

A Best Practice Approach Report describes a public health strategy, assesses the strength of evidence on the effectiveness of the strategy, and uses practice examples to illustrate successful/innovative implementation.

Date of Report: October 25, 2012

Best Practice Approach Perinatal Oral Health

- I. Description (page 1)
- II. Guidelines and Recommendations (page 11)
- III. Research Evidence (page 13)
- IV. Best Practice Criteria (page 15)
- V. State Practice Examples (page 16)
- VI. Acknowledgement (page 19)
- VII. Attachments (page 20)
- VIII. References (page 22)

Summary of Evidence Supporting Strategies to Promote Perinatal Oral Health

Research	++
Expert Opinion	+++
Field Lessons	+
Theoretical Rationale	+++

See **Attachment A** for details.

I. Description

A. Perinatal Oral Health and Its Significance

Every year, over 6 million women become pregnant in the United States resulting in approximately 4 million live births.¹ Despite the continuous improvement of perinatal health over the last several decades, about one-half million infants (one in eight) are born prematurely each year.²

Studies showing an association between maternal periodontal infection and adverse birth outcomes have evoked considerable interest and support from maternal and child health groups for prenatal oral health interventions. Women during the perinatal period particularly stand to benefit from counseling and routine dental services given their greater oral health needs and the profound influence of their oral health status and behaviors on their infant's oral health.

Perinatal Oral Health during Pregnancy and the Postpartum Period

The perinatal period is defined differently in reports based on whether it refers to the mother, the fetus and/or the newborn infant, and/or the type of health care and outcomes of interest. For this report, perinatal oral health refers to oral health care recommended for women during pregnancy as well as up to two months after childbirth.

During the perinatal period, women experience complex physiological changes that can adversely affect their oral health. Changes in diet and oral hygiene practices, as well as morning sickness or esophageal reflux, can lead to tooth demineralization and an increase in caries risk if appropriate interventions are not provided.^{3,4} Because of hormonal, vascular, and immunologic changes associated with pregnancy, gingival tissues often manifest an exaggerated inflammatory response to local irritants such as plaque biofilm.³⁻⁵ Depending on the study, prevalence of gingivitis during pregnancy ranges from 30% to 100%, and an estimated 5% to 20% of pregnant women manifest clinical signs of periodontitis.^{3,6} Data from the 1999-2004 National Health and Nutrition Examination Survey (NHANES) indicate that one in four US women of childbearing age (15-44 years) had at least one untreated carious tooth surface, and the condition was more common among socioeconomically disadvantaged women.⁷ Untreated dental caries and periodontitis are the most common chronic diseases of the mouth,⁸ and, therefore, a sizable subgroup of US women may enter pregnancy with active dental disease, or pregnancy may trigger the progression of the disease process.

Periodontal Disease and Adverse Birth Outcomes

In 1996, the first report was published suggesting maternal periodontal infection as a possible risk factor for preterm low birth weight.⁹ Periodontal disease is a chronic infection caused by anaerobic gram-negative bacteria.^{10,11} The bacteria responsible for periodontal disease are capable of producing a variety of chemical inflammatory mediators such as prostaglandins, interleukins and tumor necrosis factor, and endotoxins that are implicated in premature labor and other adverse outcomes.¹⁰ It is suggested that oral organisms and cytotoxic by-products can be disseminated systemically to the maternal-fetal-placental complex. This may cause or potentiate an inappropriate immune response or a maternal and/or fetal response that results in adverse birth outcomes.⁹

Accumulated scientific evidence on the association between maternal periodontal disease and risk of preterm birth and low birth weight is mixed,^{5,6,10,12,13} but generally points to a positive association. Han et al. reported a case of term stillbirth caused by oral *Fusobacterium nucleatum*.¹⁴ It provided the first human evidence that the bacteria originated from the mother's subgingival plaque and translocated to the placenta and fetus, caused acute inflammation leading to the fetal demise.

Clinical intervention trials conducted during the past decade have shown conflicting results for the effect of periodontal therapy during pregnancy on reducing adverse birth outcomes.^{5,6,15-20} Only one in four high quality US studies designed to assess the effect of periodontal therapy (meaning mechanical removal of supra- and sub-gingival microbial deposits and calculus from the root surfaces using hand or ultrasonic instruments—scaling and root planing) on pregnant women,¹⁵⁻¹⁸ showed improved birth outcomes.¹⁸ Nevertheless, these studies indicated that routine periodontal treatment during pregnancy did not increase the incidence of adverse pregnancy outcomes.

Mother's Oral Health and Early Childhood Caries

The perinatal period also is a critical time for primary prevention of dental caries. The development of primary teeth begins by 8 weeks in utero, and permanent molars and incisors begin to form at around 20-24 weeks in utero.²¹ Fetal distress, adverse birth outcomes, and challenges in neonatal life increase the risk for craniofacial anomalies and developmental enamel defects,^{22,23} which can also increase risk for dental caries.²⁴

Second, dental caries is a diet-dependent multifactorial bacterial disease. Many studies have documented that cariogenic bacteria that cause dental caries can be transmitted

from intimate caregivers to children.^{25,26} Studies show that maternal untreated caries increases the odds of the children developing caries.^{27,28} Furthermore, maternal beliefs, self-efficacy and knowledge about appropriate oral health behavior influence children's tooth brushing.^{29,30} Dental caries during early childhood (Early Childhood Caries) imposes significant co-morbidities affecting children, families, and communities: high treatment costs, lost work and school hours, psychosocial distress, and sometimes death when the appropriate intervention is delayed.³¹ In light of this evidence, oral health interventions targeting pregnant women are an optimal approach for preventing early childhood caries.

Oral Health Care During Pregnancy

Pregnancy is an opportune time for oral health interventions and promotion.^{4,5} Pregnancy qualifies many women for health and dental insurance, theoretically providing access to health and dental care systems during this time when they are at high risk for dental caries and periodontal disease.^{4,5} During pregnancy, a woman may be more receptive to changing health behaviors that may negatively affect her unborn child.^{4,5} Providing every pregnant woman with oral health education and intervention should be part of standard perinatal services.

Despite inconsistent scientific evidence to show that periodontal therapy during pregnancy reduces the risk for adverse birth outcomes, dental treatment during pregnancy has not been associated with perinatal complications.^{4,5,16,32} While systemic dissemination of oral pathogens and/or their byproducts through scaling and root planing is often raised as a potential side effect of periodontal treatment during pregnancy,^{19,33} transient bacteremia also can occur after toothbrushing.^{34,35} High levels of anaerobic gram-negative bacteria associated with chronic periapical and/or periodontal infection is a significant risk factor for bacteremia and/or systemic diseases.^{10,35} Postponing needed dental treatment or progression/regression of periodontal conditions with incomplete treatment during pregnancy, therefore, would only result in unfavorable oral and overall health outcomes.¹⁰ Prevention and treatment of periodontal disease and dental caries before, during, and after pregnancy are the best way to improve perinatal health of individuals and the community.

B. Barriers to Perinatal Oral Health Care

Despite heightened oral health needs and the apparent benefit of oral health education and clinical interventions, many women forgo oral health care during pregnancy. Data from the Pregnancy Risk Assessment Monitoring System (PRAMS) indicate that 19% to 53% of pregnant women utilize oral health care during pregnancy.³⁶⁻⁴¹ About one-half of those with perceived dental needs actually received oral health care during pregnancy.^{37,41} Underutilization of oral health care during the perinatal period may be caused by a number of factors.

Financing Oral Health Care

During the past two decades, Medicaid has become the largest payer of maternity related services in the United States.⁴² Federal law *requires* states to extend eligibility for pregnancy-related care to pregnant women with incomes up to 133% of the federal poverty level, and *allows* states to cover pregnant women with higher incomes.⁴² Medicaid pays for more than four in ten births nationwide, and in several states, covers more than one-half of all births.⁴²

There is considerable variation between states in eligibility policies and scope of dental coverage for low-income women during the perinatal period as Medicaid coverage for adult dental services is optional. As of 2008, pregnant women in 28 states were eligible for state adult Medicaid dental benefits; while 19 states offered some type of pregnancy specific dental benefit.⁴³ Dental insurance coverage during the perinatal period lags far behind access to medical insurance. This gap may worsen in light of current economic pressures as Medicaid dental programs for adults may be among the first areas in a state budget to be cut. This creates a significant impediment to efforts to promote perinatal oral health for the population at most risk for dental diseases, underscoring the need for a strategy to finance oral health care.

In 2009, dental spending in the United States stood at \$102.2 billion with 40% representing out-of-pocket expenses.⁴⁴ Studies show that preventive dental interventions are effective in reducing disease burden and increasing cost savings. Restorative dental treatments and management of pain and dental infection through medication and/or surgical treatment in the emergency room or an acute care facility are not only costly but also ineffective in light of the chronic and infectious nature of common dental diseases.

Recognizing the importance of perinatal oral health, several private health plans offer enhanced dental benefits during pregnancy, including coverage for an additional cleaning and full reimbursement for copayments or coinsurance related to dental visits.⁴⁵ Such benefits help to reduce the financial obstacle faced by many pregnant women. Insuring females of childbearing age for regular preventive dental services and adequately compensating dentists for their time spent to provide perinatal oral health counseling and education may help reduce the overall burden of dental disease in the community, and ultimately the dollars required to finance dental care.

Workforce Preparedness/Willingness

Despite the apparent benefits of promoting oral health during the perinatal period, dental providers historically have been hesitant to provide oral health care during pregnancy, often postponing care until after delivery. Dental school curricula typically do not include competency requirements in oral health care for pregnant women. Use of outdated guidelines, insufficient knowledge and a lack of experience with perinatal oral health care may be reasons dentists feel uncomfortable treating pregnant women.

The shortage of dentists willing to treat pregnant women is compounded by a shortage of dentists enrolled as Medicaid providers. The majority of dentists in private practice (92% of active dentists in the US)⁴⁶ do not participate actively in the Medicaid program.⁴⁷ Dentists often note low reimbursement rates, slow payment, administrative burdens, and high “no show” rates for appointments as the primary reasons for not participating in the Medicaid program.⁴⁸ Inadequate education, training, and sense of social responsibility for the dental needs of the Medicaid population and the adverse impact on the business may also contribute to dentists’ unwillingness to serve this population.⁴⁷

Results from recent surveys of dentists indicate that the majority believe perinatal oral health is important and are willing to provide oral health education and counseling during pregnancy.⁴⁹⁻⁵¹ However, beliefs about and practices in providing dental treatment for pregnant women vary significantly. In a survey of Oregon general dentists, the greatest variation between self-reported knowledge and perinatal oral health guideline recommendations were in the following areas: obtaining full-mouth radiographs, administering nitrous oxide, administering long-acting anesthetic injections, and using over-the-counter pain medications.⁵⁰ Reported barriers include insufficient compensation for time and costs to provide oral health counseling, concerns about safety of the

procedures and legal risks associated with negative birth outcomes, and a lack of demand for perinatal oral health care.⁴⁹⁻⁵¹

System Integrations and Care Coordination/Referrals

Until recently, there were no national consensus statements by professional organizations to provide guidance to practitioners for the management of oral health problems during pregnancy. This caused confusion for pregnant women and resulted in delays and failure to access comprehensive perinatal oral health care. *The National Consensus Statement for Health Professionals* recommends establishing relationships among health professionals and sharing pertinent information. A letter of referral and medical clearance from a health provider may allay dental provider concerns about potential malpractice claims and legal risk related to oral health care during pregnancy.⁴⁹⁻⁵¹

Perinatal healthcare providers are frustrated trying to include oral health during perinatal health appointments when there is a lack of resources for making dental referrals. This is a particular problem in the Dental Health Professional Shortage Areas (DHPSA) where 49 million Americans live. Although 79% of professionally active dentists in the United States are in general practice, maldistribution of dentists continues to pose a problem for rural and underserved communities.⁵² In 2010, 72% of the 1,124 federally qualified health centers provided on-site dental services.⁵³ However, provision of oral health care at local health departments (LHDs) has been decreasing during the past decade; only 20% of LHDs serving populations of less than 25,000 and 57% of LHDs serving populations of 500,000 or more offer oral health services.⁵⁴

A number of success stories from dental workforce/care coordination models for children address access to care disparities by training health and dental providers who are not traditionally a part of an oral health care delivery system for children.⁵⁵⁻⁵⁹ Since physicians, nurses, and allied health professionals are far more likely to see perinatal patients than are dentists, they may serve as important partners to advocate for and support perinatal oral health.

A comprehensive public health approach to improving preconception and perinatal health and oral health might be worth exploring. The Surgeon General's Report on Oral Health referred to the mouth as a mirror of health and disease occurring in the rest of the body in part because a thorough oral examination can detect signs of numerous general health problems, such as nutritional deficiencies, systemic diseases, microbial infections, or immune disorders.^{60,61} As approximately one-half of pregnancies in the United States are unintended, women with chronic health conditions such as obesity, diabetes, and eating disorders, or recreational habits and addictions such as tobacco and alcohol use, may enter the pregnancy without proper preconception health care.⁶² Additionally, periodontal disease and preterm birth share many common risk factors.^{63,64} This fact alone justifies the importance of dental providers' involvement in delivering preventive services for women of childbearing age.

Women's Knowledge, Attitudes, and Behaviors

A woman's knowledge, attitudes, and behaviors regarding oral health during the perinatal period may be influenced by culture, values, myths, socioeconomic constraints, system inadequacies or dental providers' behaviors. In addition, she may have missed opportunities for receiving information and counseling.

Women enrolled in Medicaid are significantly less likely to visit the dentist before, during, and after pregnancy despite their greater dental disease burden compared to those with

private insurance.^{36,45} However, ineffective use of available dental benefits by pregnant women is also evident among the cohort with private health insurance.⁴⁵ PRAMS data indicate that oral health care is not discussed with women during pregnancy as frequently as other prenatal health issues, such as breastfeeding, birth control, HIV testing, smoking and drinking (i.e., only 41% to 60% receive oral health discussions vs. >75% for other prenatal health topics).^{36,37,41} A survey conducted in Ohio indicates that 40% of women were advised about dental visits during pregnancy by a health care professional and only 44% of them actually made a dental visit during pregnancy.⁴⁹ While only 54% of the surveyed women believed that oral health during pregnancy was more important than when not pregnant, the most common reasons for not seeing a dentist were “insufficient funds” (37%), “safety concerns about dental treatment” (35%), “lack of available dentist” (16%), and “lack of transportation” (12%).⁴⁹

Environmental and policy contexts as well as sociocultural and psychological influences on women’s perinatal oral health behaviors must be evaluated better to develop comprehensive population-wide approaches to changing behaviors that will improve perinatal health and oral health. Strategic outreach efforts to educate women of childbearing age regarding perinatal oral health and the provision of incentives to obtain regular dental care are needed.

C. Strategic Framework for Improving Perinatal Oral Health

State and local dental public health programs are responsible for identifying the population’s oral health problems/needs and issues. The following strategic framework for improving perinatal oral health is based on core public health activities set forth in Ten Essential Public Health Services⁶⁵⁻⁶⁷ and the Maternal and Child Health Pyramid of Health Services.⁶⁸ Public health agencies can use the framework to examine perinatal oral health systems, implement steps to improve perinatal oral health, and build broad community support for public policies, regulations, funding, and other means for improving perinatal oral health in the community. See Attachment B for a Logic Model that also depicts the strategic framework.

1. Assess and Monitor Perinatal Oral Health

Establishment of state/community-based perinatal oral health surveillance is essential for: monitoring, timely communication of findings, and the use of data to initiate and evaluate perinatal oral health programs.

Examples of Actions

- Integrate perinatal oral health data with other health-assessment and data-collection efforts conducted by public health systems (e.g., PRAMS, BRFSS).
- Assess perinatal oral health needs, oral health risks and access to dental services during pregnancy.
- Monitor progress toward short-term and long-term goals and objectives for perinatal oral health.

2. Enhance Infrastructure and Build Partnerships

The perinatal period offers women additional opportunities to access health care systems and preventive, educational, and counseling services. Opportunities and

constraints of perinatal oral health systems must be evaluated to plan better for sustainable, accountable, and coordinated oral health services. The following examples highlight common opportunities in the community to enhance infrastructure and partnerships for perinatal oral health.

Examples of Actions

- Integrate oral health into community perinatal, Early Head Start, maternal and child health (MCH) programs, and/or chronic disease prevention programs (e.g., prenatal programs, home visitor programs, the Special Supplemental, Nutrition Program for Women, Infants, and Children [WIC], and tobacco-cessation programs).
- Advocate for perinatal oral health services through non-governmental institutions/organizations (e.g., managed care organizations, community faith-based groups, mother-to-mother networks, academic institutions, and not-for-profit philanthropies).
- Work with health professional and community networks (e.g., perinatal networks, oral health coalitions, and rural health networks).
- Enhance Medicaid benefits for pregnant women and women of childbearing age (e.g., inclusion of dental benefits in “pregnancy-related” services).

3. Inform and Empower the Public to Mobilize Support

To make perinatal oral health a priority, all stakeholders (perinatal service professionals, policy makers, dental providers and women in the community) must be informed, empowered, and “buy into” the importance and significance of perinatal oral health.

Examples of Actions

- Adopt, endorse, and promote perinatal oral health guidelines and recommendations to all professionals and agencies engaged in perinatal health, social, and educational services.
- Develop advocates (i.e., perinatal oral health champions) to promote perinatal oral health programs and interdisciplinary system integration.
- Mobilize communities to advocate for policies and activities that will improve perinatal oral health (e.g., Medicaid dental coverage during the perinatal period, oral health services in perinatal programs, fluoride varnish and water fluoridation programs).
- Engage a broad group of stakeholders to set priorities for perinatal oral health and disseminate the goals in state oral health plans.
- Improve perinatal oral health information systems to be appropriate for pregnant women’s cultures and literacy levels to better educate them on the importance of maternal oral health during the perinatal period.
- Disseminate perinatal oral health success stories.

4. Ensure Adequate Oral Health Workforce and Systems

A competent oral health workforce and an integrated systems approach to oral health interventions are essential to facilitate changes in women's oral health behavior during the perinatal period and to improve oral health outcomes. Collaborative efforts by academic institutions and state agencies are necessary to educate dental and perinatal service providers and ensure that local perinatal oral health care and financing systems are functioning and adequate.

Examples of Actions

- Develop a core set of perinatal oral health competencies for dental professionals and other health care professionals.
- Ensure the availability of undergraduate and postgraduate dental education and Continuing Education (CE) opportunities to develop and maintain competencies in perinatal oral health care.
- Expand the diversity of the dental workforce to meet the demands in perinatal oral health.
- In underserved areas, increase the number of safety-net dental clinics that co-locate with perinatal health clinics.
- Implement strategies to develop and sustain case management, care coordination and referral systems.

5. Promote and Support Research and Evidence-Based Practices

Data from research and program evaluation improve the way we educate the oral health workforce, motivate women about oral health, coordinate referrals and consultations, treat oral diseases, and promote oral health during the perinatal period.

Examples of Actions

- Utilize research- and surveillance-based data to define perinatal oral health needs and disparities and to address barriers to perinatal oral health.
- Evaluate data from existing perinatal oral health programs to develop and disseminate more effective perinatal oral health services and workforce models.
- Promote and support research to improve quality and effectiveness of perinatal oral health care (e.g., effective motivational interviewing for pregnant women, treatment protocols for periodontal disease during the perinatal period that are effective and safe).

6. Integrate Oral Health into the Patient-Centered Medical Home

Patient Centered Medical Home (PCMH) is an approach to provide comprehensive primary care for children, youth and adults that is promoted by many organizations.^{69,70} PCMH is a "whole person" oriented approach to health care; therefore, perinatal healthcare providers should facilitate partnerships between women, other health care providers including oral

health professionals, and when appropriate, their family, and personal and professional social support systems to attain optimal perinatal health outcomes. Perinatal care health professionals should assess their clients' oral health status and advise about oral health care. Oral health care providers in the community should work with perinatal care providers to deliver timely, comprehensive, evidence-based and safe dental care and oral health guidance for women during the perinatal period. As an outcome of these community-based organized efforts, women will be educated and motivated about oral health during the perinatal period to improve self-management skills and be better prepared to achieve oral health in their offspring.

Examples of Actions

- Ensure perinatal oral health care that is comprehensive, continuously accessible, coordinated, culturally effective, compassionate, and family- or patient-centered.
- Promote appropriate community- and individual-based oral disease risk assessment and evidence-based and risk-based oral health intervention and promotion.
- Educate and motivate pregnant women about oral health and support their oral health decisions and self-management plans.
- Provide coordinated perinatal care that includes oral health intervention.
- Promote effective interdisciplinary provider communication and health care and financing system efficiency.
- Make information available in languages and literacy levels common to the local community about perinatal insurance benefits and social, educational, and MCH services in the community.

D. Initiatives and Coordinated Efforts

1. [Oral Health Disparities Collaborative \(OHDC\) Pilot](#)

The Health Resources and Services Administration (HRSA), Bureau of Primary Health Care (BPHC), initiated the OHDC pilot to develop “comprehensive primary oral health care system change interventions” (based on the Chronic Care Model and evidence-based concepts) to improve early childhood caries (ECC) prevention and treatment, and perinatal oral health in community health centers. The [Oral Health Disparities Collaborative Implementation Manual](#) was developed from the pilot to guide future efforts.

2. [The Children’s Dental Health Project \(CDHP\) Perinatal Initiative](#)

The CDHP, in conjunction with the American Academy of Pediatric Dentistry (AAPD), developed the [Improving Perinatal and Infant Oral Health Project](#) to address the oral health needs of pregnant women and children. The program’s goals are to increase the awareness and availability of prenatal and infant oral health care. Strategies implemented to achieve these goals include educational initiatives for families and health providers, as well as research and analysis of policies that impact the quality and delivery of perinatal care. The project examines the outcomes of such policies in its determination of recommendations for best practices.

3. [HRSA, Maternal and Child Health Bureau \(MCHB\)](#)

[Consensus Conference on Perinatal Oral Health \(2006\) and follow-up \(2008\)](#)

In 2006, MCHB sponsored an event, “Research to Policy and Practice Forum: Periodontal Health and Birth Outcomes.” In 2008, this meeting was followed by the “Improving Perinatal Oral Health: Moving Forward” conference. These two events focused on the role of perinatal oral health care in improving overall maternal and infant health. Recommendations include the promotion of existing guidelines to treat pregnant women, the integration of oral health services into routine perinatal care, and the education of the public and other health providers regarding perinatal oral health issues.

4. **Initiatives in States to Promote Oral Health during Pregnancy**

[New York](#)

In 2006, the New York State Department of Health (NYSDOH) published “[Guidelines for Oral Health Care during Pregnancy and Early Childhood](#).” Working closely with perinatal networks, the guidelines were distributed to dental, prenatal and pediatric professionals via a satellite broadcast, presentations, web posting, and mailings of printed materials. Linguistically appropriate materials in the form of mini-posters and a wallet card were developed and distributed to prenatal, infant, and child health care providers for use with their respective patients. In addition, the New York State Medicaid Prenatal Care Standards were revised to include assessment of oral health care needs at the first prenatal care visit, education about the importance of oral health, and appropriate referral to a dentist for further care.

[West Virginia](#)

Through a March of Dimes chapter grant, West Virginia (WV) adopted and disseminated highlights of the NY perinatal guidelines to more than 2,500 providers including dentists, pediatricians, obstetricians, physician assistants, and midwives. This effort was part of a WV’s Children’s Oral Health Project that began in 2006 and is supported by multidisciplinary professional organizations in WV. Through a grant from the Benedum Foundation, the WV University (WVU) School of Dentistry provided Perinatal Continuing Education programs for dentists, dental hygienists, WIC liaisons, Right from the Start nurses, and social workers across the state to promote perinatal oral health care and increase the number of WV Medicaid women accessing oral health services. In addition, the WVU School of Dentistry has partnered with the WV Perinatal Partnership (a non-regulatory body representing providers and consumers of perinatal services and the interested public at large) to offer and promote recommendations for improving birth outcomes.

II. Guidelines & Recommendations from Authoritative Sources

A. [Oral Health Care During Pregnancy: A National Consensus Statement. Summary of an Expert Workgroup Meeting \(2012\)](#)

This document presents a summary of an expert workgroup meeting held on October 18, 2011, in Washington, DC and the resulting national consensus statement. It was developed to increase health professionals' awareness of the importance and safety of women's oral health care during pregnancy through the promotion of evidence-based science. The document provides guidance on oral health care for pregnant women for both prenatal care health professionals and oral health professionals, pharmacological considerations for pregnant women, and guidance for health professionals to share with pregnant women.

B. [New York State Department of Health – Oral Health Care During Pregnancy and Early Childhood. Practice Guidelines](#) (August 2006)

In 2006, the New York State Department of Health convened an expert panel of medical and dental professionals and developed oral health care recommendations based on scientific evidence and professional consensus for dental, perinatal, and pediatric care providers. These were the first perinatal oral health guidelines to bring about changes in the health care delivery system and to improve the overall standard of perinatal care.

C. [National Maternal and Child Oral Health Resource Center \(OHRC\) – Oral Health Care During Pregnancy: A Summary of Practice Guidelines](#) (Winter 2008)

This document summarizes the New York State Department of Health's perinatal oral health practice guidelines. The summary guidelines were written by authors from the NY State Department of Health, coordinated by the CDHP, and produced by the OHRC.

D. [California Dental Association Foundation – Oral Health During Pregnancy and Early Childhood: Evidence-Based Guidelines for Health Professionals](#) (February 2010)

In 2009, the California Dental Association Foundation convened an expert panel of health care professionals to update the accumulated scientific evidence on perinatal oral health to highlight the importance of prevention and treatment of dental and periodontal diseases during pregnancy and early childhood. These guidelines include practice recommendations for community-based program providers as well as all health care providers.

E. [Office of Surgeon General](#)

[Oral Health in America: A Report of the Surgeon General](#) (October 2000)

The major message of this report is that oral health is essential to the overall health and well-being of all Americans. The comprehensive report provides an in-depth review of oral-general health connections and oral disease burdens and disparities, and details the impact of systemic diseases and birth defects on the craniofacial complex.

[National Call to Action to Promote Oral Health](#) (Spring 2003)

This follow-up report describes action plans and strategies to achieve the goals of the 2000 Surgeon General's report to promote America's oral health and reduce disparities that affect vulnerable members of our society because of their limited socioeconomic and geographic resources and special oral health care needs. The report emphasizes the following actions that are applicable to perinatal oral health:

- Change perceptions of oral health
- Overcome barriers by replicating effective programs and proven efforts
- Build the science base and accelerate science transfer
- Increase oral health workforce diversity, capacity, and flexibility

- Increase collaborations

F. [American Academy of Pediatric Dentistry \(AAPD\) Guideline on Perinatal Oral Health Care](#) (2012-2013)

AAPD recognizes that perinatal oral health, along with infant oral health, is one of the foundations upon which preventive education and oral health care must be built to enhance the opportunity for a child to have a lifetime free from preventable oral disease. AAPD recommends every expectant mother receive a comprehensive oral health evaluation from a dentist and establish a dental home as early as possible during pregnancy. The recommendations also include professional partnerships in perinatal oral health education, care provision, and referrals.

[Guideline on Adolescent Oral Health Care](#) (2012-2013)

This guideline addresses the issues of adolescent pregnancy and management of oral health care particular to the pregnant adolescent rather than specific treatment recommendations for oral conditions.

G. [American Academy of Periodontology \(AAP\)](#)

[AAP Statement Regarding Periodontal Management of the Pregnant Patient](#) (January 2004)

This statement encourages all women to attain good oral health prior to and throughout their pregnancies and encourages necessary treatment beginning early in and throughout the pregnancy.

H. [American College of Obstetricians and Gynecologists \(ACOG\) and American Academy of Pediatrics—Guidelines for Perinatal Care, Sixth edition](#) (2007)

A joint project by ACOG and American Academy of Pediatrics, this edition outlines basic, specialty, and subspecialty levels of perinatal care and provides information on oral health care during pregnancy along with various perinatal health issues and practice recommendations. The document, available at ACOG online bookstore (http://sales.acog.org/bookstore/guidelines_for_perinatal_care_p262.cfm), advises perinatal care providers to counsel women to continue usual oral health care and oral hygiene practices during pregnancy, including brushing and flossing, scheduled prophylactic cleanings, and any necessary dental treatment.

I. [Smiles for Life: A National Oral Health Curriculum, 3rd edition](#) (2010)

Smiles for Life is a comprehensive oral health curriculum developed by the Society of Teachers of Family Medicine Group on Oral Health. This curriculum is designed to enhance the role of primary care clinicians in the promotion of oral health for all age groups through the development and dissemination of high-quality educational resources. It includes a chapter on oral health care during pregnancy. Available online, this course addresses the importance of oral health before, during, and after pregnancy. Clinicians can explore the prevalence of oral disease during pregnancy and its consequences for both mothers and children, as well as review dental treatment guidelines for pregnant women. This website also provides a printable Prenatal Pocket Card that summarizes key knowledge about oral health care for pregnant women.

J. [Pregnancy Reference Card: Baby Smiles \(2009\)](#)

This perinatal oral health guideline was created by the investigators at the University of Washington for an intervention study ("Baby Smiles") conducted in four rural counties in Oregon. The recommendations in the reference card were reviewed with dentists and prenatal care providers throughout Oregon and used to inform area dentists and other community partners in Oregon about the importance and safety of dental care during pregnancy. It was distributed widely at community health partnership meetings and at

Continuing Dental Education. The reference card was produced with support from the Northwest Center to Reduce Oral Health Disparities (NIH/NIDCR U54 DE019346), School of Dentistry, University of Washington. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Dental & Craniofacial Research or the National Institute of Health.

III. Research Evidence

During the past decade, the following four areas of research in perinatal oral health frequently have been discussed among the public and professionals:

1. Periodontal disease during pregnancy and the potential association with adverse birth outcomes.

The accumulated evidence has not been sufficient to conclude that periodontal disease is a cause or an effect modifier in combination with other factors for preterm birth. However, overall, the evidence demonstrates that an association exists between periodontal disease and adverse birth outcomes.

- Xiong et al. A systemic review (2006)⁶⁴:
 - 25 studies (13 case-control, 9 cohort, and 3 controlled trials) were identified.
 - 18 studies suggested an association (Odds Ratios [ORs] ranging from 1.10 to 20.0).
 - 7 studies found no evidence of an association (ORs ranging from 0.78 to 2.54).
 - 3 clinical trials suggested oral prophylaxis and periodontal treatment can lead to a 57% reduction in preterm low birth weight babies (pooled Risk Ratios [RRs] 0.43; 95% Confidence Interval [CI] 0.24-0.78) and a 50% reduction in preterm births (RRs 0.5; 95%CI 0.20-1.30).
 - Authors' conclusion: There is evidence of an association between periodontal disease and increased risk of preterm birth and low birth weight, especially in economically disadvantaged populations.

2. The effectiveness of periodontal therapy during pregnancy to reduce the risk of adverse birth outcomes.

There is insufficient evidence to determine whether or not periodontal disease increases risk for preterm birth. Treatment as performed in most studies (scaling and root planing) was ineffective in reducing adverse birth rates, thereby resulting in no observable difference in outcomes between treated and untreated groups.

- Polyzos et al. Systematic review and meta-analysis (2010)²⁰:
 - 11 trials (with 6,558 women) were included.
 - 5 studies with high methodological quality found no significant effect of periodontal treatment during pregnancy on the overall rate of preterm birth (OR 1.15; 95%CI 0.95-1.40) or the rate of low birth weight infants (OR 1.07, 95% CI 0.85-1.36).
 - 6 low quality studies supported a beneficial effect of periodontal treatment during pregnancy.

- Uppal et al. A meta-analysis (2010)⁷¹
 - The selected 10 randomized control trials (RCTs) analyzed the risk for preterm birth (PTB) in 6,142 participants; 8 of these RCTs had data on low birth weight (LBW) and a total of 5,829 participants.
 - Pooled estimate of OR for PTB in the treatment group was 0.59 (95%CI 0.40-0.88).
 - Pooled estimate of OR for LBW in the treatment group was 0.72 (95% CI 0.44-1.17).
 - High quality studies (studies with low bias) yielded the pooled estimates of ORs 1.08 (95%CI 0.89-1.31) for PTB and 1.18 (95% CI 0.96-1.45) for LBW.
- Xiong et al. Review and meta-analysis (2011)¹⁹:
 - 9 clinical trials that had PTB as an outcome suggested that periodontal treatment did not significantly reduce the rate of PTB (pooled RR 0.82; 95% CI 0.64-1.06).
 - 5 clinical trials that had LBW as an outcome suggested that treatment of periodontal disease during pregnancy may reduce the rate of LBW (pooled RR, 0.64; 95% CI 0.40-1.00).
- Jeffcoat et al. (2011)⁷²:
 - Most recently, the use of over-the-counter, alcohol-free, 0.07% cetylpyridinium chloride mouthrinse during pregnancy was reported to be associated with reduced incidence of preterm birth <35 weeks.
- Chambrone et al. Systematic review and meta-analysis (2011)⁷³
 - 14 RCTs (a total of 6,813 pregnant women with live births) were included.
 - 2/3 of the included trials found that maternal periodontal disease treatment may reduce the incidence of adverse pregnancy outcomes such as preterm birth and/or low birth weight.
 - Meta-analyses including 11 RCTs failed to demonstrate an association between maternal periodontal treatment and improved adverse pregnancy outcomes.
 - Meta-regression analysis, sensitivity analysis excluding studies identified as non-homogeneous, and meta-analyses excluding studies considered to be at an unclear or high-risk of bias also did not support such association.
 - Most analyses showed a reduction in the number of adverse pregnancy outcomes, while a statistically significant effect of maternal periodontal therapy on the number of adverse events was not found.

3. The overall safety of providing dental treatment during pregnancy.

Research listed below as well as those RCTs that investigated the effect of periodontal therapy during pregnancy on birth outcomes show that routine dental treatment including periodontal therapy during pregnancy does not increase the incidence of adverse pregnancy outcomes. New York State Department of Health and CDA Foundation and the National Maternal and Child Oral Health Center's national consensus statement in their development of recommended treatment guidelines for pregnant women, concluded that the use of diagnostic radiation, nitrous oxide, and local anesthesia are safe for pregnant patients when practiced under the standards established by the dental profession.^{4, 5, 74}

- Michalowicz et al. (2008)³⁰:

- Using data from randomized controlled trials, safety outcomes were reported from a cohort of pregnant women undergoing scaling and root planing and other dental treatments.
- The rates of adverse birth outcomes did not differ significantly between women who received dental treatment and those who did not.
- Use of topical or local anesthetics during root planing was not associated with an increased risk of adverse birth outcomes.

4. The safety of using amalgam for a pregnant patient.

There are no studies in humans that show an increased risk of adverse systemic effects directly attributable to the placement of amalgams during pregnancy to either the mother or fetus.

In 2009, the [US Food and Drug Administration \(FDA\)](#) changed their regulation classifying mercury from a Class I risk (least risk) device to Class II (more risk level) device and provided a special controls guidance document for dental amalgam. In relation to pregnant women, the document recommends that amalgam products have the following statement or its equivalent:

“The developing neurological systems in fetuses and young children may be more sensitive to the neurotoxic effects of mercury vapor. Very limited to no clinical information is available regarding long-term health outcomes in pregnant women and their developing fetuses, and children under the age of six, including infants who are breastfed.”

“In addition, the estimated concentration of mercury in breast milk attributable to dental amalgam is an order of magnitude below the EPA protective reference dose for oral exposure to inorganic mercury. FDA has concluded that the existing data support a finding that infants are not at risk for adverse health effects from the breast milk of women exposed to mercury vapors from dental amalgam.”

The US FDA is currently updating the evidence regarding the safety of dental amalgam. New guidance on this issue may be released later in 2012.

IV. Best Practice Criteria

The ASTDD Best Practices Project has selected five best practice criteria to guide state and community oral health programs in developing their best practices. For these criteria, initial review standards are provided to help evaluate the strengths of a program or practice to promote perinatal oral health.

1. Impact / Effectiveness

- A practice or program enhances the **processes** to improve oral health status and/or improve access to oral health care for pregnant women.
 - Example: Increased number of programs to train physicians, nurses/midwives, and dentists to provide perinatal oral health services or increased number of providers being trained.
- A practice or program produces **outcomes** that improve oral health status and/or improve access to dental care for women during the perinatal period.

Example: Reduced dental caries experience and untreated caries among pregnant women and young children. Increased rates of annual preventive dental visits and fewer numbers of emergency or hospital visits for dental infections among women and children.

2. Efficiency

- A practice or program shows cost savings in preventing oral disease and reducing the extent of treatment needs for perinatal patients.

Example: Cost savings based on the comparison of the cost for delivering preventive dental services during the perinatal periods to the projected cost of dental treatments and adverse birth outcomes or early childhood caries.

- A practice or program shows leveraging of federal, state, and/or community resources to improve perinatal oral health.

Example: Using strategies of enhancing existing systems and resources as well as multidisciplinary partnerships between the public and private sectors to support perinatal oral health program (e.g. oral health outreach, care coordination, case management, preventive services, and patient-centered health home for pregnant women).

3. Demonstrated Sustainability

- A practice or program that has demonstrated sustainability or has a plan to maintain sustainability.

Example: A program that has demonstrated continuous provision of service, accountability, and innovation for pregnant women and receipt of agency line-item funding and reimbursement from public and private insurers.

4. Collaboration / Integration

- A practice or program establishes partnerships or collaborations that integrate oral health efforts with other disciplines to improve the general health of pregnant women and infants.

Example: The state oral health and MCH programs working collaboratively to improve systems of care and financing for oral health (i.e. exploring new models for payment and delivery of care).

5. Objectives / Rationale

- A practice or program aligns its objectives with the national or state agenda to improve the oral health and general health of pregnant women.

Example: Program objectives target Healthy People 2020 objectives to reduce caries experience, untreated decay, and use of the oral health care delivery system.

V. State Practice Examples

The following practice examples illustrate various elements or dimensions of the best practice approach. These reported success stories should be viewed in the context of the states and program's environment, infrastructure, and resources. End-users are encouraged to review the practice descriptions (click on the links of the practice names) and adapt ideas for a better fit to their state's and programs.

A. Summary Listing of Practice Examples

Table 1 provides a listing of programs and activities submitted by states. Each practice name is linked to a detailed description.

Table 1. State Practice Examples Promoting Perinatal Oral Health			
#	Practice Name	State	Practice
1. Perinatal Oral Health Surveillance			
1	CUBS surveillance program	AK	02004
2. Perinatal Oral Health Professional Training			
2	Evidence-based Perinatal Oral Health Guidelines	CA	06005
3	Children's oral health education program OB collaborative	NJ	33021
4	New York State Perinatal Oral Health Initiatives	NY	35009
5	Mini Perinatal Oral Health Residency	RI	45003
6	West Virginia Childhood Oral Health Project	WV	55001
3. Perinatal Oral Health Care Coordination and Systems Integration			
7	The Mother and Youth Access (MAYA) Project	CA	06004
8	Infant Oral Care Program	CA	06006
9	Oral Health Disparity Collaborative	CO/MT	99001
10	Home by One	CT	08005
4. Perinatal Oral Health Promotion			
11	Healthy Teeth, Happy Babies	CO	99003

Highlights of state practice examples are listed below.

1. Perinatal Oral Health Surveillance

AK [CUBS Program/Practice #02004](#)

The Alaska Childhood Understanding Behaviors Survey (CUBS) is a follow-up survey to the Pregnancy Risk Assessment Monitoring System (PRAMS) that was developed by the Alaska Division of Public Health, Section of Women's, Children's and Family Health, in 2006. After a pilot period in 2006 and 2007, CUBS has been ongoing since January 2008. CUBS' purpose is to fill a gap in knowledge by collecting information related to child behavior, health, health care access, and school readiness among Alaska's 3-year-olds. By using the methodology of re-interviewing mothers who

completed a PRAMS survey, CUBS is also able to evaluate factors present at birth or early life that affect risk for later adverse childhood outcomes.

2. Perinatal Oral Health Professional Training

- CA [Evidence-based Perinatal Oral Health Guidelines / Practice #06005](#)
In February 2009, the California Dental Association Foundation (CDA Foundation) and the American College of Obstetricians and Gynecologists held the California Perinatal Oral Health Consensus Conference to develop practice guidelines to assist medical and dental professionals in providing appropriate evidence-based oral health care to perinatal populations. Upon completion of the guidelines, a dissemination process systemically shared the guidelines with healthcare professionals and community organizations involved in the care of pregnant women and young children. The dissemination of perinatal oral health guidelines to medical and dental team members is an important step in improving the oral health of pregnant women and creating a foundation for achieving optimal oral health in their children.
- NJ [Children's Oral Health Education Program OB Collaborative / Practice #33021](#)
This program partners with obstetric clinics at Federally Qualified Health Centers (FQHC's) to incorporate oral health education and referral for dental care into standard obstetrical care. COHP trains physicians, midwives, and nurse practitioners about oral hygiene recommendations and the association between oral health and pregnancy outcomes. Presently, this model collaborative is being conducted at three FQHC's with expansion proposed for the FQHC's throughout the State.
- NY [New York State Perinatal Oral Health Initiatives / Practice #35009](#)
The New York State Department of Health Bureau of Dental Health (NYSDOH-BDH) has a multi-faceted strategy for educating health and dental care professionals on the importance of oral health, recommendations for the provision of oral health services, and the use of evidence-based preventive interventions for pregnant women, infants, and young children.
- RI [Perinatal Mini-residency program / Practice #45003](#)
The Rhode Island Oral Health Program convened a Prenatal & Pediatric Dentistry Mini-Residency for dental professionals, including dentists, dental hygienists, dental assistants, and dental students/residents for the purpose of increasing their knowledge, skills, and abilities to provide high quality, community responsive dental services to pregnant women and very young children. The two day event offered 14 CE credit hours. The program was open to both private practice and community care providers, with the aim of establishing more Age 1 Dental Homes.
- WV [West Virginia Childhood Oral Health Project / Practice #55001](#)
The goal of the Childhood Oral Health Project is to increase the responsiveness of the West Virginia University (WVU) Health Sciences Center to address issues related to childhood oral health. Strategies included modifying the curriculum of the WVU Schools of Dentistry, Medicine, Nursing, and Pharmacy to include oral health content.

3. Care Coordination and Systems Integration

- CA [The Mother and Youth Access \(MAYA\) Project / Practice #06004](#)
The MAYA Project, a randomized clinical trial, was designed to compare different interventions to prevent dental caries: chlorhexidine rinses to reduce the number of bacteria causing decayed teeth, fluoride varnish applications to increase enamel remineralization, and parental oral health counseling to promote behavioral change.

- CA [Infant Oral Care Program \(IOCP\) / Practice #06006](#)
 The IOCP partners with the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), Head Start/Early Head Start, and a Federally Qualified Health Center to provide early oral health intervention and care coordination to typically underserved, low-income, minority children ages 0-5 and their mothers/caregivers in a non-traditional setting. The aim of the program is to simultaneously increase entry points of access and integrate perinatal and pediatric health care with oral health services to improve overall health outcomes in the community.
- CO & MT [Oral Health Disparities Collaborative / Practice #99001](#)
 The Oral Health Disparities Collaborative was launched to improve access to oral health services for low-income children ages 0 to 5 and pregnant women. The Collaborative used the Chronic Care Model as the framework for system redesign.
- CT [Home by One Program / Practice #08005](#)
 Connecticut Department of Public Health's Home By One Program seeks to establish a dental home for CT children by age one, targeting those at high risk, through an integrated partnership connecting parents, WIC nutritionists, pediatricians, dentists, and state and local agencies.

4. Perinatal Oral Health Promotion

- CO [Healthy Teeth, Happy Babies / Practice #99003](#)
 Since 2006, this critical public health campaign has been working to reduce oral disease in infants and pregnant women in Colorado. Healthy Teeth Happy Babies and the Delta Dental of Colorado Foundation run bilingual advertising throughout the Denver area to raise awareness about the link between mother and baby oral health while providing information to prevent the spread of dental disease.

VI. Acknowledgements

This report is the result of efforts by the ASTDD Best Practices Committee to identify and provide information on developing and successful practices that address perinatal oral health care. The ASTDD Best Practices Committee extends a special thank you to the ASTDD Perinatal and Early Childhood Committee for their partnership in the preparation of this report.

ASTDD would like to thank Hiroko Iida, DDS, MPH, Assistant Professor, University of North Carolina, School of Dentistry, who was the primary author for this document and Jayanth Kumar, DDS, MPH, Director, Bureau of Dental Health, New York State Department of Health, contributing author and project director.

This publication was supported by Cooperative Agreement 5U58DP001695 from CDC, Division of Oral Health.

Suggested citation: Association of State and Territorial Dental Directors (ASTDD). Best practice approach: perinatal oral health [monograph on the Internet]. Sparks, NV: Association of State and Territorial Dental Directors; 2012 October 25. 26 p. Available from: <http://www.astdd.org>.

VII. Attachments

ATTACHMENT A

Strength of Evidence Supporting Best Practice Approaches

The ASTDD Best Practices Committee takes a broad view of evidence to support best practice approaches for building effective state and community oral health programs. The Committee evaluated evidence in four categories: research, expert opinion, field lessons and theoretical rationale. Although all best practice approaches reported have a strong theoretical rationale, the strength of evidence from research, expert opinion and field lessons fall within a spectrum. On one end of the spectrum are promising best practice approaches, which may be supported by little research, a beginning of agreement in expert opinion, and very few field lessons evaluating effectiveness. On the other end of the spectrum are proven best practice approaches, ones that are supported by strong research, extensive expert opinion from multiple authoritative sources, and solid field lessons evaluating effectiveness.

<u>Promising</u> <u>Best Practice Approaches</u>					<u>Proven</u> <u>Best Practice Approaches</u>	
Research	+		⇒		Research	+++
Expert Opinion	+		⇒		Expert Opinion	+++
Field Lessons	+		⇒		Field Lessons	+++
Theoretical Rationale	+++		⇒		Theoretical Rationale	+++

Research

- + A few studies in dental public health or other disciplines reporting effectiveness.
- ++ Descriptive review of scientific literature supporting effectiveness.
- +++ Systematic review of scientific literature supporting effectiveness.

Expert Opinion

- + An expert group or general professional opinion supporting the practice.
- ++ One authoritative source (such as a national organization or agency) supporting the practice.
- +++ Multiple authoritative sources (including national organizations, agencies or initiatives) supporting the practice.

Field Lessons

- + Successes in state practices reported without evaluation documenting effectiveness.
- ++ Evaluation by a few states separately documenting effectiveness.
- +++ Cluster evaluation of several states (group evaluation) documenting effectiveness.

Theoretical Rationale

- +++ Only practices which are linked by strong causal reasoning to the desired outcome of improving oral health and total well-being of priority populations will be reported on this website.

ATTACHMENT B
Perinatal Oral Health Logic Model

Objectives

Assess/Monitor Perinatal Oral Health

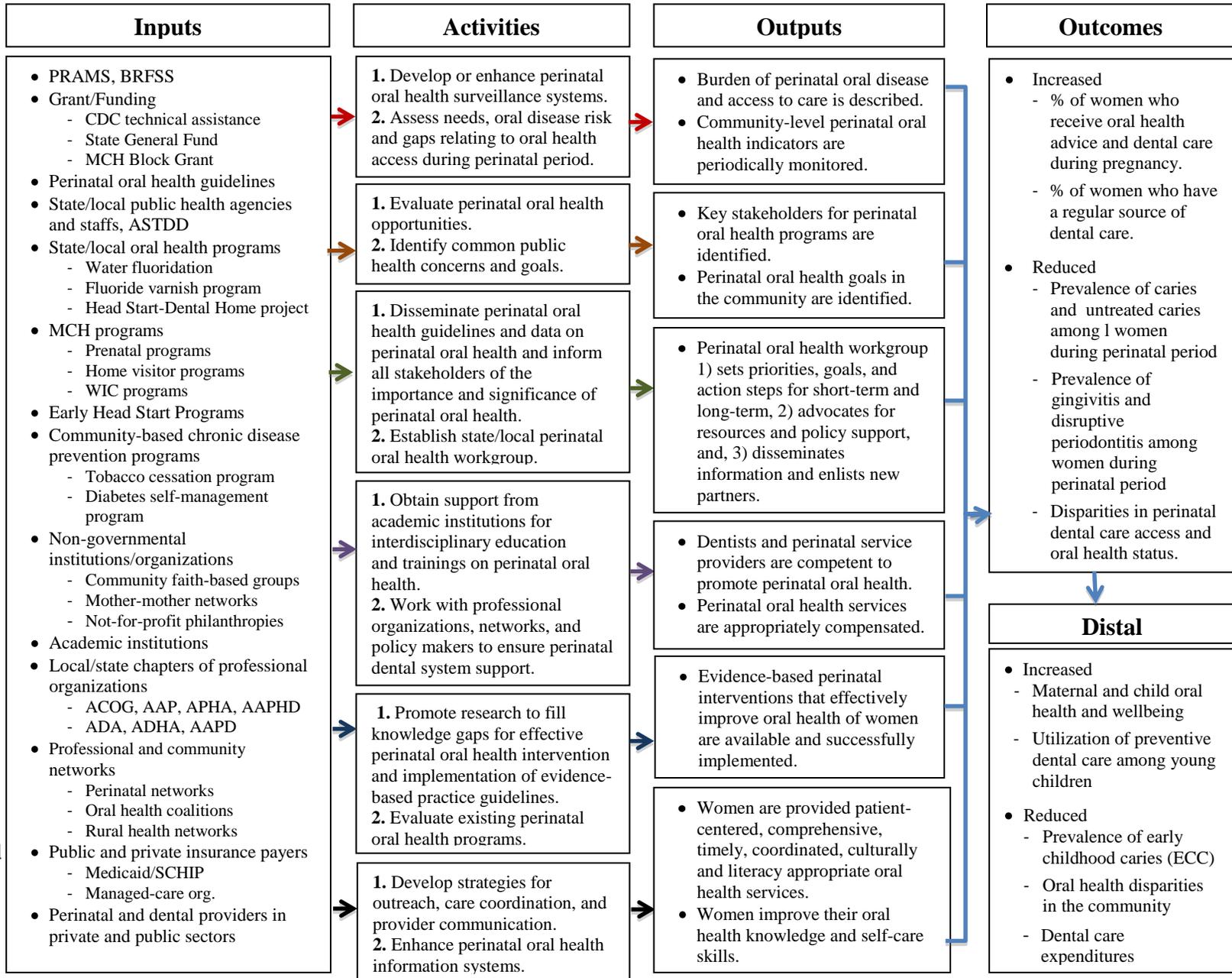
Enhance Infrastructure & Build Partnerships

Inform, Empower Public & Mobilize Support

Ensure Workforce & Systems

Utilize Data/ Research

Integrate Oral Health Program into Patient-Centered Medical Home



VIII. References

1. Ventura SJ, Abma JC, Mosher WD, Henshaw SK. Estimated pregnancy rates by outcome for the United States, 1990-2004. National Vital Statistics Reports; vol. 56, no. 15. Hyattsville, MD: National Center for Health Statistics. 2008.
2. Martin JA, Osterman MJK, Sutton PD. Are preterm births on the decline in the United States? Recent data from the National Vital Statistics System. NCHS data brief, no 39. Hyattsville, MD: National Center for Health Statistics. 2010.
3. Gajendra S, Kumar JV. Oral health and pregnancy: A review. N Y State Dent J. 2004; 70(1):40-4.
4. New York State Department of Health. Oral Health Care During Pregnancy and Early Childhood. Practice Guidelines. NYSDOH 2006. Albany, NY.
5. CDA Foundation. Oral Health During Pregnancy and Early Childhood: Evidence-Based Guidelines for Health Professionals. 2010. Sacramento, CA.
6. Offenbacher S, Boggess KA, Murtha AP, Jared HL, Lieff S, McKaig RG et al. Progressive periodontal disease and risk of very preterm delivery. Obstet Gynecol. 2006;107(1):29-36.
7. Iida H, Kumar JV, Kopycka-Kedzierawski DT, Billings RJ. Effect of tobacco smoke on the oral health of U.S. women of childbearing age. J Public Health Dent. 2009; 69(4):231-41.
8. U.S. Department of Health and Human Services. 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.
9. Offenbacher S, Katz V, Fertik G, Collins J, Boyd D, Maynor G et al. Periodontal infection as a possible risk factor for preterm low birth weight. J Periodontol. 1996;67:1103-13.
10. Han YW. Oral health and adverse pregnancy outcomes- What's next? J Dent Res. 2011; 90(3):289-93.
11. Bobetsis YA, Barros SP, Offenbacher S. Exploring the relationship between periodontal disease and pregnancy complications. J Am Dent Assoc. 2006;137(suppl):7S-13S.
12. Srinivas SK, Sammel MD. Periodontal disease and adverse pregnancy outcomes: is there an association? AJOBG.
13. Albert DA, Begg MD, Andrews HF, Williams SZ, Ward A, Conicella ML et al. An examination of periodontal treatment, dental care, and pregnancy outcomes in an insured population in the United States. Am J Public Health. 2011; 101(1):151-6.
14. Han YW, Fardini Y, Chen C, Iacampo KJ, Peraino VA, Shamonki JM et al. Term stillbirth caused by oral *Fusobacterium nucleatum*. Obstet Gynecol. 2010; 115(2 Pt2):442-5.
15. Michalowics BS, Hodges JS, Novak MJ, Buchanan W, DiAngelis AJ, Papapanou PN et al. Changes in periodontitis during pregnancy and the risk of pre-term birth and low birthweight. J Clin Periodontol. 2009; 36(4):308-14.
16. Offenbacher S, Beck JD, Jared HL, Mauriello SM, Mendoza LC, Couper DJ et al. Effects of periodontal therapy on rate of preterm delivery: a randomized controlled trial. Obstet Gynecol. 2009; 114(3):551-9.
17. Macones GA, Parry S, Nelson DB, Strauss JF, Ludmir J, Cohen AW et al. Treatment of localized periodontal disease in pregnancy does not reduce the occurrence of preterm birth: results from the Periodontal Infections and Prematurity Study (PIPS). Am J Obstet Gynecol. 2010; 202(2):147.e1-8.

18. Jeffcoat M, Parry S, Sammel M, Clothier B, Catlin A, Macones G. Periodontal infection and preterm birth: successful periodontal therapy reduces the risk of preterm birth. *BJOG*. 2011; 118(2):250-6.
19. Xiong X, Buekens P, Goldenberg RL, Offenbacher S, Qian X. Optimal timing of periodontal disease treatment for prevention of adverse pregnancy outcomes: before or during pregnancy? *Am J Obstet Gynecol*. 2011; Mar 16 epub ahead of print.
20. Polyzos NP, Polyzos IP, Zavos A, Valachis A, Mauri D, Papanikolaou EG et al. Obstetric outcomes after treatment of periodontal disease during pregnancy: systematic review and meta-analysis. *BMJ*. 2010; 341:c7017.
21. American Academy of Pediatric Dentistry. *The Pediatric Dentistry Handbook*. 2nd edition. Chicago, IL.
22. Seow WK, Humphrys C, Tudehope DI. Increased prevalence of developmental dental defects in low-birth-weight children: A controlled study. *Pediatr Dent*. 1987; 9:221-5.
23. Lai PY, Seow WK, Tudehope DI, Rogers Y. Enamel hypoplasia and dental caries in very-low birthweight children: a case-controlled longitudinal study. *Pediatr Dent*. 1997; 19:42-9.
24. Pascoe L, Seow WK. Enamel hypoplasia and dental caries in Australian Aboriginal children: prevalence and correlation between the two diseases. *Pediatr Dent*. 1994; 16(3):193-9.
25. Berkowitz RJ. Causes, treatment and prevention of early childhood caries: a microbiologic perspective. *J Can Dent Assoc*. 2003; 69(5):304-7.
26. Li Y, Caufield PW. The fidelity of initial acquisition of mutans streptococci by infants from their mothers. *J Dent Res*. 1995; 74(2):681-5.
27. Weintraub JA, Prakash P, Shain SG, Laccabue M, Gansky SA. Mothers' caries increases odds of children's caries. *J Dent Res*. 2010; 89(9):954-58.
28. Dye BA, Vargas CM, Lee JJ, Magder L, Tinanoff N. Assessing the relationship between children's oral health status and that of their mothers. *J Am Dent Assoc*. 2011; 142:173-83.
29. Huebner CE, Riedy CA. Behavioral determinants of brushing young children's teeth: implications for anticipatory guidance. *Pediatr Dent*. 2010; 32(1):48-55.
30. Finlayson TL, Siefert K, Ismail AL, Sohn W. Maternal self-efficacy and 1-5-year-old children's brushing habits. *Community Dent Oral Epidemiol*. 2007; 35:272-81.
31. Casamassimo PS, Thikkurissy S, Edelstein BL, Maiorini E. Beyond the dmft: The human and economic cost of early childhood caries. *JADA*. 2009; 140(6):650-7.
32. Michalowicz BS, DiAngelis AJ, Novak MJ, Buchanan W, Papapanou PN, Mitchell DA et al. Examining the safety of dental treatment in pregnant women. *J Am Dent Assoc*. 2008; 139:685-95.
33. Boggess KA. Treatment of localized periodontal disease in pregnancy does not reduce the occurrence of preterm birth: results from the Periodontal Infections and Prematurity Study (PIPS). *Am J Obstet Gynecol*. 2010; 202(2):101-2.
34. Bhanji S, Williams B, Sheller B, Elwood T, Mancl L. Transient bacteremia induced by toothbrushing: a comparison of the Sonicare toothbrush with a conventional toothbrush. *Pediatr Dent*. 2002; 24(4):295-9.
35. Li X, Kolltveit KM, Tronstad L, Olsen I. Systemic diseases caused by oral infection. *Clin Microbiol Rev*. 2000; 13(4):547-58.
36. Iida H, Kumar JV, Radigan AM. Oral health During Perinatal Period in New York State: Evaluation of 2005 Pregnancy Risk Assessment Monitoring System Data. *N Y State Dent J*. 2009; 75(6):43-7.
37. Hwang SS, Smith VC, McCormick MC, Barfield WD. Racial/Ethnic disparities in maternal oral health experiences in 10 states, pregnancy risk assessment monitoring system, 2004-2006. *Matern Child Health J*. 2011;15(6):722-9.

38. Collins JL, Lin M, Mosley MJ, Garikapaty V. Missouri Pregnancy Risk Assessment Monitoring System (PRAMS) 2007-2008 Data Report. Jefferson City, MO: Missouri Department of Health and Senior Services, Division of Community and Public Health, Section of epidemiology for Public Health Practice, November 2010. Available at http://www.health.mo.gov/data/prams/pdf/prams_report.pdf
39. Family Health Service Division, Hawaii State Department of Health. Hawai'i Pregnancy Risk Assessment Monitoring System (PRAMS) Trend Report 2000-2008. August 2008. Available at <http://hawaii.gov/health/doc/pramstrendreport2010.pdf>
40. Centers for Disease Control and Prevention. Perceived Health Needs and Receipt of Services During Pregnancy—Oklahoma and South Carolina, 2004-2007. MMWR. 2010; 59(23):710-4. Available at <http://www.cdc.gov/mmwr/pdf/wk/mm5923.pdf>
41. Junhie Oh, Leonard L, Fuller D, Miller K. Less than optimal oral health care during pregnancy in Rhode Island women: Oral health care as a part of prenatal care. Health By Numbers. 2011; 94(5):141-3. Available at <http://www.rimed.org/medhealthri/2011-05/2011-05-141.pdf>
42. Ranji U, Salganicoff A, Stewart AM, Cox M, Doamekpor L. State Medicaid Coverage of Perinatal Services: Summary of State Survey Findings. The Henry J. Kaiser Family Foundation. Menlo Park, CA. November 2009. Available at <http://www.kff.org/womenshealth/upload/8014.pdf>
43. American Dental Association. Medicaid Compendium Update. Available at <http://www.ada.org/2123.aspx>
44. Centers for Medicare & Medicaid Services. National Health Expenditure 2009 Highlight. Available at <https://www.cms.gov/NationalHealthExpendData/downloads/highlights.pdf>
45. Buerlein J, Peabody H, Santoro K. Improving Access to Perinatal Oral Health Care: Strategies & Considerations for Health Plans. Children's Dental Health Project (CDHP) and National Institute of Health Care Management (NIHCM). July 2010. Available at <http://nihcm.org/pdf/NIHCM-OralHealth-Final.pdf>
46. IOM (Institute of Medicine). 2011. Advancing Oral Health in America. Washington, DC: The National Academies Press.
47. IOM (Institute of Medicine). 2009. The U.S. oral health workforce in the coming decade: Workshop summary. Washington, DC: The National Academies Press.
48. United State General Accounting Office. Factors contributing to low use of dental services by low-income populations. GAO/HEHS-00-149. September 2000. Available at <http://www.gao.gov/new.items/he00149.pdf>
49. Strafford KE, Shellhaas C, Hade EM. Provider and patient perceptions about dental care during pregnancy. J Matern Fetal Neonatal Med. 2008;21:63-71
50. Huebner CE, Milgrom P, Conrad D, Lee RS. Providing dental care to pregnant patients: a survey of Oregon general dentists. J Am Dent Assoc. 2009;140:211-22
51. Da Costa EP, Lee JY, Rozier RG, Zeldin L. Dental care for pregnant women: an assessment of North Carolina general dentists. J Am Dent Assoc. 2010;141:1307-16
52. Mertz E, Mouradian W. Addressing children's oral health in the new millennium: Trends in the dental workforce. Acad Pediatr. 2009; 9:433-9.
53. National Network for Oral Health Access (NNOHA). Mitsuko Ikeda (mitsuko@nnoha.org) , email, July 6, 2012.
54. IOM (Institute of Medicine) and NRC (National Research Council). 2011. Improving access to oral health care for vulnerable and underserved populations. Washington, DC: The National Academies Press.
55. Kaakko T, Skaret E, Hujoel P, Grembowski D, Moore CS, Milgrom P. An ABCD program to increase access to dental care for children enrolled in Medicaid in a rural county. J Public Health Dent. 2002;62:45-50

56. Greenberg BJ, Kumar JV, Stevenson H. Dental care management: increasing access to oral health care for families and children with low income. *J Am Dent Assoc.* 2008; 139:1114-21.
57. Binkley CJ, Garrett B, Johnson KW. Increasing dental care utilization by Medicaid-eligible children: a dental care coordinator intervention. *J Public Health Dent.* 2010; 70:76-84.
58. Pahel BT, Rozier RG, Stearns SC, Quinonez RB. Effectiveness of preventive dental treatments by physicians for young Medicaid enrollees. *Pediatrics.* 2011;127:e682-9
59. IOM (Institute of Medicine). Improving Access to Oral Health Care for Vulnerable and Underserved Populations. Report Brief. July 2011. Available at <http://iom.edu/~media/Files/Report%20Files/2011/Improving-Access-to-Oral-Health-Care-for-Vulnerable-and-Underserved-Populations/oralhealthaccess2011reportbrief.pdf>
60. U.S. Department of Health and Human Services. 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.
61. Committee on Oral Health Initiative; Institute of Medicine. Advancing Oral Health in America. Report Brief. April 2011. Available at <http://www.iom.edu/~media/Files/Report%20Files/2011/Advancing-Oral-Health-in-America/Advancing%20Oral%20Health%202011%20Report%20Brief.pdf>
62. D'Angelo D, Williams L, Morrow B, Cox S, Harris N, Harrison L et al.; Center for Disease Control and Prevention (CDC). Preconception and interconception health status of women who recently gave birth to a live-born infant—Pregnancy Risk Assessment Monitoring System (PRAMS), United States, 26 reporting areas, 2004. *MMWR Surveill Summ.* 2007; 56(10):1-35.
63. Hujoel PP, Drangsholt M, Spiekerman C, DeRouen TA. Periodontitis-systemic disease associations in the presence of smoking—causal or coincidental? *Periodontol 2000.* 2002; 30:51-60.
64. Xiong X, Buekens P, Fraser WD, Beck J, Offenbacher S. Periodontal disease and adverse pregnancy outcomes: a systematic review. *BJOG.* 2006;113:135-43
65. Center for Disease Control and Prevention. National Public Health Performance Standards Program (NPHPSP). 10 Essential Public Health Services. Available at <http://www.cdc.gov/nphpsp/essentialservices.html>
66. American Association for Community Dental Programs. A model framework for community oral health programs based upon the ten essential public health services. Available at <http://www.aacdp.com/docs/Framework.pdf>
67. The Association of State and Territorial Dental Directors (ASTDD). Guidelines for State and Territorial Oral Health Programs. Available at <http://www.astdd.org/state-guidelines>
68. U.S. Department of Health and Human Services Health Resources and Services Administration Maternal and Child Health Bureau. Rethinking MCH: The Life Course Model as an Organizing Framework. Concept Paper. November, 2010. Available at <http://www.hrsa.gov/ourstories/mchb75th/images/rethinkingmch.pdf>
69. Patient-Centered Primary Care Collaborative. Joint Principles of the Patient Centered Medical Home. February 2007. Available at <http://www.pcpcc.net/content/joint-principles-patient-centered-medical-home>
70. Roudebush JR, Kaufman J, Johnson BH, Abraham MR, Clayton SP. Patient- and family-centered perinatal care: partnerships with childbearing women and families. *J Perinat Neonatal Nurs.* 2006; 20:201-9.
71. Uppal A, Uppal S, Pinto A, Dutta M, Shrivatsa S, Dandolu V et al. The effectiveness of periodontal disease treatment during pregnancy in reducing the risk of

- experiencing preterm birth and low birth weight: a meta-analysis. *J Am Dent Assoc.* 2010; 141(12):1423-34.
72. Jeffcoat M, Parry S, Gerlach RW, Doyle MJ. Use of alcohol-free antimicrobial mouthrinse is associated with decreased incidence of preterm birth in a high risk population.
 73. Chambrone L, Pannuti CM, Guglielmetti MR, Chambrone LA. Evidence grade associating periodontitis with preterm birth and/or low birth weight: II. A systematic review of randomized trials evaluating the effects of periodontal treatment. *J Clin Periodontol.* 2011; 38:902-14.
 74. Oral Health Care During Pregnancy Expert Workgroup. 2012. *Oral Health Care During Pregnancy: A National Consensus Statement-Summary of an Expert Workgroup Meeting.* Washington, DC: National Maternal and Child Oral Health Resource Center.