Literature Review

Visionaries or Dreamers? The Story of Infant Oral Health

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Abstract: *Purpose:* To review the early history of the promotion of oral health for infants and toddlers, the impact of the AAPD guideline on infant oral health care and ways to maximize health outcomes. **Methods:** Review of the literature. **Results:** Concepts on primary prevention and early intervention were reported as early as the 19th century. Progress to positively impact the oral health of children has been made. Nevertheless, the advice of early scholars and clinicians that oral care and prevention must begin early with the caregivers and the emergence of the infant's first tooth have not been fully embraced by the profession. **Conclusions:** A historical perspective on oral health care for infants and toddlers has been presented. There is a need to move away from the surgical approach of managing oral disease and embrace the concepts of primary care beginning perinatally while more broadly addressing social determinants of health. (Pediatr Dent 2011;33:144-52) Received August 25, 2009 | Last Revision December 14, 2009 | Accepted March 26, 2010

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In 1990, funded by the Office of Maternal Child Health (HRSA) and the Medicaid Bureaus (HCFA), a task force made up of four panels with 42 professionals initiated the *Bright Futures* Project. A charter principle of *Bright Futures* was that children should be able to look forward to a future that is bright with possibility and a belief in their own potential -- unclouded by disease, injury or disadvantages. The vision of *Bright Futures* was based on a philosophy, a set of expert guidelines and a practical developmental approach to providing health supervision for children of all ages from birth to adolescence.¹

The foundation of *Bright Futures* health supervision is health promotion, not just preventing or treating illness or injury, but actively promoting the physical, emotional and mental well-being of children and their families.

Pediatric Dentistry has been a member of *Bright Futures* since its inception and has contributed significantly to the oral health sections and many of the other health promotion themes. To complement the *Bright Futures* guidelines, practical guides for the busy health professional were developed. *Bright Futures in Practice: Oral Health* was the first in a series of six practical guides (2004) and provides a structured and comprehensive approach to anticipatory guidance for health care professionals.²

Pediatric Dentistry was well-positioned to participate in this first of its kind multi-disciplinary activity. The mission of the American Academy of Pediatric Dentistry (AAPD) is

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to advocate policies, guidelines and programs that promote optimal oral health and oral health care for infants and children through adolescence, including those with special health care needs.

By 1990, Pediatric Dentistry already had 13 policies/ guidelines on a wide range of topics in oral health prevention and promotion for infants, children and adolescents. One of those policies/guidelines, "*Infant oral health and the first professional dental visit*" was presented to the AAPD Board of Trustees in 1984 and approved by the membership in 1986.³ In 2011, this policy/guideline will be 25-years-old.

This article reviews the early history of oral health promotion during infancy and early childhood, the progress made since 1986, and finally, what remains to be done.

Prevention and Promotion Prior to 1980. Because of the number of theories promoted for the caries process (from worms to humors to parasites, to chelating agents), little was written on preventing the disease process until the 1890s, when W.D. Miller published, *Microorganisms of the Human Mouth* and stated that "dental decay is a chemo-parasitic process consisting of two stages, decalcification and dissolution." He further stated that "there is no single species of microorganisms that causes caries, but rather that the process was mediated by oral microorganisms capable of producing acid and digesting protein".⁴

In the late 1920's, there were articles by Sullivan⁵ on the importance of children's oral health; Willett⁶ on the care of baby's teeth and Puterbaugh⁷ on the dentist's 'civic responsibility' to promote oral health. In the same decade, the University of Iowa Extension Bulletin # 220, *Save the Baby's Teeth-Baby's Teeth are Priceless*, was devoted to the baby's teeth and stated, "Every healthy baby should have clean teeth that are strong and sound (Figure 1). A clean mouth makes

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Figure 1. The University of Iowa Extension Bulletin # 220, Save the Baby's Teeth-Baby's Teeth are Priceless.

baby feel happy and sound teeth are needed to chew the food that will make him grow day after day. When the baby teeth come, keep them clean by brushing them with a small, soft toothbrush after each meal". They go on to discuss nonnutritive sucking habits and the first visit to the dentist by two and a half years.⁸ Later that year Bulletin # 223 was published that emphasized prenatal and perinatal health including the importance of the mother's diet and care of mother's teeth as conditions for baby's healthy teeth.⁹ Early textbooks in children's dentistry and pedodontics offered a number of suggestions (Table 1).

Nevertheless, most children did not visit the dentist unless they had a swelling, or experienced a toothache, with the treatment of choice being an extraction.

G.V. Black, considered the father of dentistry in the United States, published his first text in 1908, *A Work on Operative Dentistry* that described the methods of preparing teeth with dental caries, how to address pulpal involvement, and restorative materials available. In a 1914 edition, in the few pages devoted to children, he states "The child is a bundle of impulses—each of which are ready to break into action without notice or restraint". In a subsequent edition (1924) he states "Another point of still greater importance perhaps is the awakening of a feeling among the laity and especially among the parents that children should visit the dentist often, in order that simple operations may be done in ample time to prevent the development of more serious conditions". In his seventh edition (1937), he expands and states, "There is no question whatever but that the beginning (oral care) should be made early in the life of each individual – as soon as the baby has a tooth".¹⁰

In 1940, Stephan demonstrated changes in pH (critical pH ~5.5) over time when the oral cavity is challenged with carbohydrate exposures, especially sugar. The 'Stephan Curve' established the amount of time it required for the pH of saliva to return to 6 or 7 after a sucrose challenge. This would eventually be used as a basis for tooth brushing after meals.¹¹

In 1945, the first community (Grand Rapids, MI) initiated community water fluoridation. In 1955, the first reports on comparing the effects of water fluoridation in Newburgh with Kingston (non-fluoridated), New York were published.¹²

In 1947, an article, *Dental Care-Birth through Two Years* described the importance of early dental care.¹³ In the 1960s, Keyes and Fitzgerald reported a number of studies on the interaction of plaque (bacteria) and a carbohydrate rich diet on a susceptible tooth. The diagrammatic representation of their conclusions was a Venn diagram of overlapping circles that acting concurrently would initiate the caries process over time.¹⁴ Therefore, for most of the 20th century, caries prevention programs were developed to interfere with one or all three factors.

Promoting Oral Health through organized medicine and dentistry. The American Academy of Pediatrics (AAP) has promoted pediatric healthcare beginning in 1967 with the development of a recommendation on preventive care for children. The first schedule was in an AAP publication, "*The Standards of Child Health Care*" (1967).¹⁵ It stated that at two years pediatricians should have a discussion and guidance on 'care of teeth', at two and half years a 'dental

Table 1. EARLY TEXTBOOKS AND RECOMMENDATIONS FOR THE FIRST DENTAL VISIT					
Textbook title	Author	Year	Year Recommendations for the first dental visit		
Operative Dentistry for Children	ME Jordon	1927	Two years of age.		
Practical Pedodontics	FE Hogeboom	1933	Physician will make recommendations.		
Juvenile Dentistry	WC McBride	1937	Brushing only after the second primary molar fully erupts.		
Dentistry for Children	JC Brauer	1939	Three years of age, most favorable.		
Juvenile Dentistry	WC McBride	1941	Three and a half to four years of age. Public Health 'men' recommend two years.		
Pedodontics	RE McDonald	1963	No recommendation.		
Dentistry for Children	JC Brauer et al	1964	No recommendation.		
Dentistry for the Child and Adolescent	RE McDonald	1969	Risk assessment and appointment at eighteen months of age.		

referral,' and at four years referral for 'dental care'. There were two revisions between 1967 and 1970. In the 1974 revision, <u>Recommendations for Preventive Health Care of Children and Youth</u> published in the AAP publication 'News and Comments' reflected the change occurring in pediatric practice at the time.¹⁶ These recommendations noted that physicians should inspect teeth and check on dental hygiene at each visit, and the initial examination by a dentist should occur at 35- to 37-months-of-age. In subsequent revisions, the dental referral remained at 36 months until the early 2000's.

While medicine played an important role in promoting early childhood oral health prior to the 1980's, the dental profession had also been very active in this regard. In 1927, a group of dentists founded the American Society for the Promotion of Dentistry for Children to promote greater and improved dental treatment for children. In 1941, the Society was renamed the American Society of Dentistry for Children (ASDC) and for many years, it was the major spokesperson for dentistry for children through its journal, regional and national meetings, advocacy with other health professional groups, and public service announcements.

A year following the renaming of ASDC, the American Board of Pedodontics was established (1942) by the ASDC as the certifying agency for a newly created specialty of Pedodontics. The early qualifications for a pedodontic training program only referred to the child or children and were behaviorally and restoratively oriented. One of the qualifications for the pedodontist was the ability to instruct a child and parents in methods for maintaining good oral health.

In 1948, the American Academy of Pedodontics was established by 100 members of ASDC to promote further research into children's dentistry.

The Journal Dentistry for Children (JDC), the main publication in North America devoted to children's dentistry, was introduced in 1934. The journal's early issues were devoted to managing the behavior of children and restorative dentistry. In a review of the journal's publications on preventive dentistry for children from 1968 to 1988, only 171/1099 (16%) articles published during that period were related to preventive dentistry, with 25 emphasizing

parent education.¹⁷ No articles were specifically related to infant dental care or the first professional dental examination. Nevertheless, ASDC recognized an opportunity to promote prevention in its publications, because of many members' frustrations with the high number of young children in their care with extensive dental disease.

In 1970, ASDC published a wall chart for physicians' offices stating that a child's physical examination was not complete without a dental examination. From a survey of ASDC members, it was reported that many members were committed to prevention and were in need of a comprehensive program designed for children. The same year, ASDC responded with a guideline, 'Adapting a Simple Preventive Dental Program for Children'.¹⁸ This guideline was followed by a second publication that focused on ways to motivate and sustain a preventive program for children and parents.¹⁹ Although neither publication recommended the infant dental visit and early intervention, both publications emphasized that the disease was preventable and that the first dental visit at 3 years (as promoted by AAP) was too late. A public awareness program was initiated during the same period, and a bold step was taken in 1979 with the production of a public service announcement and brochures recommending that infants visit the dentist at 6-months-of-age or shortly after the emergence of the first tooth. This milestone event was the first time that a national organization publicly supported the concept of an infant dental examination. Paralleling this 1979 public awareness campaign was the launching of the *Pediatric Dentistry* journal, which would become the most recognized pediatric oral health journal in North America.

Publications in the 1970's promoting the prevention of disease instead of repairing the effects of disease may have been prompted by the overwhelming success of the American Society of Preventive Dentistry. Publications on microbiology of the infant's mouth²⁰, dental preventive programs for the infant²¹, perinatal preventive dental programs²², AAPD policies on oral health programs for infants, children and adolescents^{23,} and a joint AAPD/AAP statement on the devastating effects of improper bottle use during infancy²⁴ all contributed to a better understanding of early intervention. However, the majority of children continued to be affected with dental disease.

In the 1970's, the decayed, extracted or filled (def) measure of primary teeth was ~1.6 and the Decayed, Missing or Filled (DMF) measure of permanent teeth was ~1.7 for school aged children 6-11 years. By age 17, the average DMF was ~6.2.²⁵ There were approximately 100,000 dentists in the U.S. of whom ~1700 were pedodontists.²⁶ The oral health status of pre-school children was unknown, and with the annual live birth rate of ~3.1 million, it was clear that the profession needed to consider a paradigm shift and emphasize the importance of primary prevention, which meant scheduling the infant for an early visit before the effects of dental disease were present and to reduce or prevent the prevalence of dental caries in the pediatric population (Table 2).

Prevention and promotion after 1980. The 1980's began with the renaming of the specialty of pedodontics to pediatric

Table 2.	. MEAN NUMBER OF DECAYED AND FILLED PRIMARY TEETH (dft)					
	Chil United Stat					
	1-5 yrs old	Race/ethnicity		6-11 yrs old		
			1-11 yrs old			
		White	Black	Hispanic		
1963-65*	No data	3.1	2.3	No data	3.0	
1971-74*	1.0	2.8	2.1	No data	2.7	
1988-94 NHANES	1.01	1.15	1.35	2.05	1.62	
1999-02 NHANES	1.06	1.32	1.42	2.14	1.67	
1999-2004 NHANES	1.17	1.46	1.45	2.18	1.84	

* National Center for Health Statistics.

dentistry.²⁷ In 1984, the AAPD approved the change in name to help redefine the specialty in broader terms and better reflect additional areas of expertise. These areas included, but were not limited to, increased emphasis on prevention, growth and development, and expanded clinical research.

Further reflecting the need to shift the focus of the specialty was emerging evidence indicating a relationship be-

tween maternal and infant oral health. Specifically, data on the correlation between elevated maternal *Streptococcus mutans* levels and increased risk for dental disease in early childhood had been described.^{28, 29, 30} In 1985, The American Board of Pediatric Dentistry took a progressive approach by adding the presentation of a child under age 3 as a requirement for a candidate's site visit.

Table 3.	HISTORICAL TIMELINE RELATED TO PERINATAL AND EARLY CHILDHOOD ORAL HEALTH				
Year	Historical event				
1890	W.D. Miller first to describe dental disease as a two stage process "decalcification and dissolution".				
1908	G.V. Black's first text "A Work on Operative Dentistry" describes restorative care.				
1927	American Society for the Promotion of Dentistry for Children (ASPD) is founded.				
1930	American Academy of Pediatrics (AAP) is founded.				
1934	Journal of Dentistry for Children is launched.				
1937	G.V. Black proposes oral care beginning "as soon as a baby has a tooth".				
1940	R.M. Stephan describes critical pH (~5.5) for dental disease.				
1941	ASPD is renamed American Society of Dentistry for Children.				
1942	American Board of Pedodontics is founded.				
1945	Grand Rapids, Michigan is the first community to initiate community water fluoridation.				
1948	American Academy of Pedodontics is founded.				
1960	P.H. Keyes introduces Venn diagram (bacteria, carbohydrates, and host).				
1961	Accreditation Standards for Advanced Specialty Education in Pediatric Dentistry are developed.				
1965	Canadian Academy of Pediatric Dentistry is founded.				
1967	AAP begins promoting children's healthcare that includes oral health.				
1979	Journal- <i>Pediatric Dentistry</i> is launched.				
1984	American Academy of Pediatric Dentistry (AAPD) approved specialty name change from "Pedodontics" to "Pediatric Dentistry".				
1986	AAPD's first Infant Oral Health Care Policy Statement approved.				
1990	Bright Futures Project initiated.				
1994	The term "Early Childhood Caries" is adopted at CDC meeting.				
1995	The concept of "Anticipatory Guidance" is described in Pediatric Dentistry-Journal of the American Dental Association (JADA) publication.				
1999	Section of Pediatric Dentistry and Oral Health: AAP is founded.				
2000	Surgeon General Report on Oral Health.				
2001	Canadian Dental Association endorses the age 1 visit.				
2002	The "Dental Home" concept is established- JADA publication.				
2003	AAP Policy statement shifts the first dental visit to occur at age 1 for high-risk children.				
2005	American Dental Association (ADA) adopts the concept of a dental home.				
2006	New York State: Perinatal and Infant Oral Health Guidelines are introduced.				
2007	ADA adopt that the dental home should be established by age 1.				
2007	Code on Dental Procedure and Nomenclature-CDT 0145 is established for the oral evaluation of children under 3 years.				
2007	Fischer-Owen's Conceptual Model for Children's Oral Health- Pediatrics publication.				
2007	Section on Pediatric Dentistry and Oral Health: Canadian Pediatric Society is founded.				
2008	AAP modifies policy to refer all children to a dental home by age 1 unless there is limited workforce.				
2009	AAPD: Perinatal Oral Health Care Guidelines are introduced.				
2009	Early Childhood Caries textbook published.				
2010	California Dental Association: Oral Health During Pregnancy and Early Childhood: Evidence-Based Guidelines for Health Professionals are introduced.				
2011	25th Anniversary of the AAPD's Infant Oral Health Policy Statement.				

With additional evidence mounting, an active group of members of AAPD began to operationalize this information into what became the AAPD's first policy statement on infant oral health. This policy was initially proposed in 1983, presented to the board in 1984, and approved in 1986 at the AAPD annual session in Colorado Springs.³ Emanating from the AAPD's Clinical Affairs Committee, this document emphasized the importance of infant oral health as the foundation for prevention and a lifetime free from oral disease.

The same year the policy was approved, two timely articles were published in the JDC.^{31,32} The manuscripts discussed a protocol and rationale for infant oral health, underscoring the technique first described in 1972, "how" to incorporate oral health care needs of infants and toddlers into clinical practice, and the importance of taking advantage of our current knowledge and technology in the prevention of disease in early childhood. These articles challenged delaying the first dental visit until age 3, further questioning other organizations' recommendations and timing of the first visit.

It was recognized during this period that the use of various terminology to describe dental disease in young children did not reflect the multifactorial nature of the disease. The use of such names as "nursing caries", "baby bottle tooth decay" and "milk bottle syndrome" was confusing from a clinical, advocacy, and research perspective to describe a single entity, despite the various etiologies.³³ To ameliorate this, the term Early Childhood Caries (ECC) was coined at a Centers for Disease Control (CDC) workshop in 1994.³⁴ Although the term did not encompass the exact etiology of the disease, it was broadly descriptive, and became an important step in allowing stakeholders to improve communications and set agendas on how best to address this disease.

Following this workshop, preparations for the first ECC Conference in Bethesda, Maryland were underway. This meeting brought together a number of experts to examine critically the current evidence for prevention and treatment of dental disease. A document proposing strategies for researchers and policy-makers to address the "silent epidemic" of ECC was developed and provided the foundation for the culminating 2000 Surgeon General's Conference on Children and Oral Health, dedicated to the oral health of all citizens. ³⁵

As preparations for the upcoming conference were in progress, a keynote address in 1998 at the annual meeting of the College of Diplomates of the American Board of Pediatric Dentistry aroused a new level of interest among the membership regarding the possibility and impact of prevention as early as infancy. This presentation emphasized the opportunities of establishing preventive strategies beginning with the mother and described the concept of a defined period called the "window of infectivity" whereby infants acquired Mutans streptococci from their mothers, but only after the emergence of the primary teeth. ^{36, 37} Supported by animal models, issues of bacterial fidelity and transmissibility were reviewed, opening a new direction in the area of prevention.

In 1998, The Accreditation Standards for Advanced Specialty Education in Pediatric Dentistry adopted what became the basis for the most recent standards for pediatric dental specialty training. ³⁸ First founded in 1961 by the ADA Council of Education, one of the organization's main goals has been to assure that pediatric dentists are proficient in providing both primary and comprehensive preventive and therapeutic oral health care for infants and children through adolescence, including those with special health care needs. Specific topics on infant oral health were included in Standard 4 – Curriculum, and the inclusion of this standard set the stage for all resident training to provide education for the competent dental care of infants and toddlers.

Paralleling the educational front was the introduction of the Section of Pediatric Dentistry and Oral Health at the AAP in 1999. This development created a collaborative momentum to address children's oral health and was the beginning of a strong partnership that would bring about significant change in the advocacy for early childhood oral health.

A new millennium. The millennium started enthusiastically with the Surgeon General's Conference on Children and Oral Health in 2000.³⁹ With the pediatric dental membership's peaked interest regarding the prevention of ECC, the conference merely confirmed this critical mission and allowed for this momentum to take a life of its own. For the first time, oral health was at the forefront of health issues for all children and throughout the human lifespan.

As underserved populations with the greatest oral health needs continued to experience significant challenges to dental care access, efforts were underway to address these issues. A number of states, including Washington and North Carolina, began to use the medical home to deliver preventive oral health services to Medicaid-eligible children under age 3 years in a much more formalized manner. ⁴⁰ These services included anticipatory guidance, risk assessment, and fluoride varnish application.

With this medical movement in place to collaborate with dentistry, other seminal events occurred, including the introduction of the concept of a "dental home" that mirrored a "medical home", and a critical policy statement by the Section of Pediatric Dentistry and Oral Health through the AAP. 41,42 The AAP statement proposed a small but significant modification to shift the timing for dental referrals from 36 months to 12 months of age. It also indicated a notation that "early dental referral may be appropriate for some children". The recommendation further included that physicians perform a caries risk assessment for infants as early as 6 months of age and that those deemed to be high-risk be referred to a dental home. While this was a critical advancement, the policy reflected the reality of the limited dental workforce to care for very young children, among them general dentists with limited training in this area.

In 2004 the AAPD's infant oral health policy had received its fourth revision confirming that primary health care providers refer a child to a dental home by the first birthday.⁴³

Also in 2004, new evidence reported reduced dental costs for children who received an early preventive dental visit compared to those seen at 5 years of age. ⁴⁴ This study reinforced the findings of a much earlier study in 1967 reporting that for every year the first examination was delayed, the fees increase incrementally by ~ \$35 (\$231 in 2009 US dollars).^{45, 46}

A number of these events set in motion efforts for various organizations to embrace early childhood oral health as a way to address the ECC epidemic. In 2005, the ADA adopted the concept of the dental home and in 2007 indicated that it should begin by age 1.47 This was paralleled by the introduction of a new Code on Dental Procedures and Nomenclature (CDT code) - 0145 that could be used when performing an oral evaluation for children under 3 years with caregiver counseling.48 In 2008, the AAP revised its oral health policy and advocated for all children to be referred to a dental home by their first birthday unless workforce limitations existed. 49,50 This document encouraged physicians to deliver preventive oral health services in the medical home under these less than ideal workforce situations, reflecting a significant change from the 1967 suggested schedule for preventive child health care.

While an emphasis in the arena of prevention for infants and toddlers continued to unfold, an interest in addressing the perinatal period had emerged, particularly with the noted relationship between maternal periodontal disease and preterm/low birth weight over the past 15-20 years.^{51,52} New evidence on the colonization of bacteria occurring in the predentate infant, the impact of treating mothers with xylitol products, and the influence on reduction in caries among their offspring over the first 5 years of life had created another wave of interest regarding possibilities for ECC prevention.^{53,54,55} To date, a number of perinatal guidelines have been introduced, identifying pregnancy as a critical stage to establish positive oral health behaviors.^{56,57,58}

Along with the increased interest in perinatal oral health has come a greater appreciation for the complexity of oral disease, from its etiology to the actual human and economic cost. In 2007, Fischer-Owens et al published a conceptual model that focused on population health and examined etiological factors beyond Keyes' 1960 model to include the child, family, community, the time dimension, and the notion of differential susceptibility and resilience.⁵⁹ This model provided a new framework by which the profession could better predict and understand the evolution of oral health diseases in pediatrics. Similarly, the work by Boyce et al., suggesting a convergence between psychosocial, infectious, and stressrelated biological processes implicated in the production of greater cariogenic bacterial growth, and in an increased physical vulnerability of the developing dentition, brings a new heuristic to understanding the complexity of dental disease.⁶⁰

In 2009, Casamassimo et al., introduced a morbidity and mortality pyramid commonly used in health care.⁶¹ This pyramid better delineates human costs associated with ECC, family associated morbidity, the economic burden it places on the health care systems, and mortality as a significant outcome often overlooked by stakeholders. The authors acknowledge that while dental indices including the dmfs have provided useful information, they have failed to portray the broader effects of ECC. These more comprehensive assessments of both the etiology and human /economic impact of ECC can allow for more meaningful actions regarding its prevention and treatment. The future of early childhood oral health. Table 3 provides a historical outline of perinatal and early childhood oral health. As we look towards the future, several interrelated areas should be considered to help maximize pediatric health outcomes.

From a clinical perspective, a shift in practice paradigm from a "surgical" to a "medical" management approach for dental caries remains critical.^{62,63} This calls for greater knowledge and understanding of the infectious nature of ECC, early risk assessment, and the development and use of effective chemotherapeutic interventions and emerging technologies. Similarly, an emphasis on targeted oral health care rather than a 'shot-gun' approach is an important practice shift for caries prevention and management.⁶⁴ From a preventive angle, this will require new skill-sets to more effectively impact behavior change. Most recently, techniques including motivational interviewing show promise in these efforts.65 Continued surgical and medical efforts alone, however, will not eradicate dental disease nor eliminate disease processes or disparities.⁶⁶ Multilevel strategies involving the families, clinicians, and child services will be necessary to achieve any meaningful impacts on dental disease⁶⁷, with clinicians needing to remain engaged in policy strategies, multidisciplinary collaborations, and educational roles that contribute to population health.

From a **research perspective**, refining our diagnostic skills can help target oral health interventions. Caries risk assessment is at the core of the medical management of dental disease. Research to validate age appropriate caries risk assessment tools remains necessary.⁶⁸ The area of salivary diagnostics, largely driven by the Human Genome Project, shows promise in terms of ECC risk assessment and prevention and the identification of pediatric diseases.⁶⁹ A better understanding of the cost-effectiveness of preventive strategies in early childhood can further empower our profession and policymakers to ensure that all children receive appropriate care.

Most importantly, the World Health Organization has set forth an international agenda to assure that a research focus exists for addressing the social determinants of health and measuring the positive impact that these types of interventions may have.⁷⁰ This platform includes issues related to poverty, increasing literacy, and ensuring fair financing and access to basic health services. As we shift to identifying individual social environments as critical in the development of ECC, a better understanding of these issues can ultimately help alleviate oral health inequities more effectively than salivary diagnostics, risk assessment tools, and/or chemotherapeutic agents alone.^{59,60}

From an **educational perspective**, there is a need to advocate for training of the current workforce of general and pediatric dentists in various areas. These include best practices on how to perform dental home related functions with a focus on collaboration with our medical colleagues to assist in health messaging for conditions where common disease risk factors exist. Training emphasizing quality of oral health care delivery is also critical. Finally, cultivating health professionals to focus on the influence of social determinants of health to include cultural and socioeconomic barriers will be essential as our profession addresses ECC management. Similarly, avenues to ascertain continued education for primary health providers delivering oral health services need to be explored, as they are important in assuring quality oral health care.

From an academic perspective, closing the gap in dental education related to perinatal and early childhood oral health will assist in creating a culture in clinical practice that includes the entire lifespan of patients – from womb to tomb. To best achieve this goal, more specific inclusion of educational standards by the Commission on Dental Accreditation that focuses on non-surgical oral care for pregnant women, infants and toddlers are desired. This shift would help ensure that all students receive appropriate training for the delivery of oral preventive services necessary for the care of these populations.⁶⁶

Better education of students regarding their professional and ethical responsibilities in working to assure that everyone has equitable access to care and good oral health will also be essential. A shift in paradigm from a behavioral approach alone, to one that is more evidence-based will be vital to our development as a specialty and profession.

From a policy perspective, the dental and medical professions should continue to work collaboratively to support integrative oral health care systems. For example, to date, the majority of U.S. States have programs whereby physicians can deliver preventive oral health services to children, providing opportunities to partner and create stronger health care systems to improve the oral and general health of children.⁷¹ Such programs have shown an increase in access for the underserved, in addition to decreasing caries-related treatments.^{72,73} However, there are challenges to contend with in delivering these services in these settings during early childhood, including lack of compliance with well-child visits at a time when risk for dental disease is increasing. This will require the dental profession to not view these services as substitutive, but as complementary to opportunities for reaching children that may not have regular access to care.^{74,75}

The reorganization and introduction of mid-level providers will further necessitate a shift in practice patterns.⁶¹ Paralleling these efforts will be the need for policy and regulation development that adequately compensates for the delivery of preventive services. Finally, as indicated above, policy will require a shift to a social determinant of health framework to more fully address the largely social and cultural etiology of childhood oral disease.

Conclusion

This paper provided a historical perspective on oral health care for infants and toddlers beginning in the 19th century through present and shares a vision for the future. While the first visit at the time of the emergence of the first tooth has been promoted for nearly a century, our emphasis on a surgical approach to disease control and prevention has hindered our ability to make significant progress in this arena. While pediatric and general dentists have made a valiant effort to promote oral health, the limited workforce available to care for approximately 15 million children under the age of 5 years has created significant challenges. The recent entry of pedia

tricians and family practitioners are a welcome addition. However, with no cure or vaccine in sight, and with water fluoridation under scrutiny, we must find other interventions to combat caries that are not dependent on professional involvement, from enlisting caregivers to become active participants to more broadly addressing social determinants of health. While we should be proud of what we have accomplished since 1986 with the introduction of the age 1 dental visit guideline, the 25th anniversary of this AAPD policy statement offers an opportunity to rededicate ourselves and increase our efforts to assure equity of oral health for all children.⁷⁶

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