

EARLY CHILDHOOD CARIES

Early Childhood Caries Planning
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August, 2010

TABLE OF CONTENTS

Executive Summary	3-4
Literature Review	5-10
Early Childhood Caries in Peoria County	10-15
Initiatives	15-19
Reference List	20-23
Illinois Early Childhood Oral Health Program Model	24
Oral Health Advisory Committee List	25-26

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Executive Summary

Tooth decay is the most common chronic disease of childhood; five times more frequent than asthma and seven times more frequent than hay fever. Eighty percent of untreated tooth decay is experienced by only 25% of children under the age of 19. Children from low-income, minority families experience more untreated cavities, more restricted activity days related to dental pain and are less likely to have dental exams on a routine basis than their more affluent counterparts (USDHHS, 2004). Poor children have nearly 12 times more restricted-activity days because of dental-related illness than children from higher-income families (CDC, 2002).

Early childhood caries is defined as “the presence of one or more decayed, missing (due to cavities) or filled tooth surfaces in any primary tooth in a child 71 months of age or younger (American Academy of Pediatrics, 2008). Poor oral health poses specific dangers for young children. Infants and toddlers are at an especially high risk for poor nutrition, growth delay and lack of weight gain as a result of dental disease, more specifically dental caries. (Hilton, Stephen, Barker, & Weintraub, 2007). Poor diet as well as behavioral and socio-environmental factors can often overwhelm preventative interventions, predisposing young children to dental disease.

Over the past 20 years, the prevalence of dental caries among age groups 2-11 in primary teeth increased from approximately 40% to 42%. However, children ages 2 to 5 have had the most significant increase from approximately 24% to 28% (U.S

Department of Health and Human Services, 2007). Despite improvements in oral health initiatives in the United States, children still remain a primary disparity group.

Monitoring children's oral health, taking steps to prevent disease, treating problems early, raising public awareness, and devoting sufficient resources are key to improved oral health outcomes. Oral Health has been identified as one of the top three health issues in Peoria County as a result of the ongoing MAPP process begun in 2008. With specific focus on Early Childhood Caries, the Oral Health Advisory Group has chosen the following Healthy People 2010 oral health objectives to address over the next five years:

21-1a. Reduce the proportion of children with dental caries experience in their primary teeth (baseline: 18% of children aged 2-4; target: 11%)

21.2a. Reduce the proportion of young children with untreated dental decay in their primary teeth (baseline: 16% of children aged 2-4; target: 9%).

21-12 Increase the proportion of low-income children and adolescents who received preventive dental service during the past year (baseline: 20% of children and adolescents under the age of 19 at or below 200% poverty level; target: 57%).

Literature Review

According to the Surgeon General, “oral health is essential to the general health and well-being of all Americans” (U.S Department of Health and Human Services, 2007). Poor oral health has a significant impact on the quality of life, causing pain and embarrassment, time off school and work, limiting function and is costly to treat. Poor oral health affects individuals both physically and psychologically, influencing how people grow, look, speak, chew, taste and socialize. Severe caries can impair the quality of life as a result of the complications that may arise. Quality of life issues that can be attributed to severe dental caries are pain, discomfort, disfigurement, acute and chronic infections, eating and sleep disruption. Poor oral health can result in a higher incidence and risk of hospitalizations, high treatment costs and loss of school or work days (Sheiham, 2005).

Early childhood caries (ECC) is defined as “the presence of one or more decayed, missing (due to cavities) or filled tooth surfaces in any primary tooth in a child 71 months of age or younger (American Academy of Pediatrics, 2008). ECC, identified as the most common chronic disease of childhood, is five times more frequent than asthma and seven times more frequent than hay fever, posing specific dangers for young children (USDHHS, 2007). Infants and toddlers are at an especially high risk for poor nutrition, growth delay and lack of weight gain as a result of dental disease, more specifically dental caries. Weight gain is a critical component of physical development for infants and can be hindered by poor oral hygiene habits and dental disease. A study comparing three year-old children who had dental caries as a result of poor hygiene habits after nursing and those who did not found that children with dental caries

weighed approximately 1 kg less than control children who did not have caries. The weight difference can be attributed to toothache and infection that altered eating and sleeping habits, dietary intake and metabolic processes. (Sheiham, 2005).

It is well accepted that dental caries is an infectious and transmissible disease. As with any infectious disease, three factors must be present: an infectious agent, a susceptible host and a supportive environment. Change in any one of these factors influences the occurrence of disease by increasing or decreasing the risk for disease.

The *Streptococcus mutans* bacteria is the primary causative agent for development of ECC. Primarily transmitted to the child from the mother through shared use of utensils, food and close contact, *S. mutans* can colonize in the mouths of infants even before teeth erupt and the earlier this occurs the more likely that damage to the primary teeth can develop when the oral environment is optimal (Li and Caufield, 1995). *S. mutans* produces acid and thrives in an acidic environment. Frequent intake of carbohydrate-rich or sugary food (fruit juice, formula, milk or soda) and nighttime bottle feeding are key factors affecting the acidity of the oral environment, providing susceptibility for tooth decay. The natural history of ECC is primary infection with *S. mutans* followed by accumulation of *S. mutans* to pathologic levels and finally demineralization of enamel, leading to cavity formation. Characteristically, the primary anterior teeth are affected first followed by the upper primary molar teeth. (Anderson and Shi, 2006).

Additional risk factors for developing ECC include ethnicity, minority or low socioeconomic status, poor parental or sibling oral health, poor oral hygiene and

inadequate fluoride exposure, previous decay experience, low birth weight, children with developmental disabilities and limited/no access to dental care (AAPD, 2008).

National data indicates that racial or ethnic minority children are more likely to present with dental decay than nonminority children. Mexican-American children ages 2-11 have a 16.8% increase in the incidence of dental caries when compared with their non-Hispanic counterparts (Hilton, Stephen, Barker, & Weintraub, 2007). The highest rate of ECC in the United States occurs in 2-5 year old Mexican-American children and data suggests that there is a higher proportion of Mexican-American children ages 12-23 months experiencing dental caries than any other racial or ethnic group (National Maternal and Child Oral Health Resource Center, 2004; USDHHS, Office of Minority Health, 2008). Eighteen percent of white children ages 2-5 years have had caries experience, increasing to 40% among Mexican-American children and 29% among black children. The difference in caries prevalence among racial/ethnic groups is largest among those children with 6 or more decayed surfaces (Dye, et al, 2004).

Dental caries experience exceeds 55% among children whose families are below the federal poverty level compared with 31 percent among children whose families are at 200 percent of the federal poverty level or higher. Other studies have demonstrated higher caries prevalence among children from minority and lower SES backgrounds (U.S Department of Health and Human Services, 2007). Poverty heavily affects a child's healthcare creating barriers to the child's access to care. Many of the families who are of low socioeconomic status are either uninsured or underinsured. The lack of insurance prevents children from receiving preventative dental care and increases the likelihood that the child will develop dental disease. In fact, "children and adolescents

without health insurance are four times more likely than those with private health insurance to have unmet oral health care needs.” (Carmona, 2004).

The likelihood of poorer nutrition in low income families can cause a delay in tooth eruption, affect tooth size and enamel solubility, and cause salivary gland dysfunction (Ogata, & Trahms, 2003). While the association between lower socioeconomic status and ECC is imprecise, some studies suggest that lower SES children consume more sugar sweetened foods or beverages than higher SES children (Warren, et al, 2008). Other studies suggest children with ECC have a high frequency of sugar consumption, not only from fluids given by bottle but also from sweetened solid foods, particularly consumed before naps and bedtime. These studies suggest that this dietary characteristics are likely the most significant caries risk factors in the development of ECC (Bray, et al, 2003).

Although no national studies have been conducted to determine the prevalence of oral and craniofacial diseases among the various populations with disabilities or chronic conditions, it is estimated that 12.8% of U.S. children and adolescents ages 0-17 years of age have special health care needs. (Maternal Child Health Bureau, 2005-2008). The oral health of these children may be affected negatively by medications, therapies, special diets, or by their difficulty with cleaning teeth thoroughly on a daily basis. Conditions that may lead to special health care needs include Down syndrome, cleft lip/palate and other craniofacial defects, cerebral palsy, learning and developmental disabilities, emotional disturbances, vision and hearing impairments, diabetes, asthma, genetic and hereditary disorders with orofacial defects, or HIV infection. Children and with disabilities present unique problems and are at increased

risk for oral infections, delays in tooth eruption, periodontal disease, enamel irregularities, and moderate-to-severe malocclusion. (Maternal Child Health Bureau, 2008). Some studies show that the population with mental retardation or other developmental disabilities has significantly higher rates of poor oral hygiene and needs for periodontal disease treatment than the general population, due, in part, to limitations in individual understanding of and physical ability to perform personal prevention practices or to obtain needed services. There is a wide range of caries rates among people with disabilities, but overall their rates are higher than those of people without disabilities. Providing preventative or restorative care to children with special needs presents unique challenges related to mental and physical limitations, often resulting in lack of cooperation and/or combative behavior.

Fluoride acts to slow demineralization and enhance remineralization of teeth, thus providing prevention benefit. Since the 1950s communities have sustained efforts to increase the amount of fluoride in the water supply as a proactive measure to reduce tooth decay (Milgrom et al., 2000). Topical fluoride in water and toothpaste has reduced tooth decay by 29% to 51% in children and adolescents. Fluoridated water and toothpaste are inexpensive, easily accessible and are effective ways to reduce dental caries (National Maternal & Child Oral Health Resource Center, 2004).

Fluoride varnish, applied by health professionals, has been found to be effective in preventing or reducing caries in the primary teeth of infants and children. An evidence-based research brief by the Association of State and Territorial Dental Directors (2007) stated “the ADA (2006) rates the quality of evidence for the efficacy of fluoride varnish in preventing and controlling dental caries in primary teeth of high risk

children as high and strongly recommend its use. Other evidence suggests that the preventive effect is strongest when fluoride varnish is applied before caries develop. The CDC (2001) and ADA (2006) “recommend at least biannual applications for effective control or reduction of dental caries in primary teeth for moderate to high risk children and application should begin no later than age one for the highest risk children”.

Early Childhood Caries in Peoria County

According to the United States Census Bureau (2008), the total population in Peoria County from 2006-2008 was estimated at 183,069. Of the total population, 7.1% or 13,035 are children under the age of 5. Overall, the racial composition of the county is 79.1% white, 18.1% black and 2.9% Hispanic. The state of Illinois racial composition is comparable for whites (71.4%) and Blacks (14.6%) while the Hispanic population is higher in the state (14.9%). Sixty five percent of children under the age of 6 reside within families employed in the labor force (State: 62.9%) while 17.4% of families with children less than 5 years of age live below the federal poverty level (State: 14%).

In 2008, 42.7% of the children in Peoria County were enrolled in Medicaid, an increase of 3% from 2006 enrollment figures (Illinois Department of Healthcare and Family Services). In 2005, between 5% and 5.9% of children ages 0-18 were uninsured (Gilead Report, 2009). Data on the number of individuals who are underinsured is not readily available. “In the Peoria metropolitan area, unemployment worsened slightly to 13.2%, the worst February rate since 1984-the last time rates stayed in double digits for a sustained period of time-and an increase from 12.9% in January. A year earlier, the rate was 9.4% in the Peoria region” (Peoria Journal Star, April 2, 2010). With the

increasing unemployment rate it can be inferred that the number of children enrolling in the state Medicaid system who are now uninsured or underinsured has increased significantly since 2008.

With a total of 157 dentists located in Peoria County, there is a dentist-to-population ratio of one dentist for every 1166 people. However, 62% of the total population reside within the city of Peoria and geographically dental offices are located on the far north side of the city with few operating practices in lower socioeconomic or rural areas. Although there is reluctance among dentists to serve Medicaid patients largely due to an increased number of missed appointments, additional documentation and low reimbursement rates, access to dental care is assured through the Peoria City/County Health Department and Heartland Community Care Clinic for these children. Both clinics accept Medicaid payment and are located in economically disadvantaged areas within the city of Peoria.

There is a strong connection between oral health and overall health, starting even before birth. Bacteria from oral disease in pregnant women can cause slow fetal growth and low birth weight in infants, contributing risk factors for ECC. In Peoria County infants with low birth weights (<2500 grams) account for 8.7% of all births while those with very low birth weights (<1500 grams) are seen in 2.1% of all births. Black mothers are almost twice as likely to have a low birth weight baby and more than twice as likely to have a very low birth weight baby (IDPH, 2007).

Effective dental care requires early identification of children at high risk for dental caries so that they may receive early and appropriate intervention. The American Academy of Pediatric Dentistry (AAPD, 2006) recommends that by 12 months of age,

every child be seen by a dentist, have a dental home and receive regular preventive checkups. Approximately half (47.5%) of children under the age of 5 are enrolled in nursery school and/or kindergarten. In the 2007/2008 school year, compliance with required dental exams for children entering kindergarten was fair with 87.4% of the kindergartners reported to have had dental exams prior to school entry (IDPH, 2008). Slightly more than 23% of the children had untreated caries at the time of the exam for kindergarten. Anecdotally, for many of these children, this was the first time they had ever seen a dentist. Head Start enrollment for the County in the same school year was 745 (Head Start Annual Report, 2007). While compliance with required dental exams among Head Start children is close to 100% related to highly effective interventions with families, many of these children are seeing a dentist for the first time at age 2 or 3.

The Caries-risk Assessment Tool (CAT) was created by the AAPD (2002) to assess the level of risk for caries development in children and adolescents based on a set of clinical, environmental and general health factors. Instead of only determining the presence of cavities and other irritations in the mouth, the CAT helps assess a patient's risk for oral disease by examining numerous health and lifestyle factors as part of the regular dental checkup. Factors such as caries activity, family history, sugar consumption, fluoride exposure, oral hygiene practices, and socioeconomic status are all explored to provide unique, patient-specific guidance to prevent future disease. When caught early enough, there are a number of non-invasive interventions that can be suggested that will arrest or reverse the disease process and keep the structure of the teeth intact. The table below summarizes risk factors and level of risk related to the CAT assessment.

Factor	Risk		
	Low	Moderate	High
Caries activity	None	Within 24 months	Within 12 months
Family history of decay	No decay	Low caries rate	High caries rate
Fluoride exposure	Optimal	Low to optimal	Low
Sugar consumption	With meals only	1-2 between meals	>3 between meals
Dental home	Established	Irregular use	None
Demineralized areas	No white spots	1 white spot	>1 white spot
Presence of plaque/gingivitis	None	Moderate	Visible plaque on anterior teeth

Utilizing the Caries-risk Assessment tool, a non-randomized survey of 420 children seen at the Peoria City/County Health Department Dental Clinic during February and March of 2010 was conducted and data aggregated to identify significant oral health needs of this population. Data collected was compared to a similar study completed in 2007.

Tooth decay noted at the time of exam increased by 25% in the 2-5 year old age range to over 75% of the children seen. Significant changes in age groups 6-9 and 10-18 were not noted, however the incidence of tooth decay remains almost 90% in these age groups. Those children experiencing previous tooth decay in less than 12 months increased by 29% in the 2-5 year old group, 18% in the 6-9 year old group and only 6% in the 10-18 year old group.

The reported exposure to sugary drinks and foods (>3 times per day) decreased in all age groups, most significantly in the 10-18 year old age group (34%).

Anecdotal, the incidence of Baby Bottle Tooth Decay has decreased significantly through combined community educational efforts, however the incidence of tooth decay in the posterior teeth has increased indicating that children may be consuming significant amounts of sugary drinks and foods with poor attention being paid to brushing the posterior teeth on a regular basis. For both years, the percentage of

children aged 2-5 brushing their teeth 2-3 times per day is unchanged at only 22%, while increases in frequency are noted in both the 6-9 year old groups (19%) and the 10-18 year old age group (17%).

Overall clinical evaluation indicates that the 2-5 year old age group is at significant risk for developing caries. The presence of visible plaque and enamel defects in this age group increased by approximately 50% while the presence of gingivitis increased by 65%-nearly 85% of children in this age group. The 6-9 year old age group has experienced a slight decrease in these risk factors, however the incidence remains around 60%. While the most significant decrease in gingivitis is seen in the 10-18 year old age group (50%), the presence of visible plaque and enamel defects, although slightly decreased, remains at approximately 50%.

Possibly the most important factor in determining a child's oral health is their parent's knowledge about good oral health, dental hygiene, nutrition and how to access dental care. Many parents do not understand the strong connection between oral health and overall health. Of the children surveyed in 2010, only 47.1% were regularly seeing a dentist, 44.9% had a dentist but visiting irregularly and 8% reported having no dentist.

In Illinois, 15.1% or 318,478 school-age children had special care needs. Peoria County school enrollment for children with special needs is comparable at 16% (Illinois State Board of Education, 2008). In 2006, 28% of these families in Illinois were reportedly at or below the 200% federal poverty level and only 59.3% reported that they had adequate private or public insurance.

In a study conducted within District 150 in 2005, parental perceptions of dental needs and dental treatments comparing the special needs (SN) and non-special needs

(NSN) population found that there is no greater perception of dental needs or barriers to access to dental care in the SN population versus the NSN population, however dental needs do exist in both of the populations. Thirty-three percent of the special needs children were without a dental home and of those, 5% had not seen a dentist at all within the last year. A number of barriers were reported by parents of both SN and NSN children when seeking dental care in Peoria. The most common barriers reported were an inability to locate a dentist who accepts Medicaid, lack of finances, the lack of a dentist overall, and the inability to locate a dentist. Also noted in this study was that special needs children appear to be more compliant with mandated dental examinations than their non-special needs counterparts. Overall in this study, 42% of children with special needs are of non-white ethnic origin. Although race alone is not a determinant of poor oral health, studies have shown that the incidence of dental disease is higher in minority populations. Low socioeconomic status and low level of education are risk factors that also affect minority populations in this area and contribute to dental health disparities in the special needs population (McCarthy, 2005).

Initiatives

Early Childhood Caries are preventable. It is estimated that approximately ninety percent of oral health is achieved through what people do for themselves and only ten percent is achieved by what is done by the dental team. Thus it is imperative that parents make the connection between their own oral health behaviors and that of their children. Information alone does not guarantee behavior change. In Peoria County multiple strategies focusing on prevention education, reduction of identified risk factors and responsible use of resources have been implemented to address comprehensive

oral health education for families, encouraging parents to act on the messages to reduce childhood dental disease.

- A network of pediatric and general practice dentists was established through the Peoria Dental Society by sponsoring the first Friday in February as Give Kids a Smile Day. Through this activity and throughout the year, over 105 dentists and sponsoring organizations volunteer in bringing dental health education and dental treatment of urgent needs to 3700 children at Early Head Start and school-based clinics. Twice the dental care for uninsured and Medicaid children was provided in 2009 through engaging an additional 25 volunteer dentists. Additionally, 12 area dentists have volunteered to treat children referred for emergency care at no cost to the families. Ongoing surveillance is establishing baseline data to measure outcomes.
- In 2008, a UIC pediatric dentist provided training on the Bright Smiles program to the Peoria District Dental Society. In a strong collaborative effort the PCCHD Dental Clinic became an active participant in the Illinois Association of Pediatric Physicians Bright Smiles program, where the PCCHD Dental Director implemented training for physicians at Heartland Community Health Clinic to provide oral exams and fluoride varnish applications during well baby visits.
- Exams, cleanings and application of fluoride varnish is provided twice yearly for appropriate Head Start children. Ongoing needs assessments identify gaps for these children in accessing care.
- Outcomes of oral health presentations have been measured through a collaborative partnership between the PCCHD, Hult Education Center and

Heartland Community Health Center Dental Dollars program. Results of this study have been incorporated into the development of new community-based oral health presentations.

- Evidence-based interventions are a high priority. In 2009, the Health Department clinic participated in two research projects with the UIC College of Dentistry and SIU School of Dental Medicine. Throughout each year numerous dental hygiene, medical and nursing students observe and participate in clinical activities and complete service learning projects. In 2009, medical students engaged local physicians and colleagues to participate in the Bright Smiles program and to participate in age one exams and fluoride varnish application. Utilizing the Head Start Training Module based on the Bright Smiles Program medical students engaged and trained Head Start parents and children in the importance of good oral health in English and Spanish.
- The WIC program is well positioned to enhance its oral health education function, identify high-risk children and make referrals for management of ECC. Research indicates that mothers are the most influential in promoting positive health behaviors and seeking care. In the spring of 2010, nursing students revised the oral health education component targeting mothers with children age one and two. Through additional coordination with the WIC program and the PCCHD dental clinic, the provision of age one and two dental exams, fluoride varnish applications and establishing routine dental care is facilitated through the integration of oral health education and prevention programs with existing WIC and Maternal Child Health programs, encouraging parents to understand the

importance and follow-through of these activities. Nursing students also designed and implemented an educational bulletin board emphasizing sugar content in common drinks and foods as well as the importance of brushing the back teeth.

- The Peoria District Dental Society, Heartland Community Health Clinic, OSF Saint Francis Hospital and the Peoria City/County Health Department have developed and nurtured a collaborative partnership by combining efforts to design and implement a General Residency Program. This program will allow dental residents to expand from traditional clinical areas into the community setting, learning valuable concepts in public health dentistry for application to practice. The scope of the program and impact on community oral health status continues to evolve with the first group of residents enrolled in July of 2010.

There are many other ongoing programs and initiatives occurring throughout the community. In 2010 an Oral Health Advisory Committee was designed to provide representation from community agencies and providers having a vested interest in improving overall oral health outcomes. An oral health community needs assessment was completed by the committee in July, 2010 and results were compared to a similar assessment completed in 2007. Although progress in reducing risk factors was shown, it remains clear that continued efforts must be made to foster collaboration among private and public community providers to plan and implement strategies that will provide a strong and consistent message for parents to effectively reduce the incidence of early childhood caries in our community.

While significant barriers to positive oral health outcomes exist, Peoria County is also rich in resources working to organize community responses to oral health

problems, promoting a healthy environment, developing interventions and working to eliminate health disparities. Within the professional dental and medical community there exists the potential to provide leadership in the further development of collaborative relationships to effectively manage resources, facilitate partnerships and engage the community in an effort to promote positive oral health behaviors.

Traditionally, there has been an emphasis on dental health education, either with individuals or groups, which has focused on imparting knowledge on prevention of dental disease. It is estimated that approximately ninety percent of oral health is achieved through what people do for themselves and only ten percent is achieved by what is done by the dental team. Thus it is imperative that parents make the connection between their own oral health behaviors and that of their children. Current concepts of oral health promotion acknowledge the importance of environment (both physical and social), lifestyle/individual behaviors and access to services. The common risk factor approach acknowledges that early childhood caries have common predisposing risk factors. Individuals' efforts to change their own health behavior are often constrained by economic, social and cultural influences. Low educational status, lack of time, energy and money, and exposure to family and friends who frequently engage in health-damaging behavior are all factors which may act to constrain individual efforts to promote their health or that of their children. In recognition of the fact that individuals live within a community, current oral health promotion initiatives must increasingly have more community participation and development as key elements. Collaboration holds the promise of allowing progress on issues that any one or two organizations alone could never budge.

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