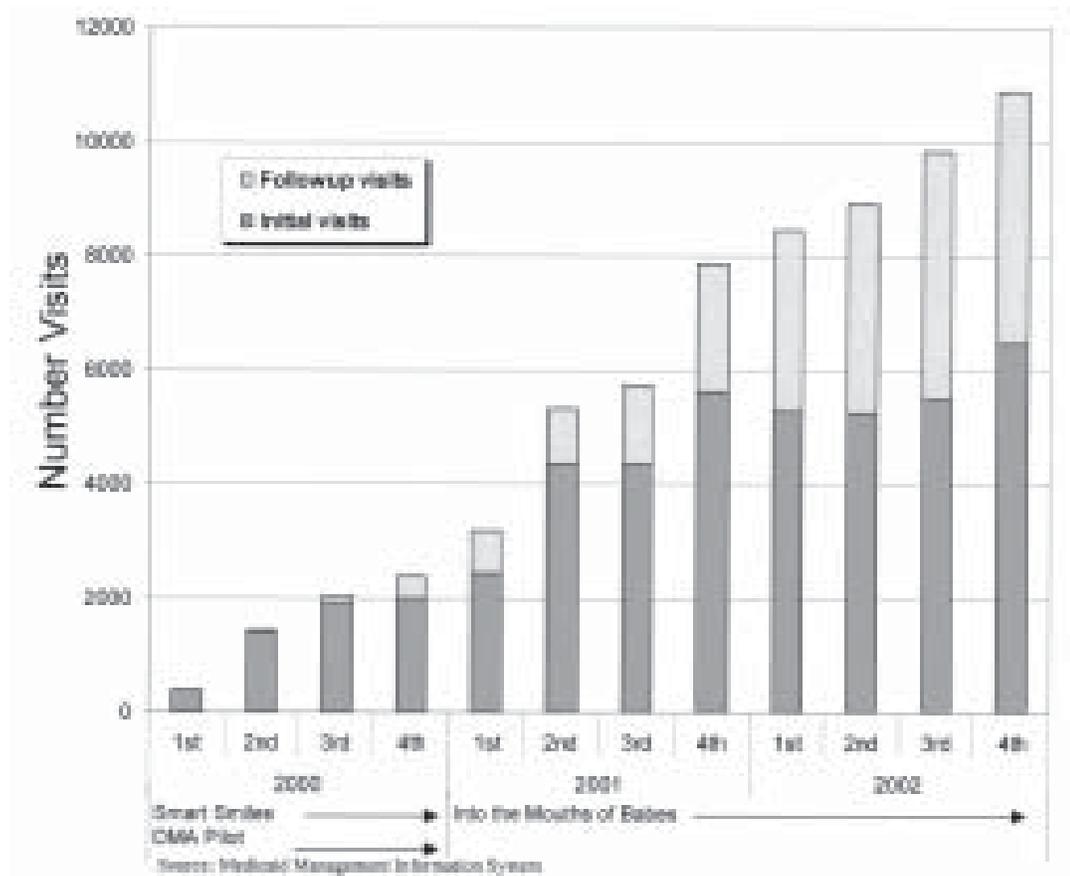


Figure 2. Number of medical visits with preventive dental services, children 0-35 months of age, by quarter, 2000-02

The preliminary results from the initiatives in North Carolina demonstrate that physicians and other primary health care professionals can intensify their traditional roles in oral health care, expand their roles to include a clinical caries preventive procedure new to them, and integrate these preventive dental services into their practices. We believe that the program has substantially increased access to preventive dental services for young children who otherwise would not have received them. In 2002, there were almost 40,000 visits to medical offices in which preventive dental services were provided for infants and toddlers enrolled in Medicaid, a population group with severely limited access to dental services in North Carolina. Wide geographic distribution of participating medical providers resulted, further increasing access to preventive services in many areas of the state. Medicaid reports demonstrate an increase in the use of preventive dental services in dental offices during this same time period, providing an indication that overall access for young children has been achieved rather than a shift from dental to medical settings.²²

A number of states and programs are experimenting with alternative models for the provision of dental services. A case study analysis of some models, most of which are in the early stages of development, concluded that they have had little impact thus far.²³ Several reasons potentially explain our ability to establish this early childhood dental program in North Carolina and its initial success in improving access to preventive dental services.

Documentation of Dental Problems and Gaining Commitment

One of the more important factors in program implementation and provider adoption was the documentation provided by the public, policymakers, and researchers of the high prevalence of dental disease and problems with access among young children in the state.²⁴⁻³² A task force on dental care access with broad-based representation from public health, dentistry, and medicine was convened at the request of the North Carolina legislature and was chaired by the state's lieutenant governor. This task force made a number of recommendations to improve access to dental care for Medicaid recipients, including development of a medical model for preventive dental services. Local awareness of dental problems was sup-

ported by national publications, which gave credibility to the local interpretation of problems.⁴ A consensus developed among diverse groups in the late 1990s that problems with dental disease and access to care were severe, that they needed to be addressed immediately, and that solutions would require innovative programs.

Partnerships and Resources

Successful implementation of a program such as Into the Mouths of Babes usually requires collaboration among a number of individuals and organizations. Into the Mouths of Babes has benefited from strong collaborative relationships. The Medicaid program is the lead agency and is committed to providing state funds to match federal allocations to reimburse medical providers for dental services. Representatives from the state dental public health program actively participate in providing advice about program policies and implementation, thus firmly establishing the link between the traditional public payor of preventive services and the program that delivers those services.

The North Carolina Pediatric Society and the North Carolina Academy of Family Physicians provide the CME training as a benefit to its membership, firmly establishing the program as one being offered by the medical profession. Faculty from the University of North Carolina schools of dentistry and public health provide scientific support for the intervention components and are conducting a number of evaluation projects. The North Carolina Dental Society and the North Carolina Academy of Pediatric Dentistry have endorsed this early childhood caries initiative because of the undersupply of preventive services for young children enrolled in public finance programs.

Finally, a program must have adequate resources to be successful. The development and implementation of the statewide program would not have been possible without federal grant funds and contributed time and effort of its multiple partners.

Importance of Information from Pilot Projects

The decision by policymakers within Medicaid to implement the statewide program and its initial success are based in part on having information from the regional program, Smart Smiles. This program provided preliminary evidence that primary

health care providers would incorporate these oral health activities into their practices; that given appropriate scientific documentation, they would use a fluoride product that had extensive documentation of efficacy and safety but had not been approved by regulatory bodies for caries prevention; and that dentists would support their involvement in oral health activities. Further development of these concepts for the Medicaid program in its pilot reinforced the feasibility of the approach and the decision to offer the program statewide.

The pilot program by Medicaid also contributed in another important way. Inducing change within professional practice requires an understanding of the problems providers will face.³³ Extensive discussions were held with physicians who participated in the pilot to identify barriers to adoption and their recommendations on how to implement the program. The resulting information was used to design the statewide program.

Targeting Young, High-Risk Children with Primary Prevention

We consider the program to be an incremental one. It emphasizes primary prevention as one aspect of a short-term solution to the high levels of disease in young children and the undersupply of dentists. It also focuses on infants and toddlers who have the most severe dental access problems of any aged child and highlights dental caries as the most significant oral condition they face. These characteristics permit a more simplified message and straightforward intervention than would be possible with a broader age group and equal focus on all dental conditions. It also targets that age group that traditionally has not yet established a dental home and often is forced to use expensive dental services because of undetected disease that has progressed to advanced stages.^{34,35} Effective prevention could help sustain these children until they reach the age that they are more likely to be able to establish a dental home.

Overcoming Barriers to Medical Adoption

A number of barriers must be overcome to engage primary medical care workers in the provision of oral health services. Some fail to appreciate the importance of oral health; they can lack knowledge, skill, and confidence in performing some activities; they can have concerns over the efficacy of preven-

tive oral health interventions; and they may be hesitant to screen for dental problems without adequate dental referral sources.^{15,36,37} Perhaps one of the most challenging barriers is the demand on physicians' time. The provision of preventive health care services in primary care is below optimal levels, and physicians claim that one of the major causes is that they do not have enough time to perform the large number of recommended preventive services.^{38,39} A recent study supports their position. According to Yarnall et al.,⁴⁰ the average doctor would need to cut her or his patient load in half to meet preventive services guidelines recommended by the U.S. Preventive Services Task Force.

The characteristics of the CME program and the intervention itself were designed to help overcome these barriers. Instruction of providers in oral health must not only result in the necessary knowledge and skill, but be provided in minimum time while maintaining those characteristics that are likely to be effective. Didactic sessions alone are unlikely to change professional practice.⁴¹ Multifaceted interventions targeting different barriers to adoption or change are more likely to be effective than single interventions.⁴² We chose a CME course of less than two hours to fit within office hours, enhanced with practice guidelines for the patient interventions, case-based problems, interactive sessions, practical strategies for implementation, a toolkit with resource materials, and available follow-up.

Scientific Support for the Medical Interventions

A number of dental caries preventive interventions are available for use in medical settings.^{43,44} However, the evidence for the role of physicians in preventing caries in preschool children is not strong.^{45,46} A systematic review conducted for the U.S. Preventive Service Task Force addressed eleven questions: the accuracy of screening by primary health care workers in identifying children who are at elevated risk for dental caries or need referral to a dentist; whether their referrals result in children making a dental visit; the appropriateness of their prescription of dietary fluoride supplements or application of fluoride varnish; parental adherence to their recommendations for either fluoride regimen and the resulting caries prevention; and the effects of their counseling on patient adherence to caries preventive behaviors and caries rates. Using a grade of "poor," "fair," and "good" to rate the strength of the evidence,

eight of the questions were judged to have poor evidence and the other three fair. Dietary fluoride supplements and fluoride varnish were judged to be effective in the prevention of dental caries, while the evidence for the appropriateness of the supplementation decision was judged to be fair, but with the evidence suggesting that physicians are likely to make errors in prescribing.

We chose fluoride varnish as a centerpiece of our intervention. Unlike other professionally applied fluoride products, it can be used safely in young children.⁴⁷ Evidence supports the effectiveness of fluoride varnish in caries prevention, particularly in comparison to other interventions that might use antimicrobial therapy for the mother or child.⁴⁸ Effectiveness of fluoride varnish is well established because of its long history of use in Europe.⁴⁹ A recent systematic review by the Cochrane Collaboration concluded that fluoride varnish results in substantial reductions in tooth decay in primary and permanent teeth.⁵⁰ Nevertheless, no efficacy studies are available when fluoride is applied by nondental personnel or when used in children younger than three years of age. Information in the CME course is very specific about both the science that supports the use of fluoride varnishes for caries prevention and its lack of approval by regulatory or advisory bodies for caries prevention. However, “off-label” use of therapeutics is prevalent among physicians who care for children, so they are accustomed to using their professional judgment and routinely consider evidence of safety and effectiveness when deciding whether to use a product such as fluoride varnish.⁵¹

Monitoring and Evaluation

We have several studies under way with medical providers, primary caregivers, and children that should help determine outcomes of the project. Approximately 110 pediatric and family medicine practices participating in the Into the Mouths of Babes project have been enrolled in a trial to study the most effective CME method to encourage adoption and appropriate delivery of services. Practices are randomly assigned to one of three CME groups: the enhanced CME course described in this paper; the enhanced CME course plus a learning collaborative, which consists of practices joining in periodic conference calls during implementation; and the enhanced CME course, learning collaborative, and in-office visits to provide technical assistance. A sample of patients and their caregivers from these practices

also has been selected for study. Outcome measures include changes in provider knowledge and adoption in use of dental screening and preventive services, changes in caregivers’ knowledge and oral health-related behaviors for their children, and differences in caries-related dental treatment in children who receive the preventive services compared to those who do not.

In another study, funded by the NIH, we are surveying three-year-old children who have participated in the project during the first three years of life and comparing their dental caries experience with a control group of children of the same age and family circumstances. Ongoing evaluation studies and regular access to the monitoring data presented in this paper were helpful in the implementation decision by Medicaid and in decisions by individual medical providers to adopt the interventions.

Summary and Future Directions

Although the preliminary results for the medical model being used in North Carolina are promising, many important questions will need to be answered before it can be recommended for wide-scale adoption. We have demonstrated that primary medical care providers will provide preventive dental services, but have yet to document determinants of adoption, effectiveness, cost-effectiveness, or patient acceptance. The complexity of changing professional behavior is well recognized, and introducing oral health services into medical practice likely will require broad-based and multifaceted interventions. Because of the education, screening, and referral components, we believe that the program will augment rather than reduce demand for dental providers, although such effects need to be verified.

Into the Mouths of Babes is helping increase access, yet many young children still go without necessary oral health preventive and treatment services. Achieving broader and more comprehensive coverage of the Medicaid population likely will require better integration of several health and social service organizations. We already have started to collaborate with Early Head Start Centers to link these children and their primary caregivers to a medical provider who is participating in Into the Mouths of Babes. Additional efforts also need to be directed toward other health and social service programs such

as WIC. While the supply of dentists cannot be expected to increase dramatically in the next few years, strategies can be undertaken that will make the dental care delivery system more efficient so that the linkages between medical and dental practices are more effective.

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REFERENCES

1. Future of dentistry. Chicago: American Dental Association, Health Policy Resources Center, 2002.
2. Brunelle JA, Carlos JP. Recent trends in dental caries in U.S. children and the effect of water fluoridation. *J Dent Res* 1990;69(Spec Iss):723-7.
3. Edelstein BL, Douglass CW. Dispelling the myth that 50 percent of U.S. schoolchildren have never had a cavity. *Public Health Rep* 1995;110:522-30.
4. Oral health in America: a report of the surgeon general. Rockville, MD: U.S. Department of Health and Human

- Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000.
5. Grantmakers in Health and Children's Dental Health Project. Filling the gap: strategies for improving oral health. Washington, DC: Grantmakers in Health, 2001.
6. Staton A, Lau D, Wertheimer B, et al. Addressing oral health needs: a how-to guide. Boston: Health Care for All, 2002.
7. National call to action to promote oral health. Rockville, MD: U.S. Department of Health and Human Service, Public Health Service, National Institutes of Health, National Institute of Dental and Craniofacial Research/NIH Publication No. 03-5303, Spring 2003.
8. Grindefjord M, Dahllof G, Modeer T. Caries development in children from 2.5 to 3.5 years of age: a longitudinal study. *Caries Res* 1995;29:449-54.
9. Weinstein P, Domoto P, Koday M, Leroux B. Results of a promising open trial to prevent baby bottle tooth decay: a fluoride varnish study. *J Dent Child* 1994;61:338-41.
10. Inglehart MR, Filstrup SL, Wandera A. Oral health and quality of life in children. In: Inglehart MR, Bagramian RA, eds. Oral health-related quality of life. Chicago: Quintessence Publishing Co., 2002:79-88.
11. Keep America smiling: the Oral Health America national grading project 2003. Chicago: Oral Health America, 2003.
12. North Carolina Department of Health and Human Services, Division of Public Health, Oral Health Section. North Carolina calibrated dental screening data, kindergarten children, 2000-2001. At: www.schs.state.nc.us/SCHS/healthstats/databook/. Accessed: June 1, 2003.
13. Hughes JT, Rozier RG, Ramsey DL. The natural history of dental diseases in North Carolina. Durham, NC: Carolina Academic Press, 1982.
14. Labonte R. Community, community development, and the forming of authentic partnerships: some critical reflections. In: Minkler M, ed. Community organization and community building for health. New Brunswick, NJ: Rutgers University Press, 1997:88-101.
15. Lewis CW, Grossman DC, Domoto PK, Deyo RA. The role of the pediatrician in the oral health of children: a national survey. *Pediatrics* 2000;106. At: www.pediatrics.org/cgi/content/full/106/6/e84. Accessed: January 10, 2001.
16. Rogers E. Diffusion of innovations. New York: Free Press, 1983.
17. American Academy of Pediatrics. Policy statement: oral health risk assessment timing and establishment of the dental home. *Pediatrics* 2003;111:1113-6.
18. Mouradian WE, Wehr E, Crall JJ. Disparities in children's oral health and access to dental care. *JAMA* 2000;284:2625-31.
19. Proceedings of Surgeon General's Conference on Children and Oral Health: the face of a child. Washington, DC, June 12-13, 2000. At: www.nidcr.nih.gov/sgr/children/children.htm. Accessed: February 18, 2003.
20. Schulte JR, Druyan ME, Hagen JC. Early childhood tooth decay. *Clin Pediatr* 1992;Dec:727-30.
21. Dovey S, Weitzman M, Fryer G, et al. The ecology of medical care for children in the United States. *Pediatrics* 2003;111:1024-9.

22. North Carolina Department of Health and Human Services, Division of Medical Assistance. Annual EPSDT participation report (CMS 416 report). FY 1998-99 and FY 2001-02.
23. Nolan L, Kamoie B, Harvey J, et al. The effects of state dental practice laws allowing alternative models of preventive oral health care delivery to low-income children. Washington, DC: Center for Health Services Research and Policy, George Washington University Medical Center, 2003.
24. Brown A. Medicaid access to care. *NC Dent Gazette*, Summer 1999:2.
25. Cashion SW, Vann WF Jr, Rozier RG, Venezie RD, McIver FT. Children's utilization of dental care in the NC Medicaid program. *Pediatr Dent* 1999;21:97-103.
26. Hughes T, Bawden JW. A survey of private pediatric dental practices in North Carolina. *Pediatr Dent* 1999;21:104-8.
27. North Carolina Institute of Medicine, Task Force on Dental Care Access. Report to the North Carolina General Assembly and to the Secretary of the North Carolina Department of Health and Human Services. Chapel Hill: North Carolina Institute of Medicine, 1999.
28. Mayer ML, Stearns SC, Norton EC, Rozier RG. The effects of Medicaid expansions and reimbursement increases on dentists' participation. *Inquiry* 2000;37:33-44.
29. Mofidi M, Rozier RG, King RS. Problems with access to dental care for Medicaid-insured children: what caregivers think. *Am J Public Health* 2002;92:53-8.
30. Robison VA, Rozier RG, Weintraub JA. Dental caries and treatment need in schoolchildren related to Medicaid enrollment. *J Public Health Dent* 1997;57:163-70.
31. Robison VA, Rozier RG, Weintraub JA. A longitudinal study of school children's experience in the North Carolina Dental Medicaid Program, 1984-1992. *Am J Public Health* 1998;88:1669-73.
32. Venezie RD, Vann WF Jr, Cashion SR, Rozier RG. Pediatric and general dentists' participation in the North Carolina Medicaid program: trends from 1986-92. *Pediatr Dent* 1997;19:114-7.
33. NHS Centre for Reviews and Dissemination. Getting evidence into practice. *Effect Health Care* 1999;5:1-16.
34. Griffin SO, Gooch BF, Beltran E, Sutherland JN, Barsley R. Dental services, costs, and factors associated with hospitalization for Medicaid-eligible children, Louisiana 1996-97. *J Public Health Dent* 2000;60:21-7.
35. Kanellis MJ, Damiano PC, Momany ET. Medicaid costs associated with the hospitalization of young children for restorative dental treatment under general anesthesia. *J Public Health Dent* 2000;60:28-32.
36. Sanchez OM, Childers NH, Fox L, Bradley E. Physicians' views on pediatric preventive dental care. *Pediatr Dent* 1997;19:377-83.
37. Tsamosouris A, Gavris V. Survey of pediatricians' attitudes towards pediatric dental health. *J Pedodont* 1990;14:152-7.
38. Campion EW. A symptom of discontent. *N Engl J Med* 2001;344:223-5.
39. Hadley J, Mitchell JM, Sulmasy DP, Bloche MG. Perceived financial incentives, HMO market penetration, and physicians' practice styles and satisfaction. *Health Serv Res* 1999;34:307-21.
40. Yarnall KSH, Pollak KI, Østbye T, Krause KM, Michener JL. Primary care: is there enough time for prevention? *Am J Public Health* 2003;93:635-41.
41. O'Brien T, Freemantle N, Oxman AD, Wolf F, Davis DA, Herrin J. Continuing education meetings and workshops: effects on professional practice and health care outcomes (Cochrane Review). In: *The Cochrane Library*, Issue 2, 2003. Oxford: Update Software.
42. Grimshaw JM, Shirran L, Thomas R, et al. Changing provider behavior: an overview of systematic reviews of interventions. *Med Care* 2001;39(Suppl 2):II-2-II-45.
43. Centers for Disease Control and Prevention. Recommendations for using fluoride to prevent and control dental caries in the United States, *MMWR Recommend Rep* 2000;50(RR14):1-42. At: www.cdc.gov/mmwr/preview/mmwrhtml/rr5014a1.htm. Accessed: June 1, 2003.
44. Tianoff N, Kanellis MJ, Vargas CM. Current understanding of the epidemiology mechanisms, and prevention of dental caries in preschool children. *Pediatr Dent* 2002;24:543-51.
45. Ismail AI. Prevention of early childhood caries. *Community Dent Oral Epidemiol* 1998;26(1 Suppl):49-61.
46. Bader JD, Rozier RG, Harris R, Lohr KN. Dental disease prevention: the physician's role in child oral health. Evidence report/prepared by Research Triangle Institute and University of North Carolina at Chapel Hill Evidence-Based Practice Center for the U.S. Preventive Services Task Force under Contract No 290-97-0011, Task Order No. 3, with the Agency for Healthcare Research and Quality, 2002.
47. Bawden JW. Fluoride varnish: a useful new tool for public health dentistry. *J Public Health Dent* 1998;58:266-9.
48. Berkowitz RJ. Causes, treatment and prevention of early childhood caries: a microbiologic perspective. *J Can Dent Assoc* 2003;69:304-7.
49. Helfenstein U, Steiner M. Fluoride varnishes (Duraphat): a meta-analysis. *Community Dent Oral Epidemiol* 1994;22:1-5.
50. Marinho VCC, Higgins JPT, Logan S, Sheiham A. Fluoride varnishes for preventing dental caries in children and adolescents (Cochrane Review). In: *The Cochrane Library*, Issue 3, 2002. Oxford: Update Software.
51. American Academy of Pediatrics, Committee on Drugs. Policy statement. Uses of drugs not described in the package insert (off-label uses). *Pediatrics* 2003;110:181-3.