

Oral Health

Definition:

Dental caries: An oral disease that results in de-mineralization and ultimately cavitation of the tooth surface if not controlled or remineralized. Tooth decay can be either treated (filled) or untreated (unfilled).

Functional definition: Functional dentition is defined as having 21 or more natural teeth (i.e., less than six teeth lost). A full dentition in adults is the presence of all natural teeth (28 teeth), not including the third molars.

Summary

Oral health is an essential and integral component of life-long health. This chapter looks at two aspects of oral health: dental caries in children and tooth loss in adults.

Dental caries or tooth decay is the single most common chronic childhood disease.¹ If left untreated, caries can lead to pain, infection, and tooth loss. Despite the national reduction in caries in recent years, the disease has increased among Washington children since 1994. In 2005, 20% of 2nd- and 3rd-graders in Washington had untreated dental caries, and only about 45% had received dental sealants. Oral health disparities persist, with non-white, low-income, and non-English-speaking children having more caries and untreated caries and fewer dental sealants than white, non-Hispanic children.

Tooth loss leads to the impairment of oral health function and decreased quality of life. It reduces the ability to chew and speak and leads to reduction in social interactions.^{2,3} Partial tooth loss is more prevalent in younger adults, while total tooth loss is more prevalent among the elderly.

Adults must have at least 21 of their 28 teeth for functional dentition.^{4,5,6,7} Having lost six or more teeth leads to inadequacy of oral functions such as chewing and speaking. In Washington in 2004 and 2006 combined, 5% of adults ages 35–44 years and 38% of seniors 65 years and older had lost six or more teeth. Prevalence of tooth loss in adults has declined in the United States, suggesting an improvement in quality of life and continuing exposure to preventive measures. Despite improvements in partial and complete tooth loss, disparities remain among older adults, non-whites, people of

Hispanic origin, smokers, and low-income groups.

DENTAL CARIES

Time Trends

Since the early 1970s, remarkable progress has been achieved in reducing dental caries in permanent teeth among school-age children.¹ This decline is the result of preventive regimens such as community water fluoridation, dental sealants, and the increased use of fluoridated toothpastes and other professionally applied fluoride dental products. Dental caries, however, remains a substantial problem in some populations, particularly certain racial and ethnic groups and poor children.⁸ National data indicate that 80% of dental caries in the permanent teeth is concentrated in 25% of the child and adolescent population.⁹

Smile Survey 2005 is the third study of the oral health of low-income preschool and elementary school children of all income levels in Washington State. The state conducted earlier Smile Surveys in 1994 and 2000 (see Technical Notes). In 2005, 45% ($\pm 3\%$) of low-income preschool children had caries compared to 42% ($\pm 6\%$) in 2000 and 38% ($\pm 3\%$) in 1994. About 25% ($\pm 3\%$) of 3–5 year-olds had untreated caries in 2005 compared to 27% ($\pm 5\%$) in 2000. Among 2nd- and 3rd-graders, 59% ($\pm 3\%$) had caries experience in 2005 compared to 56% ($\pm 2\%$) in 2000, and 20% ($\pm 2\%$) had untreated caries in 2005. Untreated caries is a measure of access to dental care.

Year 2010 Goals

Two national *Healthy People 2010* objectives aim to reduce the proportion of children with caries in primary teeth to 11% (measured in 2–4 year-olds) and with caries in permanent teeth to 42% (measured in 6–8 year-olds).

Healthy People 2010 objectives also include reducing the proportion of children with untreated caries in primary teeth to 9% and the proportion of children with untreated caries in permanent teeth to 21%. Washington has not met either of these goals.

Geographic Variation

There are not enough data in the 2005 Smile Survey to report geographic variations.

Age and Gender

Smile Survey 2005 indicated that caries prevalence was higher in elementary school children (59% ±3%) than in preschool children (45% ±3%)

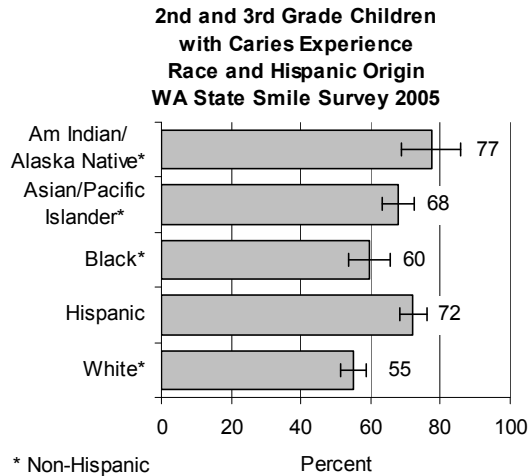
No gender-specific data are available for Washington. In 1999–2002, among children and adolescents ages 6–19 in the United States, more girls than boys had caries in their permanent teeth (45% and 40%, respectively).¹⁰

Race and Hispanic Origin

Smile Survey 2005 found significant oral health disparities. Non-white, low-income, and non-English-speaking children had the highest levels of dental disease and the lowest levels of dental sealants.

Three separate groups of children were screened: low-income children 3–5 years old enrolled in the federal Head Start or state Early Childhood Educational Assistance Program (ECEAP), American Indian and Alaska Native children in tribal schools, and elementary school children enrolled in public schools throughout Washington. Among the 3–5 year-olds (Head Start/ECEAP children), non-white and children of Hispanic origin had more caries than white non-Hispanic children. Non-white children and children of Hispanic origin in this age group also had higher rates of tooth decay, untreated decay, and dental caries in the beginning stages.

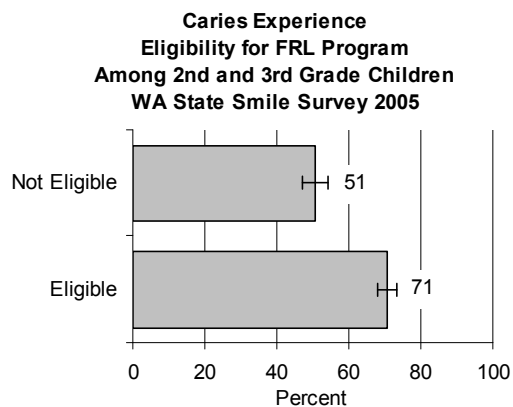
Among 2nd- and 3rd-grade students enrolled in elementary schools, American Indian and Alaska Native, Asian and Pacific Islander, and children of Hispanic origin had higher rates of caries than white non-Hispanic children.



Income and Education

Smile Survey 2005 measured family income by children’s eligibility for the federal school free or reduced lunch (FRL) program. To be eligible for the program during the 2004–2005 school year, annual household income could not exceed 185% of federal poverty levels. A household of two adults and two children, for example, could have an income of no more than \$34,873.¹¹ Children eligible for the FRL program had a significantly higher prevalence of caries, untreated caries, severe caries, and dental treatment needs than children not eligible for the FRL program.

Children from non-English-speaking families had a significantly higher prevalence of caries experience, untreated caries, severe caries, and dental treatment needs and a lower prevalence of dental sealants compared to children from English-speaking families.



Other Measures of Impact and Burden

Impact on general health. The mouth is a potential entry site for bacteria to gain access to the body.¹² If a person's general condition is weakened for any reason, normally harmless oral bacteria can start an infection or even infect other parts of the body.^{13, 14} Several systemic diseases can be caused by infectious oral microbes, especially in patients with immunological and nutritional deficiencies. Therefore, controlling existing oral infections is clearly of great importance to prevent systemic complications.¹⁵ Oral infections have been associated with diabetes, cardiovascular diseases, respiratory infections, bacteremia, and adverse pregnancy outcomes.

Impact on quality of life. Oral health is related to well-being and quality of life. Poor oral health adversely affects diet, nutrition, sleep, psychological status, social interactions, and school. Nationally, more than 51 million school hours are lost each year to dental-related illness among children.¹

Hospitalization. A substantial number of young children with untreated caries are seen in hospital emergency departments, and for many it is their first dental visit.¹⁶ Preschool-age, Medicaid-enrolled children who had an early preventive dental visit were more likely to use subsequent preventive services and to incur lower dental-related costs.¹⁷

Risk and Protective Factors

Risk factors. For dental caries, risk factors can be physical (deep pits and fissures, anatomically susceptible areas, gastric reflux, high mutans streptococci count), behavioral (frequent snacking, inadequate oral hygiene, eating disorders), socio-environmental (inadequate fluoride or poverty), and disease- or treatment-related (occurring because of a special carbohydrate diet, reduced saliva flow from medication or irritation, or orthodontic appliances).¹⁸

Fluoride. Fluoride is an effective method of preventing caries in both children and adults, and a fluoridated water system is the most cost-effective method of providing fluoride. Fluoride protects teeth in two ways—systemically and topically. When consumed by young children, it helps to strengthen their future teeth. But fluoride's main effect occurs after the tooth has

erupted above the gum. This topical effect occurs when small amounts of fluoride are maintained in the saliva and dental plaque, the film that adheres to tooth enamel. (See [Intervention Strategies](#).)

In Washington, 58% of the population on community water systems receives the benefit of fluoridated drinking water. (See [Technical Notes](#).)

Pit and fissure sealants. Dental sealants are thin plastic coatings applied to the chewing surfaces of the molars (back teeth). About 90% of caries in permanent teeth of children and adolescents occur in tooth surfaces with pits and fissures, and about two-thirds are on the chewing surfaces alone.^{9, 19} Dental sealants are highly effective in preventing caries in pits and fissures^{20, 21, 22} and in managing possible caries.²³ Sealants are 100% effective in preventing dental caries when fully retained.^{24, 25} In 2005, 45% (±3%) of Washington's 2nd- and 3rd-grade children had sealants.

[Intervention Strategies](#)

In 2002, the U.S. Task Force on Community Preventive Services conducted systematic reviews of the scientific evidence on preventive interventions for dental caries at the community level. The task force strongly recommended community water fluoridation and school-based or school-linked sealant programs as the most effective interventions.

Community water fluoridation is the process of *adjusting* the natural fluoride concentration of fluoride-deficient water to a level recommended for optimal oral health, approximately 1 part per million. Fluoridation of drinking water has been called one of the 10 great public health achievements of the 20th century and has been used successfully in the United States for the past 60 years.¹ About 170 million people in the United States (about 56% of the population) are served by fluoridated public water systems. Water fluoridation continues to be effective in reducing dental caries by 20–40%, even in an era with widespread availability of fluoride from other sources, such as toothpaste.^{26, 27} A review of 113 scientific articles from 23 countries (59 of which focused on the United States)²⁸ found that water fluoridation reduced dental caries by 40% to 49% in primary teeth and about 50% to 59% in permanent teeth.

The average cost for a community to fluoridate its water ranges from about 50 cents a year per person in large communities to about \$3 a year per person in small communities. In most communities, every \$1 invested in water fluoridation saves \$38 in dental treatment costs.²⁹

School-based or school-linked programs provide dental sealants to children unlikely to receive them otherwise. Children receiving dental sealants in school-based programs have 60% fewer new decayed pit and fissure surfaces in back teeth for up to two to five years after a single application. Among students who attended schools with sealant programs and had sealants on their teeth, about 70% received them at school.³⁰ School-based programs in Washington target high-risk children with high-risk teeth.³¹ High-risk children include vulnerable populations less likely to receive private dental care, such as children eligible for FRL programs. High-risk teeth (those with deep pits and fissures) are the first and second permanent molars that erupt into the mouth around the ages of six and 12 years, respectively. In 2005, only 174 of 784 eligible Washington schools had school-based dental sealant programs.³²

TOOTH LOSS

Time Trends

The United States has experienced a continuous decline in the prevalence of tooth loss, both partial and total.¹⁰ But disparities remain among older adults, smokers, non-whites, people of Hispanic origin, and low-income groups.

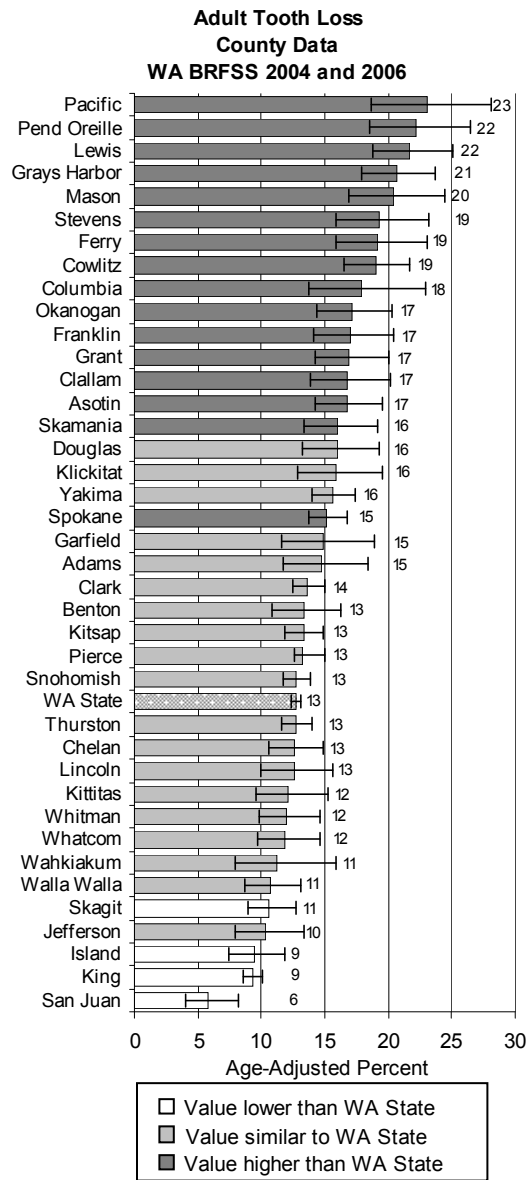
In Washington, according to the [Behavioral Risk Factor Surveillance System](#) (BRFSS), there has been a significant decrease in adults with any tooth loss from 43% ($\pm 2\%$) in 1999 to 38% ($\pm 1\%$) in 2006. Among people ages 65 and older, there also has been a significant decrease in complete tooth loss from 22% ($\pm 4\%$) in 1999 to 15% ($\pm 1\%$) in 2006.

To have a functional dentition, an adult must have at least 21 of his or her 28 teeth. For the purposes of this chapter, having lost six or more teeth is an indication of loss of functional dentition, leading to inadequacy of oral functions such as chewing and speech.^{33,34}

Geographic Variation

The BRFSS data for 2004 and 2006 combined show that across Washington counties, [age-adjusted](#) rates of adult tooth loss (six or more teeth) ranged from 6% to 23%. Adults reporting tooth loss living in Pacific, Pend Oreille, Lewis, Grays Harbor, Mason, Stevens, Ferry, Cowlitz, Columbia, Okanogan, Franklin, Grant, Clallam, Asotin, Skamania, and Spokane counties had significantly higher rates than the state, while

those living in Skagit, Island, King, and San Juan counties had tooth loss rates lower than the state. These rates are not adjusted for county differences in race, Hispanic origin, or socioeconomic status.

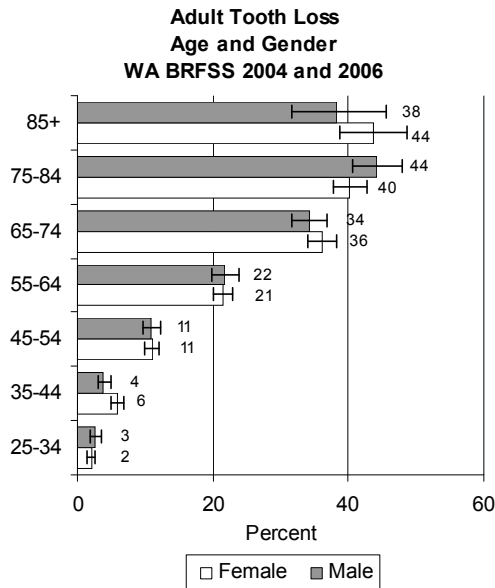


Year 2010 Goals

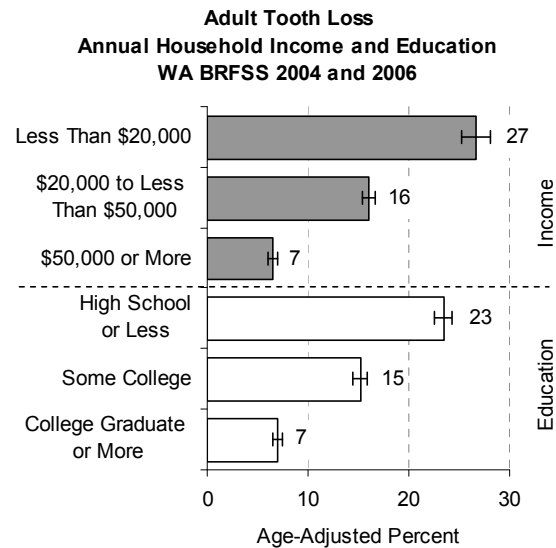
There is no specific *Healthy People 2010* objective addressing loss of six or more teeth. One target, however, is that no more than 42% of adults ages 35–44 years ever had a permanent tooth extracted because of dental caries or periodontal disease. A second target calls for reducing the proportion of adults ages 65 and older who have had all their natural teeth extracted to no more than 20%. Washington State has met both targets.

Age and Gender

The percentage of people who have lost six or more permanent teeth increases with age among both males and females.

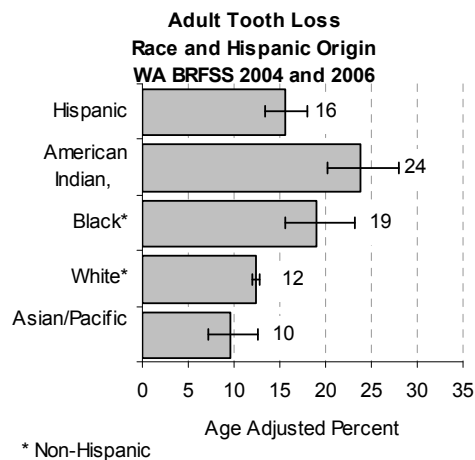


those with some college, and 7% of college graduates reported having lost six or more teeth. Similarly, 27% of adults with an annual household income of less than \$20,000 compared to 7% of those with an annual household income at or greater than \$50,000 reported having lost six or more teeth.



Race and Hispanic Origin

BRFSS data for 2004 and 2006 combined show that blacks, American Indians and Alaska Natives, and Hispanics experienced more tooth loss than whites and Asians and Pacific Islanders.



Other Measures of Impact and Burden

Impact on quality of life. Oral health is related to well-being and quality of life. Diet, nutrition, social interactions, sleep, self-esteem, and speech are affected by tooth loss, diminishing the individual's quality of life.^{2,3,35} A distinct reduction in chewing function occurs as the number of missing teeth increases, even when dentures are worn.^{36,37} In the elderly, complete tooth loss can lead to poor nutrition and weight loss affecting overall health.^{38,39} Tooth loss can lead to lowered self-confidence and altered self image, bereavement, dislike of appearance, and the perception of being more advanced in age.^{40,41}

Risk Factors

Periodontal disease and dental caries are the two leading oral disease-related causes for tooth loss. Tooth loss is also influenced by patient and dentist attitudes, availability and accessibility of dental care, and the prevailing standard of care.⁴² Other common risk factors associated with tooth loss are poor oral hygiene (resulting in increased plaque, calculus, and gingivitis), early loss of first molars, smoking, lower use of dental services, lower socioeconomic status, and perceived poor dental health.^{43,44}

Income and Education

Income and education are inversely related to amount of tooth loss. The BRFSS data for 2004 and 2006 combined show that 23% of adults with a high school education or less, 15% of

Intervention Strategies

The decrease in prevalence of tooth loss can be attributed partly to the increase in adoption of preventive regimens such as dental sealants, community water fluoridation, use of fluoride toothpaste, mouth rinse, improved oral hygiene, and support for these approaches by health care professionals.^{10,45} It is important to prevent oral disease early in life to prevent tooth loss. Improving the oral health knowledge of the public can also help improve oral hygiene and tooth retention.

Public health strategies to prevent complete tooth loss include oral health promotion for all age groups and expansion of dental insurance coverage, particularly for older persons. In addition, improved access to clinical dental services and expanded community tobacco-control activities can help prevent total tooth loss.⁴⁶

See Related Chapters: [Singleton Low Birth Weight](#), [Tobacco Use](#)

Data Sources

National Health and Nutrition Examination Survey 1999–2002.

The Oral Health of Washington's Children: Smile Survey 2005. Washington State Department of Health Behavioral Risk Factor Surveillance System (BRFSS), Washington State Department of Health, 2004 and 2006

For More Information

Maternal and Child Health Oral Health Program

Email: oralhealth@doh.wa.gov

Website: http://www.doh.wa.gov/cfh/Oral_Health/

Technical Notes

Smile Survey. While the same diagnostic criteria were used in each of the three Smile Surveys (1994, 2000, and 2006), sampling methods and type of consent varied. Smile Survey 1994 was based on a random sample of schools in targeted high-risk counties, while Smile Surveys 2000 and 2005 were based on a random sample of schools from the entire state. Smile Survey 1994 screened only 2nd-grade children. Smile Surveys 2000 and 2005 screened both 2nd- and 3rd-grade children. Passive consent was used in 1994 and 2005, and positive consent was used in 2000.

Community Water Fluoridation. Data are obtained from all systems (Group A & B) that have optimal fluoride levels between 0.8 and 1.3 ppm (naturally occurring and fluoride adjusted systems).

Endnotes

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