**IMPROVING ACCESS TO ORAL HEALTH CARE FOR PREGNANT WOMEN IN PENNSYLVANIA: STRATEGIES AND RECOMMENDATIONS**

by

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**ABSTRACT**

Optimal oral health care is an integral part of a healthy pregnancy and positive overall health outcomes. Studies on the impact of bad oral health show an association with cardiovascular, respiratory, and other complications. In Pennsylvania, access to oral health care for pregnant women is considered a significant public health challenge. The lack of state guidelines, lack of adequate perinatal oral health care coordination, and insufficient oral health education and dental provider preparedness impact the health of many women in Pennsylvania.

The Pennsylvania Oral Health Initiatives Project, a pilot database, is the result of a collaboration with the Pennsylvania Coalition for Oral Health (PCOH) aiming to identify oral health initiatives in the state and to increase awareness of important stakeholders’ characteristics for the development of future improvement endeavors. Findings indicate a shortage of oral health care resources for pregnant women and highlight the need for more comprehensive management of perinatal health care. In this essay, strategies and recommendations to develop state guidelines, increase partnerships, and integrate oral health needs assessments into the public health system are offered for the improvement of the state’s perinatal oral health care.

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preface

Thank you to Dr. Deborah Polk and to the Pennsylvania Coalition for Oral Health for giving me the opportunity to work on this project, and for providing crucial data for the development of the Pennsylvania Oral Health Initiatives Project.

# Introduction

Tooth decay is a serious health problem worldwide and in the United States (US). Among children aged 2-11 years old, it is the most common preventable infectious disease. (Benjamin, 2010). Maintaining good oral health at all stages of life is central to one’s overall health. Unfortunately, its importance is usually overlooked during critical phases, such as pregnancy. Good oral health during pregnancy is associated with positive health and birth outcomes. Oral health care during this critical period is an essential aspect of perinatal care. However, data suggest that most pregnant women in the US do not visit the dentist as regularly as needed and are less likely to receive necessary dental treatment compared to non-pregnant women (Jiang et al., 2008). A pregnant woman’s decision to seek dental care is influenced by many factors. Socio-economic disparities and barriers in the health care system impact access and utilization of these services. In the state of Pennsylvania, poor care coordination, educational shortcomings among health providers, lack of public awareness, and the absence of perinatal oral health care state guidelines impact a pregnant woman’s ability to receive optimal perinatal health care.

In 2016, a pilot database resource called The Pennsylvania Oral Health Initiatives Project was created in collaboration with The Pennsylvania Coalition for Oral Health (PCOH) with the purpose of increasing awareness of existing oral health initiatives and identifying their characteristics. A questionnaire was distributed to service provider and health coalition organizations working to improve oral health in the state. PCOH is an advocacy organization working to improve access to oral health services for underserved communities in the state. This database project was designed to aid PCOH in the planning and development of future endeavors. Analysis of the data collected provided insights into important characteristics of constituents of the state’s oral health care system. Results also served to highlight the existence of service shortages for the most vulnerable populations, particularly pregnant women. System recommendations and strategies for improvement of perinatal oral health care in Pennsylvania were developed based on analysis of preliminary findings.

Those who developed the Pennsylvania Oral Health Initiatives Project see it as the first step towards the creation of a more comprehensive referral source for perinatal oral health care. They also aim to increase awareness of the lack of resources allocated to the oral health of pregnant women in the state, improve communication and partnership among key stakeholders, and serve as source of evidence for improvement of Pennsylvania’s oral health care system.

This paper provides a foundation for the creation of future interventions aimed at improving access to oral health care for pregnant women. It provides background information on the importance of oral health care during pregnancy and on the existing barriers to oral health care access for this group, mainly in Pennsylvania. It also outlines the database creation process and summarizes the information collected. This paper examines these findings to provide recommendation and strategies for improving access to perinatal oral health care. These findings are to be considered in the development of future oral health endeavors addressing challenges in improving the oral health of target populations.

# background

## IMPORTANCE OF ORAL HEALTH CARE DURING PREGNANCY

The integration of oral health care into perinatal care is essential for the health outcomes of pregnant women and their children. A person’s oral health provides a window into their overall health. Many diseases, unhealthy behaviors, and physiological changes display the first physical manifestations in the oral cavity (Islam et al., 2011). Pregnancy is a critical time for women and is characterized by many bodily changes that consequently affect and are affected by oral health. The physiological changes that come with pregnancy alter behavior, eating patterns, and ultimately may increase the risk and susceptibility for oral health infections (Kumar, 2006). A disease known as “pregnant gingivitis” is estimated to affect more than 30 percent of pregnant women in the United States (Brown, 2008). This disease is a mild inflammation of the gums and if left untreated, can grow in severity and have serious health consequences, such as permanent damage of the gum, jaw bones, and teeth. During pregnancy, oral hygiene practices and diets may also change. Nausea and vomiting are common behaviors during pregnancy, which can create an acidic environment in the mouth and ultimately lead to tooth erosions (Kumar, 2006).

Good oral health and optimal birth outcomes have shown to be positively correlated. In 1996, the first study on the association between maternal periodontal disease and preterm birth was published (Offenbacher et al., 1996). Various epidemiological and biological studies have followed since that further strengthen the evidence for this relationship (Walia & Saini, 2015). While many have succeeded in demonstrating a strong association between periodontal disease and negative birth outcomes, no causation has been successfully proven. Regardless of all the conflicting results, researchers undeniably agree that having good oral health while pregnant is beneficial for the health of the mother and the overall health of the child.

Good oral health during pregnancy plays an important role in reducing the baby’s probabilities of developing dental problems during childhood. A person’s saliva contains millions of bacteria that cause dental cavities. *Streptococcus mutans* is a bacterium found in saliva that is mainly responsible for the formation of dental cavities. Dental cavities are caused by the demineralization of the surface of the tooth. Dental cavities, or caries, at the early stages are usually asymptomatic, as the lesion has not yet reached the tooth’s pulp, which contains the nerves. If untreated, this bacterium can destroy all surfaces of the tooth and lead to discomfort in the form of pain, infection, and even loss of function (Loesche, 1996). The first vehicle of cavity-inducing bacterial transmission occurs from mother to child. Close proximity between mother and child results in the vertical transmission of *Streptococcus mutans*. This early transmission of bacteria may increase the child’s risk of suffering from tooth decay (Brown, 2008). Thus, the healthier the mouth of the mother, the healthier the mouth of the child, and the longer it would take for the child to acquire cavity-inducing bacteria.

While mothers may be the main source of bacterial transmission to children, vertical transmission is not considered to be the most important contributor to the development of oral cavities among children. Behavioral factors, such as the amount of sugar consumed and oral hygiene, play a critical role in oral health status of children (Van Loveren & Duggal, 2001). Pregnancy presents a unique opportunity for education in oral hygiene and healthy behaviors. This critical period of time in a woman’s life can be considered a teachable moment and suitable chance for health promotion. Evidence shows that oral health counseling during pregnancy is associated with improved oral hygiene during pregnancy (Thompson, Cheng, & Strobino, 2013). The involvement of a third party (the baby) in the mother’s decision-making process creates a window of opportunity for influencing behavior. During pregnancy, women are more receptive to learning about behaviors and practices that can have a positive impact on the pregnancy and the baby (Wilkinson and McIntyre, 2012). Health interventions targeting women have a greater impact during pregnancy than at any other stage of a woman’s life (The American Academy of Pediatric Dentistry, 2011).

## IMPACT OF poor ORAL HEALTH DURING PREGNANCY

Lack of access to oral health care leads to health disparities among the most vulnerable populations. Women are considered a vulnerable population as they require great attention and care (Shivayogi, 2013). According to the Centers for Disease Control and Prevention (CDC), it is estimated that one in every two Americans over the age of 30 suffered from periodontal disease to some degree (Eke, 2012). Periodontal disease is a serious infection of the gums that may affect all surrounding tissues and ultimately tooth support. In addition, numerous studies have shown a connection between oral and systemic diseases, such as diabetes, cardiovascular disease, and respiratory complications (CDA Foundation, 2010). By improving access and utilization of oral health care for pregnant women, it is possible to reduce negative health outcomes among women and children. Improved oral health among these two groups of the population may aid in reducing the prevalence of childhood caries and the risks of acquiring systemic complications.

### Oral-Systemic Health Implications

Bad oral health and oral diseases can cause overall health problems. The American Academy for Oral Systemic Health terms the connection between oral health and overall health as oral systemic health (The American Academy for Oral Systemic Health, n.d.). Oral systemic health diseases affect the entire body and are detrimental to the quality of life. Several studies have shown that bad oral health and hygiene are strongly associated with respiratory and cardiovascular conditions (CDA Foundation, 2010). Evidence also exists of a possible link between oral health problems and diabetes (Mealey, 2006). Bad oral health may also have an impact on a person’s everyday abilities. Teeth play an important role in nutrition, speech, and communication. Dental diseases and poor appearance of teeth may impair social interaction and affect one’s self-esteem and ability to communicate. The pain caused by a toothache and lack of tooth support may also impede the ability to eat a balanced diet and may lead to insufficient nutritional intakes (Moynihan & Petersen, 2004).

In the US, one in five women does not visit the dentist 12 months before she becomes pregnant and even fewer women visit the dentist during pregnancy (Brown, 2008). This delayed access to preventative oral care increases a woman’s risk of suffering from oral systemic consequences.

### Childhood Caries Implications

Children’s health is influenced by many biological, behavioral, and environmental factors. A mother’s health and behaviors greatly impacts a child’s health and risk for disease. Oral health interventions targeting women during their pregnancy promote healthy behaviors and a solid foundation for infants. Perinatal oral care is a preventative measure to childhood caries, which is the most preventable, infectious and transmissible disease among children in the United States (Benjamin, 2010).Efforts to improve access to perinatal oral health care play an important role in reducing the prevalence of childhood caries, improving oral hygiene among families, and changing women’s attitudes towards oral health care (Kumar, 2006).

## Barriers to Good Oral Health for pregnant women

A number of social, cultural, economic, geographic, and system barriers limit pregnant women’s access to oral health care. Utilization of dental care differs across races, income statues, and educational achievements. Data from 2004-2006 collected through the Pregnancy Risk Assessment and Monitoring System (PRAMS) provide evidence of existing racial disparities in oral health among pregnant women. According to PRAMS data women who identified themselves as Hispanic or African American were less likely to receive perinatal dental care than women who identified themselves as white (Hwang et al., 2011). African American women were also at the greatest risk of having dental problems during pregnancy. Less than 50% of women, regardless of race, reported receiving any type of oral health education or counseling during pregnancy (Hwang et al., 2011).

 Socioeconomic status is another important predictor of poor oral health at any stage of life. Dental care is one of the most expensive health care services in the United States (Nasseh et al., 2015). The cost presents a barrier to care for low-income and uninsured people. According to the American Dental Association’s Health Policy Institute’s Report of Oral Health, approximately 95% of adults value good oral health, but only a small portion of them ultimately receive dental treatment. Sixty percent of adults cite cost as the main reason for not visiting the dentist more frequently (ADA Health Policy Institute, 2016). Pregnant women with low socioeconomic status are especially at a higher risk for oral health problems (Hwang et al., 2011). Data from a population-based study on postpartum women in California from 2002- 2007 revealed financial barriers to be one of the main reasons for women not receiving dental care during pregnancy. Women who had low educational attainment, low socioeconomic status, and were unmarried reported higher rates of financial barriers. According to this study, Medicaid insurance did not guarantee women access to dental care services (Marchi et al., 2010).

Psychological factors may also act as barriers to accessing dental care. Dental anxiety or fear makes it difficult for people to seek dental care. Anxious patients are more likely to cancel appointments and usually have poorer oral health in comparison to patients who are not anxious (Esa et al., 2010). Additionally, finding a provider who is part of the insurance network and/or finding a provider who is willing to treat low-income pregnant women can also be a problem for patients. Providers may be reluctant to work with this population due to fear of lawsuits that could result from perceived consequences of dental radiography and treatment. According to the Dentists Insurance Company (TDIC) there has been only one reported lawsuit in the past 20 years and lack of scientific evidence in this case did not allow for causation to be determined (CDA Foundation, 2010). Another problem may be the lack provider diversity. The low number of providers competent enough to relate to, communicate with, and make an impact on women from multiple cultural backgrounds can affect a woman’s decision to seek health information and treatment.

The separation of oral health from the rest of the health care system also contributes to access challenges to perinatal oral health care. This separation results in limited training for primary health care providers on the importance of perinatal dental care. According to a 2009 study on the perception of dental care during pregnancy, 80% of obstetricians did not use oral health screening questions during prenatal visits and 94% of them did not refer patients to dental providers (Strafford, Shellhass & Hade, 2008). A similar study found that although more than 95% of gynecologists were aware of the importance of oral health care during pregnancy, only 85% of them recommended that women visit their dental providers. The majority of gynecologists had a mistaken belief about the safety of dental radiography and local anesthesia during pregnancy (Hashim and Akbar, 2014). Another study found that only half of obstetrician-gynecologists asked about oral health issues, while 70% of them did not provide any information on perinatal oral health (Morgan et al., 2009). Strong provider education on the importance of perinatal dental care for medical practitioners, as well as for those entering the dental health field, increases the likelihood of pregnant women receiving adequate comprehensive health care services. Prenatal care providers are crucial in educating pregnant women about healthy behavior, oral hygiene, and the safety of dental care treatment during pregnancy. Perinatal counseling has already shown to be highly correlated with improved oral hygiene during pregnancy. Poor perinatal care coordination and management can greatly impact a pregnant woman’s access to oral health care (CDA Foundation, 2010).

## Existing GUIDELINES, policy statements and Evidence-based interventions

A number of guidelines, policy statements, and recommendations have been introduced nationally to address dental treatment during pregnancy (Table 1). National health organizations, such as the American Dental Association (ADA), The American Congress of Obstetricians and Gynecologists (ACOG), and the American Academy of Pediatric Dentistry (AAPD), have created a clear definition of the oral health standard of care for pregnant women. Similarly, health organizations in four states, California, Massachusetts, Michigan, and New York, have provided clinical guidelines to address their specific challenges, opportunities, and resources (Table 2). These guidelines and policy statements target health providers, health advocates, and health policymakers at every level of government. While these guidelines provide some type of consensus regarding standard of oral health care for pregnant women, they do not provide equal amount of guidance for providers in disciplines other than dental care who may come in contact with pregnant women.

Table 1. National Policy Statements and Guidelines for Oral Health Care During Pregnancy

|  |
| --- |
| **American Dental Association (ADA): Pregnancy Outcome After in Utero Exposure to Local Anesthetics as Part of Dental Treatment: A Prospective Comparative Cohort Study (2015)**  |
| This study by the American Dental Association suggests that dental treatment, as well as dental local anesthetics, do not present any risk for pregnant women. The ADA notes that women should continue dental care and treatment during pregnancy. If there is a need for the use of dental radiography, proper protection of the abdomen and thyroid region should be used (American Dental Association, 2011). |
| **The American Congress of Obstetricians and Gynecologists (ACOG): *Guidelines for Perinatal Care, 7th Ed. (2012)*** |
| The American Congress of Obstetrician and Gynecologists recommends that women continue seeking preventative dental care during pregnancy. The ACOG also encourages increased communication and interaction between dental providers and obstetricians to provide the best perinatal care to women. |
| **American Academy of Pediatric Dentistry (AAPD): *Guideline on Perinatal Oral Health Care (2011*)**  |
| The American Academy of Pediatric Dentistry notes that education for all health professionals in perinatal oral health needs to be improved. The AAPD also suggests that to serve pregnant women better and in a more comprehensive way, it is important to have a strong counseling and referral system. The AAPD also encourages policymakers, legislators and other stakeholders to get involved in improving access to perinatal oral health care.  |
| **American Academy of Pediatric Dentistry (AAPD): *Guideline on Perinatal and Infant Oral Health Care***  |
| The American Academy of Pediatric Dentistry suggests that caries-risk assessments should be used by health care professionals to provide appropriate perinatal dental management. The AAPD also recommends counseling for parents on the topics of nutrition, hygiene, and dental care management. |
| **American Academy of Pediatric Dentistry (AAPD): *Guideline on Oral Health Care for the Pregnant Adolescent***  |
| The American Academy of Pediatric Dentistry highlights the need of counseling for this specific population of pregnant adolescents. It recommends the use of a comprehensive evaluation, which should include dietary history. Preventative services and oral hygiene education are to be prioritized for these adolescents.  |
| **Oral Health Care During Pregnancy Workgroup: *Oral Health Care During Pregnancy: National Consensus Statement (2012)*** |
| This consensus statement is the result of expert collaboration from all areas of the health care field. It provides guidance for oral health practitioners and other prenatal care health professionals for the provision of oral health care during pregnancy.  |

Table 2. State Guidelines for Oral Health Care During Pregnancy

|  |
| --- |
| **California Dental Association Foundation: *Oral Health During Pregnancy & Early Childhood: Evidence-Based Guidelines for Health Professionals (2010)***  |
| This document by the California Dental Association (CDA) aims to assist health care professionals in delivering perinatal oral health services. It provides practice guidelines, as well as recommendations for system improvement to improve access to perinatal oral health care. This collaborative project by the CDA Foundation and the American College of Obstetricians and Gynecologist provides evidence-based literature on the issue of perinatal oral health. |
| **Massachusetts Department of Public Health: *Massachusetts Oral Health Practice Guidelines for Pregnancy and Early Childhood (2016)***  |
| This document provides information for patients and providers, as well as guidelines for prenatal and oral health providers. The Massachusetts Department of Public Health recommends the collaboration between pediatric providers and oral health providers. It notes the need for prenatal providers to use oral health assessments. |
| **Michigan Department of Health and Human Services: *During Pregnancy, the Mouth Matters: A Guide to Michigan Perinatal Oral Health (2016)***  |
| This guide was assembled with the help of the Michigan Department of Health and Human Services, health care professionals, professional associations, and advocacy and health care organizations in the state. It provides guidance for health care providers in the State of Michigan on the importance of perinatal oral health and on common oral health conditions. It also provides referral resources to facilitate access to oral health care for pregnant women. |
| **New York State Department of Health: *Oral Health Care during Pregnancy and Early Childhood Practice Guidelines (2016)***  |
| The New York State Department of Health identified provider practices and guidelines to develop recommendations to improve perinatal oral health. This document provides recommendations for prenatal care providers, oral health professionals, and child health professionals, and notes the need for a comprehensive standard of care for pregnant women. |

Health guidelines have the potential of improving the health of a population, yet translation of these recommendations into practice continues to be a challenge for many. Clinical practice guidelines are evidence-based recommendations and one of the foundations of efforts to improve health care (Woolf et al., pg. 1, 2012). There is little existing evidence about the effectiveness of efforts that are based on clinical practice guidelines for oral health care. No body of literature showing the impact of the clinical guidelines on oral health during pregnancy could be found. Nevertheless, clinical guidelines and practice standardization have been shown to be essential for increasing communication, reducing patient harm, improving quality of care, and improving health outcomes overall (American College of Obstetricians and Gynecologists, 2015).

Evidence on the impact of oral health interventions targeting pregnant women is limited as well, with only a few interventions evaluated for defined health outcomes. A 2015 systematic review on existing oral health promotion interventions during pregnancy highlights the lack of studies specifically addressing the oral health of pregnant women and the implications on the mother’s health (Vamos et al., 2015). Even fewer studies were found on interventions that effectively address perinatal oral health guidelines (Vamos et al., 2015). Review of these evidence-based interventions indicate the effectiveness of perinatal oral health interventions in increasing knowledge, changing attitude, and influencing health behavior (Vamos et al., 2015). More studies are still needed on interventions that address existing perinatal oral health guidelines.

Guidelines and policy statements are examples of collaborative work among oral health stakeholders. Given the complexity of the partnership development process, there is not enough research or findings to assert the effectiveness of partnerships in improving outcomes for participants and communities (Stuart et al., 2011). Nonetheless, collaboration and partnerships are still considered by many public health experts essential tools for improvement of health outcomes. In specific studies, public-private partnerships at the federal, state, and local levels have been effective in improving oral health literacy, increasing dental visits, supporting state oral health programs, and improving the oral health of the population (Bailey, 2014). Further research on the effectiveness of partnerships for improvement of perinatal oral health care needs to be conducted.

Oral health needs assessments (OHNA) are another important tool for improving the oral health of a community. While these interventions are usually not the result of partnerships, findings from OHNA are essential for independent and collaborative endeavors to effectively address specific oral health needs and challenges (The Association of State and Territorial Dental Directors, 2003). Approaches to assessing oral health needs, such as the Association of State and Territorial Dental Directors (ASTDD) Seven-Step Model, are available for the collection and analysis of data that are necessary for assisting specific groups in a community at risk for poor dental and overall health (The Association of State and Territorial Dental Directors, 2003). No clear body of literature showing the effectiveness of the inclusion of oral health needs assessment (OHNA) into the public health system could be found. More studies on the subject are needed.

## Perinatal oral health care in Pennsylvania

In Pennsylvania, access to oral health care is an issue for many. An inadequate supply of dental providers, a low number of providers participating in the state’s Medicaid program, and travel difficulties limit access to dental care and increase oral health disparities (Rural Assistance Center, 2014). Compared to the national average of 61 dentists per 100,000 people, Pennsylvania falls slightly behind with an average of 60.7 dentists for every 100,000 people in the population (United Health Foundation, 2016). A recent study by the RAND foundation estimated that 15 out of 67 PA counties currently face a shortage of full-time dental providers (Baird et al., 2016). Additionally, approximately 30% of Pennsylvanians live in rural areas. According to the National Rural Health Association, these areas experience greater oral health disparities in comparison to urban areas (Braswell & Johnson, 2013).

Effective January 1, 2015, the state of Pennsylvania expanded Medicaid coverage to low income adults with the goal of improving the oral health of the most vulnerable Pennsylvanians. A special group included in this expansion was pregnant women who fall under 215% of the federal poverty level (National Academy for State Health Policy, 2016). The most recent data from the Pregnancy Risk Assessment Program System indicate that in 2011, 39.6% of women in Pennsylvania did not have their teeth cleaned at least 12 months prior to pregnancy. One half of the women also indicated not receiving oral hygiene education from a dental provider during pregnancy. These women were more likely to have a low birth weight child than women who did receive oral health education during pregnancy (CDC, 2015).

At the moment, few statewide interventions exist to improve access to perinatal oral health care services in Pennsylvania. The Pennsylvania Dental Association and the Pennsylvania Head Start Association are the leading organizations working to improve oral health education and access for pregnant women (Risner-Bauman, 2016). The PA chapter of the American Academy of Pediatrics has also developed programs to train medical professionals on the importance of oral health care during pregnancy (Risner-Bauman, 2016). Public online information on these statewide initiatives is limited. Additionally, while not-for-profit organizations, health coalitions, and health departments provide referral resources for locating dental services, no resource could be found on services aimed specifically at dental services for pregnant women.

Statewide endeavors to promote healthy practices have been successfully developed as ways to improve the health of Pennsylvanians. LiveHeatlhyPA.com is a collaborative effort between Pennsylvania Department of Health staff members and other partners that provides resource information for target populations. This innovative website allows health care stakeholders to engage and share information to address health challenges in the state. Most importantly, the site’s Healthy Living Practices database provides access to information on current resources, interventions, programs, and practices that are occurring in the state and have been successful in improving health outcomes (Live Healthy PA, n.d.).

# METHODS

The Pennsylvania Coalition for Oral Health designed the Pennsylvania Oral Health Initiatives Project to increase awareness of the characteristics of constituents of Pennsylvania’s oral health system. The purpose was to identify oral health initiatives that are working to advance oral health in the state and to assess their objectives and priorities in addressing oral health challenges for their target population. The underlying assumption was that certain populations would not be reported as target populations for the majority of participating organizations. Questionnaires were used to identify oral health initiatives and to learn more about their practices and partnerships with other health coalitions and/or service providers working to improve oral health care.

Once the questionnaire was developed and approved by members of the PCOH Steering Committee, participants were selected through the use of online resources, such as search engines and health organization websites. Questionnaires were administered electronically. Participation in the questionnaire was completely voluntary. Contact with the organizations relied on the use of email and phone calls. Those who agreed to participate were provided detailed information on the purpose of the questionnaire, the questionnaire’s content, and contact information for inquiry purposes. The 15-item questionnaire contained a combination of close-ended and open-ended questions and was completed in an average 6-minute time frame. The maximum response time was 21 minutes. Participants who identified themselves as health coalitions were asked to provide only contact information, while participants who identified themselves as service providers were prompted to answer all questions (see Appendix A for questionnaire).

A total of 209 heath organizations were contacted intermittently over a period of nine months, beginning in May 2016 and ending on January 28, 2017. The organizations included but were not limited to county programs, local organization, health coalitions, Federally Qualified Health Centers, and county Head Start programs. Of the 73 surveys that were started, 70 were completed. Ultimately, a 33.5% response rate was recorded in the nine-month period.

# RESULTS

A total of 70 questionnaires were completed. Forty-five percent of participants self-identified as service providers, 17% as health coalition initiatives, and 38% as other. A total of 12 participants were health coalitions, 31 were service providers, and 26 were other initiatives. Fifty percent of the service providers offered services to the uninsured population in the state. The majority of participant organizations (61%) considered children as their main target populations, 48% targeted underserved rural populations, 46% targeted rural areas in the state, 37% targeted underserved urban populations, 33% targeted the homeless population, 28% targeted disabled or elderly, 28% targeted pregnant women, and 24% targeted health care providers.

Descriptive statistics were computed to explore the relationship between responses. Analysis was focused on initiatives targeting pregnant women. No additional analyses were conducted to determine other relationships. Cross tabulations were created to extract significant information from the database and to better understand the relationship between responses to question 4 and question 6. Question 4 asked: What is the main focus/goal/objective of this program? As expected, results from the database showed that pregnant women were less likely to be targeted by oral health initiatives. Question 6 asked: What is the program’s main population target? Analysis of the relationship between answers to questions 4 and 6 showed that only 12 out of 34 service providers (17% of total respondents) aiming to improve access to oral health care consider pregnant women part of their target population. Twenty-two participating service providers had as their main objective improving access to oral health care but did not consider pregnant women their target population.

Further analysis of the relationship between questions 4 and 6 showed that 13% of service provider participants identified educating health professionals as a main objective and identified pregnant women as part of their target population. Twenty-four percent of service provider initiatives educated health professionals as a main objective but did not identify pregnant women as a target population. When asked about other main goals, 67% of service provider participants indicated wanting to inform and educate the public, 51% to provide preventative oral health treatment, 22% to impact health policy, 27% to increase number of insured population, and 20% indicated other main objectives. The majority of service providers (86%) reported that the biggest challenge that their organization addresses is poor access to oral health care, followed by shortage of dentists accepting Medicaid (74%).

Regarding partnerships and awareness of other initiatives working to improve oral health in the state, 80% of service providers knew of organizations that provide oral health services and 53% of service provider initiatives reported knowing of health coalitions in Pennsylvania. Of the 12 health coalitions participating in the questionnaire, 10 reported the inclusion of oral health in the coalition’s mission statement. Results from question 18 (Do *you know of any organization that provides oral health services*?) showed that 82% of Federally Qualified Health Centers have at least one dental site in their scope of practice, many already participating with PCOH.

# DISCUSSION: RECOMMENDATIONS AND STRATEGIES

Findings from the Pennsylvania Oral Health Initiatives Project highlight the lack of available perinatal oral health resources in the state. The following recommendations on the state’s oral health system and on provider-patient interaction support the vision of improving the oral health of pregnant women in Pennsylvania.

**Recommendation #1: Build Partnerships and Networks for Perinatal Oral Health Care**

The Pennsylvania Oral Health Initiatives Project is brief summary of the available perinatal oral health resources in Pennsylvania. Further efforts are needed for completion of a searchable database that successfully connects oral health constituents in the state. Evaluation of existing oral health resources for pregnant women is also critical for the construction of a strong oral health care system. Similar to the New York State practice, the development of a network of organizations, programs, health coalitions, academic institutions, and health providers can help improve perinatal oral health. With an existing network of stakeholders, partnerships can be created to enhance perinatal care coordination, advance advocacy efforts, and further educate the public and the public health system on the importance of this issue. These partnerships can aid in determining how different missions recorded in the Pennsylvania Oral Health Initiatives Project should be addressed in different settings and sectors of the health care system.

 The promotion of partnerships within the dental community and with other sectors of the public may also lead to the creation of innovative resource tools for educating the public and improving care management. The creation of county or local assistance and referral centers could aid in locating providers and organizations that provide dental services to pregnant women. Similarly, a website and resources database can aid in connecting pregnant women with dental providers.

 Partnerships and coalitions are effective to provide health care in underserved

communities. Engaging organizations in rural areas that work to serve specific target populations greatly impacts the well-being of the whole population. Health care facilities, such as Federally Qualified Health Centers and rural health clinics, are present in the majority of the counties (Figure 1). As previously stated, 82% of the FQHCs in the state provide oral health services to vulnerable populations, including pregnant women. Considering the low number of service provider initiatives targeting pregnant women, FQHCs are important constituents of the oral health system and essential in the education of the public.

Figure 1. Map of Selected Rural Healthcare Facilities in Pennsylvania

**Recommendation #2: Integrate Oral Health Needs Assessments into the Public Health System**

Assessments are necessary for implementation and evaluation of any health program working to advance perinatal oral health. According to the 2010 Patient Protection and Affordable Care Act, not-for-profit hospitals are required to perform community health needs assessments (CHNA) every three years. The goal is to provide specific information on the health of the community and the opportunity to improve hospitals’ public health efforts. Community health need assessments are an important tool in determining how well the public health system is functioning and achieving their goals (Health Systems Transformation, n.d.).

Assessment of the current oral health care system is necessary to determine what works and what does not, and the existing challenges for delivery of care to vulnerable populations. While many health CHNAs include maternal health and perinatal care, few to none integrate perinatal oral health into this data collection system. It is important for health assessments conducted by local organizations to examine access to dental services, oral health practices, and oral health needs for pregnant women. Defining needs, disparities and barriers is necessary for the promotion of perinatal oral health practices. Data collected by CHNAs can also aid in the development of effective service models within communities.

**Recommendation #3: Create State Guidelines on Perinatal Oral Health**

State guidelines should promote care coordination across different health sectors, integration of the medical and dental sectors, and improved communication between perinatal health providers. Guidelines need to be developed for prenatal care professionals, oral health care professionals, and community-based programs. These should focus on education about the importance of oral health care, assistance for health providers in establishing and coordinating dental care, guidance on how to navigate the health system, and facilitation of integration of oral health. Development of these guidelines should result from assessment of science literature on the issue, identification of interventions, state policies, and input from interdisciplinary experts outside of the dental field, such as science, medical, and public health professionals. Evaluation of the effectiveness of these guidelines should follow after implementation.

**Recommendation #4: Improve Perinatal Oral Health Workforce and System**

The incorporation of oral-systemic health practices into the prenatal care setting is necessary for improving access to perinatal oral health care. The first line of care most pregnant women experience is with obstetricians, pediatricians, or primary care physicians, rather than dental care providers. Expectant mothers are more likely to inquire about and discuss health habits and behavior with medical providers. These health professionals play a central role in emphasizing the importance of healthy practices, including dental care. The knowledge, attitudes and practice of every health professional are critical in affecting the oral health care of pregnant women.

The inclusion of the oral cavity in routine examinations has been associated with increased referrals to dental providers and has the potential of improving oral health workforce capacity (Haber et al., 2015). A HEENOT model was developed as an addition to New York University’s health professional schools’ educational curriculum. This innovative model requires assessment of the head, eyes, ears, nose, oral cavity, and throat during the first visit examination. The transition from the traditional model to the HENNOT model demonstrates increased awareness of the importance of oral health. This approach serves as a model for the incorporation of oral health competencies in primary care examinations (Haber et al., 2015). The activities delineated by the Oral Health Delivery framework (Figure 2) may aid in using approaches that aim to integrate oral health into the rest of the health care system (Hummel et al., 2015). Collaboration between other organizations, such as the Pennsylvania American Dental Association and the Pennsylvania Medical Society, is essential for the improvement the standard of care for pregnant women.



Figure 2. Oral Health Delivery Framework

Source: Hummel J, Phillips KE, Holt B, Hayes C. Oral Health: An Essential Component of Primary Care. Seattle, WA: Qualis Health; June 2015

Education of health care professionals on the importance and safety of dental treatment during pregnancy is also necessary to improve access. A study on practice behavior and attitude among dental providers regarding oral health during pregnancy has shown that practicing dentists do not feel comfortable treating pregnant women (Jeelani et al., 2015). These attitudes come from fear of harming the fetus or fear of litigation from mothers after the baby is born. Preliminary data from the Pennsylvania Oral Health Initiatives Project shows that less than 50% of health organizations working to advance oral health in the state specifically provide services to pregnant women. And while many oral health initiatives in the state aim to educate health professionals, only a small proportion of them educate providers on the importance of perinatal oral health. Programs to strengthen the education of dental providers on this issue can increase confidence among the dental workforce about their ability to deliver optimal care to pregnant women and other vulnerable populations. A more educated workforce can help raise public awareness of the importance of oral health during pregnancy and reassure women on pregnancy changes and effects on oral health.

Education of officials, policymakers, and public health officials is equally important for the improvement of the oral health system. Understanding the connections within the system as well as acknowledging important stakeholders effectively impact Pennsylvania’s oral health system. Advocates for improvement of the state’s perinatal oral health system should work to preserve the existing initiatives and partnerships while also looking to advance efforts. These efforts should focus on improving access to oral health care for women during pregnancy and all stages of life.

# CONCLUSION

Maintaining good oral health is necessary for one’s overall health. Unfortunately, accessing dental care is a challenge for a large portion of Americans. Poor oral health has been linked with poor health outcomes and increased risks of systemic diseases such as cardiovascular, respiratory, and developmental problems. The risk of these negative health outcomes is further increased by disparities in access to oral health care. Identified disparities particularly impact populations with risk factors for further vulnerability, as are pregnant women. A growing body of literature has demonstrated the importance of oral health care during pregnancy. For these women, lack of access to oral health may impact the health of mother and fetus.

In Pennsylvania, access to oral health for pregnant women is an important public health challenge that needs to be addressed. As a response to this issue, the Pennsylvania Coalition for Oral Health developed a collaborative project called the Pennsylvania Oral Health Initiatives Project. This pilot project sought to create a comprehensive source of information on health initiatives looking to improve the oral health of Pennsylvania. Analysis of data collected demonstrated that a few initiatives are working to improve the oral health of pregnant women in Pennsylvania. While most participants identified their mission as educating the public and providers and improving access to oral health care, less than 30% of them identified pregnant women as part of their target population. Based on these findings, the following recommendations were provided: 1) build partnerships and networks for perinatal oral health, 2) integrate oral health risk assessment into the public health system, 3) create state guidelines on perinatal oral health, and 4) improve perinatal oral health workforce and system.

The Pennsylvania Oral Health Initiative Project aimed to collect preliminary evidence for the Pennsylvania Coalition for Oral Health. The information collected is not for publication, but rather it is to be used by the organization for planning of future endeavors. Findings relied on responses provided by initiatives’ managers and/or contacts and those responding to the questionnaire may not provide complete knowledge about the initiatives and their specific characteristics. The study’s sample size (209 participants) and response rate (33%) are not sufficiently strong to merit certain assumptions, particularly that the low number of initiatives targeting pregnant women is representative of the oral health resources available to pregnant women in the state. More comprehensive data on current oral health resources are necessary for the creation and implementation of system improvement strategies.

Pregnancy is an important moment in a woman’s life. With all the changes that come with that stage of life, oral health is often taken for granted. Many factors at all levels of the social ecological model impact access to perinatal oral health. It is necessary to identify and evaluate existing initiatives that are working to address these challenges with hopes of innovation and replication throughout the state. Appropriate further actions are needed to address the challenges that impede women from maintaining good oral health at all stages of life.

**APPENDIX:** **PENNSYLVANIA ORAL HEALTH INITIATIVES PROJECT QUESTIONNAIRE**





BIBLIOGRAPHY

American Dental Association. (2011). Oral health during pregnancy. *The Journal of the American Dental Association, 142*(5), 574. Retrieved from [http://jada.ada.org/article/S0002-8177(14)62017-1/abstract](http://jada.ada.org/article/S0002-8177%2814%2962017-1/abstract)

ADA Health Policy Institute. (2016). Oral Health and Well-Being in the United States. Retrieved from <http://www.ada.org/en/science-research/health-policy-institute/oral-health-and-well-being>.

American Academy of Pediatric Dentistry, Council on Clinical Affairs. (2011) Guideline on perinatal oral health care. Retrieved from <http://www.aapd.org/media/policies_guidelines/g_perinataloralhealthcare.pdf>

American Academy of Pediatrics, American College of Obstetricians and Gynecologists. (2012). Guidelines for perinatal care. 7th ed. *Elk Grove Village(IL): AAP*, 109-110, 160, 192-194, 248.

The American Academy of Pediatric Dentistry, Council on Clinical Affairs. (2016). Guideline on perinatal and infant oral health care.  Retrieved from <http://www.aapd.org/media/Policies_Guidelines/G_PerinatalOralHealthCare3.pdf>

The American Academy of Pediatric Dentistry, Council on Clinical Affairs, Committee on the Adolescent. (2007). Guideline on Oral Health Care for the Pregnant Adolescent. Retrieved from http://www.mychildrensteeth.org/assets/2/7/G\_Pregnancy.pdf

American College of Obstetricians and Gynecologists. (April, 2015). Clinical guidelines and standardization of practice to improve out- comes. Committee Opinion No. 629. Obstet Gynecol 2015;125:1027–9. Retrieved from http://www.acog.org/-/media/Committee-Opinions/Committee-on-Patient-Safety-and-Quality-Improvement/co629.pdf?dmc=1&ts=20170406T0322416852

Association of State and Territorial Dental Directors. (2003). Assessing Oral Health Needs: ASTDD Seven-Step Model. Retrieved from http://www.astdd.org/docs/Seven-Step-Model-Introduction.pdf

Bailey, R. W. (2014). Public-Private Partnership: Complementary Efforts to Improve Oral Health. Journal of the California Dental Association, 42(4), 249–252. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4597896/

Baird, M. D., Baird, M. K., & Vesely, J. V. (2016). Access to Dental Providers in Pennsylvania: Exploration of the County-Level Distribution of Dental Providers and Populations in 2013. Rand Health Quarterly, 6(1), 1.

Benjamin, R. M. (2010). Oral Health: The Silent Epidemic*. Public Health Reports, 125*(2), 158–159. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2821841/>

Brown A. (2008). Access to Oral Health Care During the Perinatal Period: A Policy Brief. *Washington, D.C: National Maternal and Child Oral Health Resource Center*. Retrieved from http://www.mchoral health.org/PDFs/PerinatalBrief.pdf

Braswell A, Johnson N. (February, 2013). Rural America’s oral health care needs. National Rural Health Association Policy Brief. Retrieved from 201https://www.ruralhealthweb.org/getattachment/Advocate/Policy-Documents/RuralAmericasOralHealthCareNeeds-(1).pdf.aspx?lang=en-US

CDA Foundation. (2010). Oral Health During Pregnancy and Early Childhood: Evidence-Based Guidelines for Health Professionals. Retrieved from <http://www.cdafoundation.org/Portals/0/pdfs/poh_guidelines.pdf>

Division of Reproductive Health, National Center for Chronic Disease Prevention and Health promotion. (2015). PRAMStat Data Portal. Retrieved from <https://www.cdc.gov/prams/work-directly-pramstat.html>

Eke, PI et al. (August 2012). Prevalence of Periodontitis in Adults in the United States: 2009 and 2010. J Dent Res, 1–7. Retrieved from <http://journals.sagepub.com/doi/pdf/10.1177/0022034512457373>

Esa R, Savithri V, Humphris G, Freeman R. (2010). The relationship between dental anxiety and dental decay experience in antenatal mothers. Eur J Oral Sci. 2010; 118:59–65. doi: 10.1111/j.1600-0722.2009.00701.

Haber et al. (2015). Putting the mouth back in the head: HEENT to HEENOT. *American Journal of Public Health, 105* (3), 437–441. doi: <http://dx.doi.org/10.2105/AJPH.2014.302495>

Hagai, Aharon et al. (2015). Pregnancy outcome after in utero exposure to local anesthetics as part of dental treatment. *The Journal of the American Dental Association, 146* (8), 572 – 580. doi: http://dx.doi.org/10.1016/j.adaj.2015.04.002

Hashim R & Akbar M. (2014). Gynecologists' knowledge and attitudes regarding oral health and PD leading to adverse pregnancy outcomes. *Journal of International Society of Preventive & Community Dentistry, 4* (3), S166–S172. doi: <http://dx.doi.org/10.4103/2231-0762.149028>

Health Systems Transformation. (n.d.). Association of State and Territorial Health Officials. Retrieved from <http://www.astho.org/Programs/Access/Community-Health-Needs-Assessments/>

Hummel J, Phillips KE, Holt B, Hayes C. Oral Health: An Essential Component of Primary Care. Seattle, WA: Qualis Health; June 2015

Hwang S. S., Smith V. C., McCormick M. C., Barfield, W. D. (2011). *Racial/Ethnic Disparities in Maternal Oral Health Experiences in 10 States, Pregnancy Risk Assessment Monitoring System, 2004–2006*. Maternal & Child Health Journal, 15, 722–729.

Islam, N.M. et al. (February, 2011). Common Oral Manifestations of Systemic Disease. Otolaryngology Clinics of North America, 44(1), 161-182. doi: 10.1016/j.otc.2010.09.006

Jeelani, S., Khader, K. A., Rangdhol, R. V., Dany, A., & Paulose, S. (2015). Coalition of attitude and practice behaviors among dental practitioners regarding pregnant patient’s oral health and pregnant patient’s perception toward oral health in and around Pondicherry. Journal of Pharmacy & Bioallied Sciences, 7(Suppl 2), S509–S512. doi: 10.4103/0975-7406.163520

Jiang P, Bargman E. P., Garrett N. A., Devries A, Springman S, Riggs S. (2008). A comparison of dental service use among commercially insured women in Minnesota before, during and after pregnancy. J Am Dent Assoc. Sep 139(9), 1173-80.

Kumar J & Samelson R. (2006). Oral Health Care During Pregnancy and Early Childhood: Practice Guidelines. *Albany, NY: New York State Department of Health, 2006.* Retrieved from <https://www.health.ny.gov/publications/0824.pdf>

LiveHealthyPA: About Us. (n.d.). retrieved from <http://www.livehealthypa.com/data-resources/about-us>

Loesche, WJ. (1996). Microbiology of Dental Decay and Periodontal Disease. *Medical Microbiology. 4th edition*, 99. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK8259/>

Marchi, K.S. et al. (2010). Most pregnant women in California do not receive dental care: Findings from a population-based study. *Public Health Reports, 125* (6) (2010), 831–842. doi:10.2307/41434849

Massachusetts Department of Public Health. (March 2016). Oral Health Practice Guidelines for Pregnancy and Early Childhood. Retrieved from <http://www.mass.gov/eohhs/docs/dph/com-health/data-translation/oral-health-guidelines.pdf>

Mealey BL. Periodontal disease and diabetes: A two-way street. JADA October 2006;137(Supplement 2):26S-31S. Retrieved from http://www.ada.org/~/media/ADA/Member%20Center/FIles/Perio\_diabetes.pdf?la=en

Morgan et al. (2009). Oral health during pregnancy. *The Journal of Maternal-Fetal & Neonatal Medicine, 22* (9), 733–739. doi:10.3109/14767050902926954

Moynihan, P., & Petersen, P. (2004). Diet, nutrition and the prevention of dental diseases. Public Health Nutrition,7(1a), 201-226. doi:10.1079/PHN2003589

Nasseh K, Wall T, & Vujicic M. (October 2015). Cost barriers to dental care continue to decline, particularly among young adults and the poor. *Health Policy Institute Research Brief, American Dental Association.* Retrieved from <http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_1015_2.ashx>.

National Academy for State Health Policy. (September 2016). Eligibility Levels for Coverage of Pregnant Women in Medicaid and CHIP. Retrieved from <http://www.nashp.org/wp-content/uploads/2016/09/FINAL-Eligibility-Levels-for-Coverage-of-Pregnant-Women-in-Medicaid-and-CHIP.pdf>

Offenbacher S, Katz V, Fertik G, Collins J, Boyd D, & Maynor G. (1996). Periodontal infection as a possible risk factor for preterm low birth weight. *Journal of Periodontology, 67,*1103-13. doi: 10.1902/jop.1996.67.10s.1103

Oral Health Care During Pregnancy Expert Workgroup. (2012). Oral Health Care During Pregnancy: A National Consensus Statement. Washington, DC: National Maternal and Child Oral Health Resource Center. Retrieved from https://www.mchoralhealth.org/PDFs/OralHealthPregnancyConsensus.pdf

Risner-Bauman, Alicia. (2016). Access to Care During Pregnancy: Pennsylvania’s Action for Oral Health. *Pennsylvania Dental Journal, 83* (2), 34-37.

Rural Assistance Center. (2017). Oral health in rural communities. Retrieved from https://www.raconline.org/topics/oral-health

Shivayogi, P. (2013). Vulnerable population and methods for their safeguard. Perspectives in Clinical Research, 4(1), 53–57. doi:10.4103/2229-3485.106389

State of Michigan Department of Health and Human Services. (2015). During Pregnancy, the Mouth Matters: A Guide to Michigan Perinatal Oral Health. Retrieved from <http://www.michigan.gov/documents/mdhhs/Oral_Health_Guidelines_2015_508090_7.pdf>

Strafford et al. (2008). Provider and patient perceptions about dental care during pregnancy. *Journal of Maternal and Fetal Neonatal Medicine*,21, 63–71

Stuart JB, Walker, JT, Minzner A. (December 2011). A Critical Review of Partnership Capacity and Effectiveness: Moving from Theory to Evidence. Retrieved from <http://www.abtassociates.com/AbtAssociates/files/e8/e85aabbc-7c2c-4c3d-9718-c22e4b7de189.pdf>

Thompson TA, Cheng D, Strobino D. (2013). Dental cleaning before and during pregnancy among Maryland mothers. *Maternal and Child Health Journal, 17* (1), 110–8. doi: 10.1007/s10995-012-0954-6.

United Health Foundation. (2015). America’s Health Ranking: 2015 Annual Report. Retrieved from http://www.americashealthrankings.org/explore/2015-annual-report/measure/dentists/state/PA#\_ftn5

Vamos CA, Thompson EL, Avendano M, Daley EM, Quinonez RB, Boggess K. (8 May 2015). Oral health promotion interventions during pregnancy: a systematic review. Community Dent Oral Epidemiol 2015; 43: 385–396. doi: 10.1111/cdoe.12167

Van Loveren, C. and Duggal, M. S. (2001), The role of diet in caries prevention. International Dental Journal, 51: 399–406. doi:10.1111/j.1875-595X.2001.tb00586.x

Walia, M., & Saini, N. (2015). Relationship between periodontal diseases and preterm birth: Recent epidemiological and biological data. *International Journal of Applied and Basic Medical Research, 5*(1), 2–6. doi: 10.4103/2229-516X.149217.

Wilkinson, S.A. & McIntyre, H.D. (2012). Evaluation of the 'healthy start to pregnancy' early antenatal health promotion workshop: a randomized controlled trial. *BMC Pregnancy and Childbirth 2012, 12*, 131. doi: 10.1186/1471-2393-12-131

Woolf et al.: Developing clinical practice guidelines: types of evidence and outcomes; values and economics, synthesis, grading, and presentation and deriving recommendations. Implementation Science 2012 7:61. Doi: 10.1186/1748-5908-7-61