

Section 2

PREVENTIVE INTERVENTIONS

This section examines water fluoridation and dental sealants. There has been a tremendous reduction in the prevalence and severity of dental caries over the past several decades. The widespread use of fluoride has been a major factor in this decline (CDC, 1992; CDC, 1999). There are currently many means of fluoride delivery, including water fluoridation and professional treatments with fluoride solutions, gels, and varnishes. Fluoride is also present in a variety of processed foods and beverages, mouth washes, toothpastes, and supplements. However, fluoridation of public water is the most cost-effective method of reducing dental caries since it reaches all residents regardless of income level and educational status (CDC, 1999). Approximately \$40 billion have been saved in reduced oral health care expenditures in the United States over the past 40 years due to public water fluoridation.

Fluoride is more effective on smooth surfaces than on pit and fissure surfaces (Backer et al., 1961). This has led to a change in the distribution of caries in areas where fluoridation is prevalent. At least 83% of childhood tooth caries are in pits and fissures (Brown et al., 1996). More recently, the introduction of dental sealants has led to a further reduction in dental caries. Sealants are thin plastic coatings that are applied to the pits and fissures of children's teeth, especially to the permanent first and second molars. Dental sealants are particularly effective in protecting these surfaces. Placing sealants on occlusal surfaces of these teeth shortly after eruption protects them from development of caries. A study of second-generation sealants found that 67% to 82% remained in place after 5 years (Mertz-Fairhurst et al., 1984). A 1993 analysis of previous research on sealants concluded that 71% of caries could be avoided by use of sealants (Llodra et al., 1993). Sealants may also be used in treatment of early caries. The use of sealants has increased since the 1980s, primarily among those of higher socioeconomic classes (Burt & Eklund, 1999).

REFERENCES

- Backer DO, Houwink B, Kwant GW. The result of 6½ years of artificial drinking water in the Netherlands: the Tiel-Culemborg experiment. *Arch Oral Biol* 1961;5:284-300.
- Brown LJ, Kaste LM, Selwitz RH, Furman LJ. Dental caries and sealant usage in U.S. children 1988-1991. *J Am Dent Assoc* 1996; 127:335-43.
- Burt BA, Eklund SA. *Dentistry, Dental Practice, and the Community*, 5th ed. Philadelphia, PA: W.B. Saunders Co., 1999.
- Centers for Disease Control and Prevention. Public health focus: fluoridation of community water systems. *MMWR* 1992;41:372-5, 381.
- Centers for Disease Control and Prevention. Achievements in public health, 1900-1999: fluoridation of drinking water to prevent dental caries. *MMWR* 1999;48:933-40.
- Llodra JC, Bravo M, Delgado-Rodriguez M, Baca P, Galvez R. Factors influencing the influence of sealants—a meta-analysis. *Community Dent Oral Epidemiol* 1993;21:261-8.
- Mertz-Fairhurst EJ. Current status of sealant retention and caries prevention. *J Dent Educ* 1984 Feb;48(2 Suppl):18-26.

2.1 Dental sealants

Data from the NIDCR's National Survey of Oral Health in U.S. School Children in 1986-1987 showed that 7.6% of children from 5 to 17 years of age had sealants. This percentage had risen to 18.5% in results from the first half of NHANES III in 1988-1991 (Brunelle, 1989; Selwitz et al., 1996). Analyses based on NHANES III data from 1988 to 1994 indicate that 26.1% of children aged 8-10 and 22.2% of children aged 14-16 had sealants.

However, many of the children most at risk for caries development are not receiving sealants. Reasons for the low level of sealant usage include reimbursement issues in both public and private sectors, lack of public knowledge, concerns stemming from early problems with sealant materials and procedures for application, and concerns about covering incipient carious decay. Current guidelines address many of these issues.

SOURCE OF DATA

The analyses reported below are based on data from the Third National Health and Nutrition Examination Survey (NHANES III) 1988-1994, National Center for Health Statistics, Centers for Disease Control and Prevention.

Demographic differences

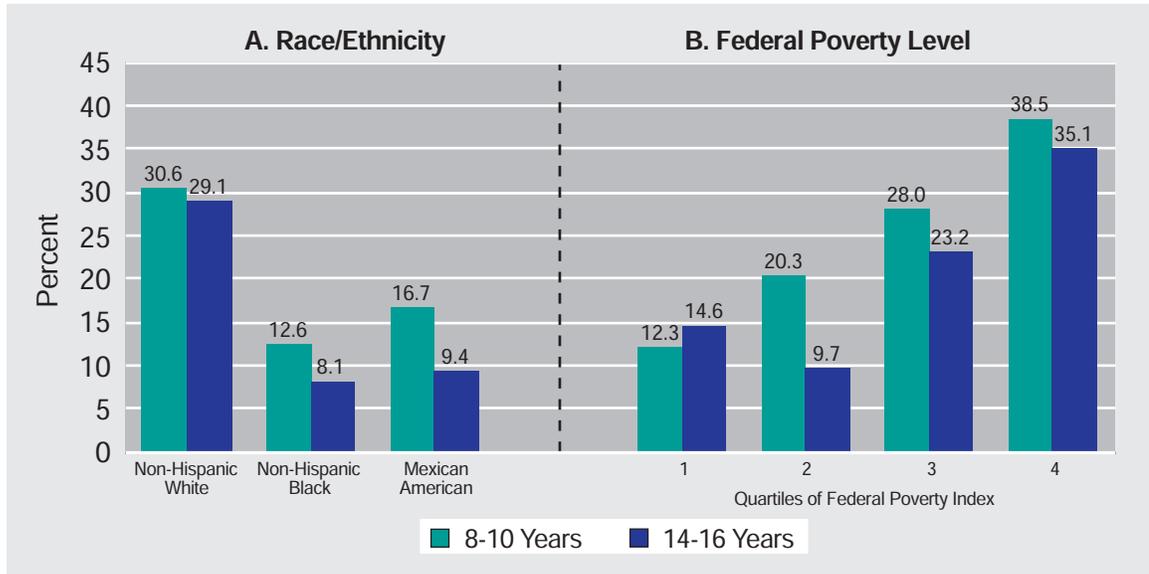
- A higher percentage of non-Hispanic white children had sealants than either non-Hispanic black or Mexican American children (Figure 2.1.1).
- The percentage of children with sealants was higher for children from higher-income families (Figure 2.1.1).
- A higher percentage of non-Hispanic white children had sealants than either non-Hispanic black or Mexican American children in both age ranges and in both income categories (Figure 2.1.2).

Bullets reference data that can be found in Table 2.1.1.

REFERENCES

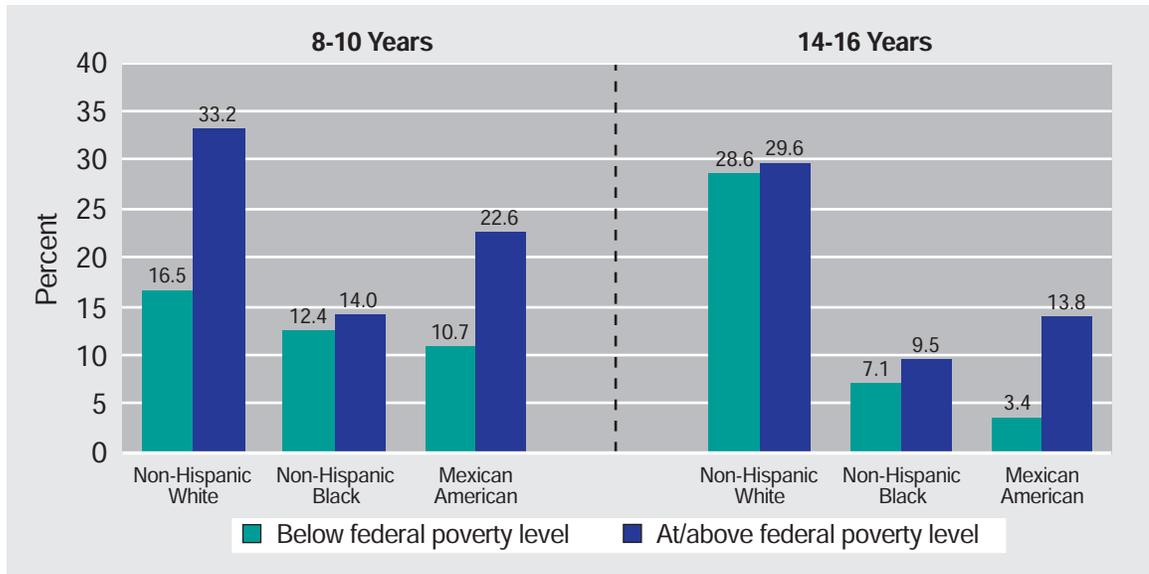
- Brunelle JA. Prevalence of dental sealants in U.S. schoolchildren (abstract). *J Dent Res* 1989;68(Spec Iss):183.
- Selwitz RH, Winn DM, Kingman A, Zion GR. The prevalence of dental sealants in the U.S. population: findings from the NHANES III, 1988-1991. *J Dent Res* 1996;75(Spec Iss):652-60.

Figure 2.1.1. Percentage of children with dental sealants on 1st or 2nd molars by age group, race/ethnicity, and federal poverty level



Note: The quartiles represented here are as follows: 1:0-0.838, 2:0.839-1.648, 3:1.649-2.912, and 4:2.913-11.889.
 Data source: The Third National Health and Nutrition Examination Survey (NHANES III) 1988-1994, National Center for Health Statistics, Centers for Disease Control and Prevention.

Figure 2.1.2. Percentage of children with dental sealants on 1st or 2nd molars by age group, race/ethnicity, and federal poverty level



Data source: The Third National Health and Nutrition Examination Survey (NHANES III) 1988-1994, National Center for Health Statistics, Centers for Disease Control and Prevention.

2.2 Fluoridation of community water systems

The Centers for Disease Control and Prevention (CDC) estimated that optimally fluoridated water was available to 65.8% of the U.S. population served by public water systems in 2000 (CDC, 2002). Water fluoridation laws vary by state, with some states requiring fluoridation in communities with a minimum population, while other states require a local referendum before fluoridation can be implemented (Burt & Eklund, 1999). A voluntary reporting system is maintained by the CDC, with information displayed on its website. The Water Fluoridation Reporting System (WFRS), a fluoridation program quality monitoring system, is maintained by CDC and participating states.

SOURCE OF DATA

The source for the data described below is the 2000 Water Fluoridation Reporting System, Centers for Disease Control and Prevention (<http://www.cdc.gov/nohss/FSMain.htm>).

As the population has grown so has the number of people on fluoridated water systems (Figure 2.2.1). Fluoridated water systems began in the 1940s when Grand Rapids, Michigan, increased its community water fluoride content to 1 part per million (ppm). Currently, 87% of the U.S. population use a public water system, and 65.8% of this population receive optimally fluoridated water (Figures 2.2.2A and 2.2.2B).

As shown in Figure 2.2.3, all residents of the District of Columbia obtain their water from public water systems that are optimally fluoridated (see Table 2.2.1 for the full listing). At

the other extreme, only 2.0% of the population in Utah receive publicly fluoridated water. The Healthy People 2010 target is for 75% of the US population to receive fluoridated water. Currently, 26 states and the District of Columbia have achieved this target.

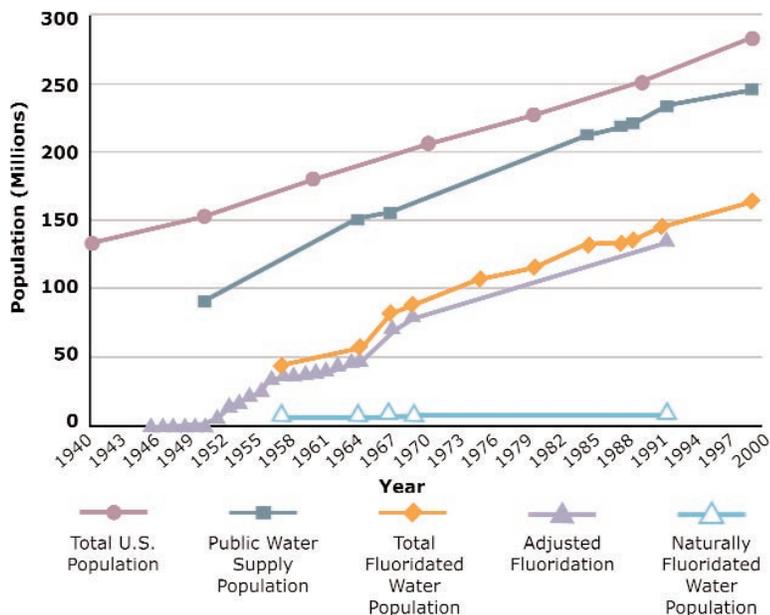
Bullets reference data that can be found in Table 2.2.1.

REFERENCES

Burt BA, Eklund SA. Dentistry, Dental Practice, and the Community, 5th ed. Philadelphia, PA: W.B. Saunders Co., 1999.

Centers for Disease Control and Prevention. Populations receiving optimally fluoridated public drinking water-United States, 2000. MMWR 2002;51:144-147.

Figure 2.2.1. Fluoridation growth by population in the United States



Source: 2000 Water Fluoridation Reporting System, Centers for Disease Control and Prevention (<http://www.cdc.gov/nohss/fsgrowth.htm>).

Figure 2.2.2A. Percentage of U.S. population on public water systems

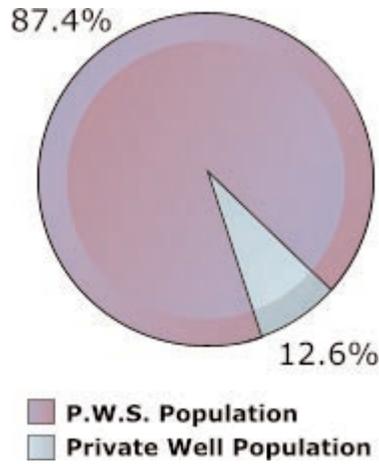
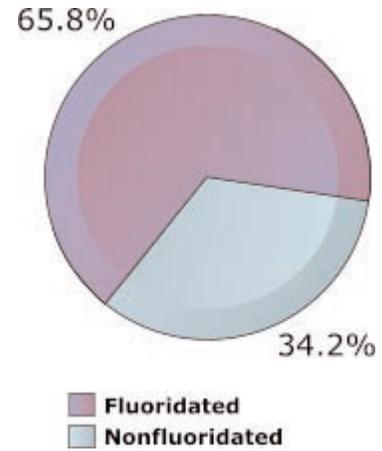
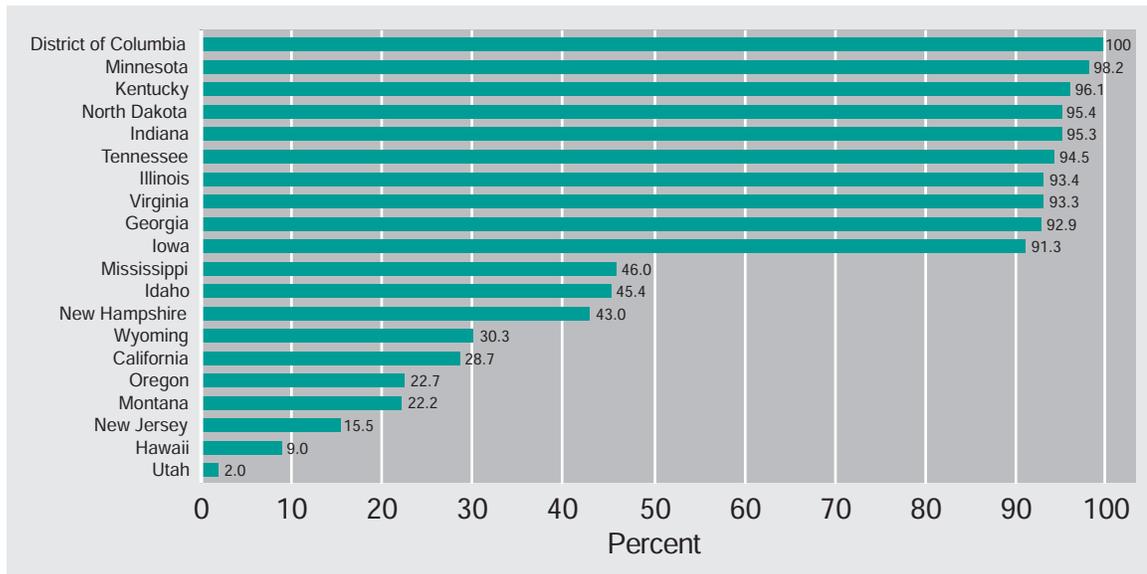


Figure 2.2.2B. Percentage of U.S. population on public water systems receiving fluoridated water



Source: 2000 Water Fluoridation Reporting System, Centers for Disease Control and Prevention (<http://www.cdc.gov/nohss/fssupplystats.htm>).

Figure 2.2.3. Percentage of population receiving fluoridated water through public water systems—10 highest and 10 lowest states, 2000



Source: Centers for Disease Control and Prevention. Populations receiving optimally fluoridated public drinking water—United States, 2000. MMWR 2002;51:144-7. (<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5107a2.htm>)