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## Research Article

# Oral Health Outcomes for Children in Hawaii: Not Much to Smile About

### Abstract

Oral health has become a major topic of discussion in the State of Hawaii based on the unreasonably high rates of dental caries in children, which are almost twice the average rates for children living in the mainland. Lack of water fluoridation, absence of a state dental school and recent efforts to start rebuild the previously dismantled oral health branch at the Department of Health may be contributing to these poor oral health outcomes. However, there are many more known caries risk factors which may be socially, physiologically, culturally and economically driven that have yet to be documented within the State of Hawaii. While community assessments may evaluate oral health needs of the overall community, low income and vulnerable populations such as pregnant women and children deserve special attention and priority. Identification of risk factors amenable to change, such as families' oral health beliefs and behaviors should be clearly documented and considered in the process of developing future oral health initiatives as a means to improve oral health outcomes for children and families in Hawaii.

## Introduction

Oral health has become a major topic of discussion on both state and national levels. Nationally, oral health is the largest unmet health care need for children. Dental caries among children is noted to be the most common chronic childhood disease, occurring 5 to 8 times more frequently than asthma [1]. The Centers for Disease Control and Prevention (CDC) report that more than one in four (28%) preschoolers experience tooth decay [2]. This finding suggests that nationally, over 4 million children are affected by dental caries, which is an increase of over 600,000 additional preschoolers during the past decade. Oral health outcomes for this vulnerable population do, however, differ from state to state and among certain segments of the population. Hawaii stands out as one of the states that currently have some of the worst oral health outcomes for children. Children living in Hawaii have unreasonably high rates of dental caries which are almost twice the average rates of those reported for children living in the mainland [3]. The State of Hawaii for two consecutive years has received an oral health grade of "F" and has been recognized as the worst overall performer among the 50 states due to its lack of oral health preventive strategies such as school sealant programs. In addition it has the lowest rate of fluoridation of any state [4]. There are also geographic and ethnic variations in the oral health of Hawaii residents, including significantly higher rates of untreated caries among Native Hawaiian and Pacific Island children, and those children living outside of Honolulu [3].

Several state specific factors have been identified as potential contributors to this alarming rate of caries in Hawaii. One of the leading risk factors for Hawaii is its lack of water fluoridation. Despite lengthy research identifying the benefits of fluoride, including cost-effectiveness for caries prevention on a community level, the State of Hawaii continues to resist the implementation of water fluoridation. Also problematic to the State of Hawaii, which is approximately 2,500 miles from the mainland, is its lack of either a public or private

dental school. The importance of having a dental school for an island community such as Hawaii cannot be underestimated. Dental schools can assist in developing and maintaining community dental outreach programs which can provide not only much needed community education about the importance of maintaining proper oral health habits and prevention of dental disease, but also provide direct dental care particularly to those underserved areas within the state.

Finally, in the year 2009, the Oral Health Branch of the Department of Health (DOH) was dismantled due to budget constraints (Annette Mente, personal communication, August 7, 2014). Therefore, a majority of the states' oral health preventative programs developed and funded by the DOH were lost in the process. Fortunately for the children and families of Hawaii a recent state initiative was developed in 2012 focusing on rebuilding the state's oral health program. However, it is likely to take years to both further develop and implement preventive programs, and even longer to see their effects in terms of measureable outcomes (e.g., reduced childhood caries, increased access to dental services, cost effectiveness of programs, etc.).

## Oral Health Disparities

Social inequities in health and oral health continue to exist, and remain major challenges today. Low income, minority and immigrant children not only have the highest dental caries rates, but also have the lowest dental care utilization despite the availability of state funded insurance such as Medicaid [5]. In 2013, 43 % of all children in Hawaii were enrolled in Medicaid which provides both medical and dental services for children under 21 years of age. Although these children had dental coverage, only 59% of the 1 to 18 year olds in 2013 had actually seen a dentist. Medicaid enrolled children in Hawaii also continue to fall far behind on preventive measures such as sealant placement with only 11% of children 6 to 9 years old having at least one dental sealant placed on permanent molars compared to the national data of 16% [6]. When comparing dental outcomes for

children living in Hawaii based on family income, 29% of low-income children 1 to 17 years of age in 2011-2012 had a dental problem in the past 12 months compared to only 13% of higher income children, indicating further disparities in the oral health outcomes for children [7]. Important issues in Hawaii which may further prohibit oral health access for families are distance, physical geography, weather, and availability and cost of transportation. According to the cost of living index census data, in 2010 the cost of living index for Honolulu exceeded the urban US mean by over 60%, placing Honolulu as one of the most expensive locations to reside in among metropolitan areas [8]. In areas where there are high costs of living and limited resources, the priority needs for the low-income families may be focused on food, shelter and security. Therefore, the cost and time of travel for preventive oral care may outweigh the perceived value.

### Consequences of Poor Oral Health in Infants and Children

The US Surgeon General's report on oral health identified the results of numerous studies that documented the negative consequences of poor oral health on children, including impaired eating, difficulty speaking and adversely impacting the development of self-esteem and social interaction [1]. Each year, over 51 million hours are lost from school due to dental problems [4]. While dental disease is a discrete health concern, it has a much broader health impact. The consequences of negative oral health in children can reach beyond the dental area, with oral health not only known to effect children's quality of life but also their overall systemic health [1]. Poor oral health has now been linked to an increased risk for cardiovascular diseases, stroke, diabetes and other chronic conditions [9,10]. Therefore, there is reason for great concern for children living in Hawaii due to the current high caries rates and both the short and long term complications that are known to be associated with dental disease.

### Risk Factors for Caries Development

Dental caries is a multi-factorial infectious disease where there is interaction among various risk factors. The most common early childhood caries (ECC) risk factors noted in the literature include low socioeconomic status (SES), limited parental education, maternal caries, limited fluoride exposure, previous caries experience, certain dietary and feeding practices, as well as poor parental oral health beliefs and behaviors [11-13]. Several of these EEC risk factors are amenable to change, including parental dietary and parental oral health beliefs and behaviors. For example, previous oral health promotion programs focusing on reducing risk factors have been successful in changing parents' oral health beliefs and behaviors thereby ultimately improving oral health outcomes for children [14-16].

### Maternal Oral Health Factors

There is a growing body of evidence now linking maternal periodontal disease to perinatal complications (e.g., preterm birth, low birth weight infants, pre-eclampsia), as well as the subsequent development of caries in offspring. Recent studies have documented the presence of oral pathogens (e.g., *F. nucleatum*, *F. Bergeryella*, *Eikenella*, *Capnocytophaga*, etc.) in maternal placental tissue [17-20]. The exact mechanisms by which maternal oral pathogens colonize

maternal placentas is not completely understood; however, periodontal disease can result in the spread of pathogens due to inflammation and bleeding of the gingiva with subsequent hematogenous spread of the pathogen outside of the oral cavity [18-20]. Evidence of oral pathogens has been documented in the amniotic fluid of women experiencing preterm labor/birth and in placentas of women with pre-eclampsia. It has been theorized that the presence of these pathogens in placental tissue stimulates inflammatory responses that can contribute to these and other perinatal complications. Moreover, a recent study by Wang et al. detected maternal oral bacteria in the cord blood of preterm infants [21]. It remains to be determined the exact mechanism by which adverse perinatal outcomes occur in relationship to oral pathogens; however, it has been postulated that the inflammatory response to the bacteria can result in a cascade of events leading to abnormal placental or uterine functioning [19,20].

Maintaining good oral health before, during and after pregnancy is important for both mothers and their babies. Proper maternal dental care and attending to dental disease with regularly scheduled dental visits not only decreases the risk for maternal and neonatal complications during pregnancy but also can significantly decrease risk factors of bacterial transmission to their infants after they are born.

During infancy, maternal oral pathogens can be spread to infants through direct transfer of maternal saliva to the infant through a variety of ways (e.g., sharing eating utensils or toothbrushes, sharing masticated food, etc.). Although infants may not have tooth eruptions at the time of these exposures, the pathogens can still colonize the infant's oral cavity and begin to impact the developing teeth so that they are more susceptible to caries and periodontal disease [22].

Unfortunately, many women of childbearing age in Hawai'i do not receive necessary dental care to prevent or treat periodontal disease. The most recent Pregnancy Risk Assessment Monitoring System (PRAMS) survey completed in Hawaii indicates that about half (51.9%) of women who gave birth during the years 2009-2011 reported having had their teeth cleaned 12 months before they got pregnant, 34.8% reported having had their teeth cleaned during pregnancy, while one in five reporting that they needed to see a dentist for a problem while being pregnant [23]. Those mothers that did not receive proper dental care before and during pregnancy or developed dental problems during pregnancy may have been at higher risk for maternal and neonatal complications, as well as increasing their risk of transmitting harmful oral bacteria to their newborn and creating an ideal environment for early childhood caries development.

### Dietary Factors

Dietary practices in a family are known to contribute to caries development. A significant risk factor associated with the development of ECC continues to be the long-term use of bottles beyond the first 12 months of life [24]. Among younger children, habits such as increased juice consumption and snacking during play have been associated with a higher risk for ECC [25,26]. When comparing children's dietary practices to the development of caries, children ages to 2 through 5 years of age who had the best dietary practices were 44% less likely to have severe ECC compared to children with

the worst dietary practices [27].

Native Hawaiian children are known to consume a high amount of starchy foods, sweet beverages, desserts, snacks, and candy all of which individually contribute to poor dental health [28,29]. However, there is limited information about other cultural groups in Hawaii, the degree that their diverse dietary practices contributes to the high rate of childhood caries, as well how the families' current SES affects their food choices. Families in Hawaii may prefer to choose a healthier diet and, their food choices may be less likely to be culturally driven but rather associated with the affordability of the food, which is correlated to their geographical location of residence and their economic means.

### Caregivers Beliefs and Behaviors

Caregivers who are lacking proper oral health knowledge and oral health beliefs and behaviors may unknowingly encourage similar unhealthy behaviors in their children. The higher prevalence of caries among caregivers has been shown to significantly increase the risk of caries prevalence among their children [30]. A lack of maternal knowledge about children's oral health, as well as low oral health literacy of female caregivers, has also been attributed to poor oral health behaviors for their children, including night time bottle use and a reduction in the frequency of tooth brushing for their children [31,32].

Children living in Hawaii and around the world rely on their parents, caregivers and community to protect them and provide for their most basic needs, including their oral health care needs. Therefore, caregivers play a pivotal role in initiating good oral health habits early in life. Included in these habits are family health routines such as brushing, flossing, eating appropriate food that decreases the risk for development of decay, as well as taking the child to the dentist by one year of age. Despite good intentions of parents, a distinct lack of oral health education places them in positions that are poised for failure resulting in poor oral health outcomes for their children, themselves, and generations to follow. Therefore knowledge of family, cultural and community oral health beliefs and behaviors are essential first steps in the process of developing oral health strategies that will be accepted and embraced by the community thereby increasing the likelihood of positively changing oral health outcomes.

### Conclusion

Families living in Hawaii need to be recognized as a group of individuals that have unique oral health challenges including a lack of availability of dental services due to island geography, cultural acceptability, affordability and appropriateness, all of which may play a role in determining the oral health outcomes for children and families. Therefore, identifying and addressing the major contributing factors to the high rate of childhood caries in Hawaii, is complex and difficult. In this paper some of the known barriers to oral health care in Hawaii have been identified. However, there may be risk factors not yet explored, which may be contributing to the high caries rate in Hawaii including issues of parent and family oral health literacy or inaccurate oral health beliefs and poor oral health behaviors. These factors may persist to the next generation, perpetuating a cycle which results in continued poor oral health outcomes for

Hawaii's populations. Providing culturally sensitive oral health care to a diverse racial and ethnic population in the state of Hawaii will continue to be a challenge. Families may have very different culturally based oral health beliefs and behaviors, as well as perceptions about medical and dental care that interfere with their acceptance of and access to proper, routine oral health care for their children.

Despite the high rate of dental disease in children and families living in Hawaii, there is an absence of data identifying factors such as the oral health beliefs and behaviors of parents of children residing in the state. The unique factors related to cultural beliefs and behaviors may potentially be contributing to the high rate of children living in Hawaii with dental disease. Due to the many adverse consequences associated with poor oral health (e.g., cardiovascular disease, pregnancy complications, etc.) there is a need to determine factors that can assist in improving the oral health status of the people of Hawaii. Identification of risk factors that are amenable to change can then lead to successful program development on both the local and state level in an attempt to decrease the rate of childhood caries and to put back the aloha smile for so many children living in Hawaii.

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