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Perspectives in Disease Prevention and Health Promotion Dental Caries and Community Water Fluoridation Trends -- United States

One of the 12 fluoridation and dental health objectives identified in the U.S. Public Health Service's Objectives for the Nation (1) states: By 1990, the number of 9-year-old children who have had caries in their permanent teeth should be decreased to 60% (40% would be caries-free). In 1971-1973, 71% of these children had caries in their permanent teeth. The National Caries Prevalence Survey, conducted by the National Institute of Dental Research (NIDR) in 1979-1980 (2), reported that 49% of these children have had decay in their permanent teeth, demonstrating this objective has been achieved. The survey also reported that 89% of 17-year-olds have had dental caries (2). Although 37% of children aged 5-17 years were caries-free, approximately 24% of children in the same age group have had five or more decayed, missing (due to caries), and/or filled permanent teeth (Figure 1).

When the NIDR survey is compared with an earlier, similar survey by the National Center for Health Statistics, the prevalence of dental decay among school-aged children appears to have been significantly reduced since 1973 (Figure 2) (2,3). The availability of fluorides from a number of sources, including community and school water fluoridation, fluoride tablets and drops, fluoride rinses and dentifrices, and clinically applied fluorides, have contributed to the decline in dental caries. It is difficult to attribute this decline to one specific modality, and the effects are not arithmetically additive. However, the combination of systemic and topical fluorides has contributed greatly to improved oral health in the United States. In 1985, approximately 20,000 employed adults and 5,000 older adults at senior citizen centers will be surveyed as part of an NIDR National Survey of Adult Dental Health. Oral health status and data on treatment needs from this survey will be available in 1987.

Although community water fluoridation remains the most effective and practical means of preventing and controlling dental caries, nearly half the U.S. population still does not have access to optimally fluoridated water. The optimal amount of fluoride necessary to reduce the most dental decay, with the least amount of risk of dental fluorosis (discoloration of the enamel), is 0.7-1.2

mg/l (0.7-1.2 parts fluoride per 1 million parts water) (4). Fluoride occurs naturally in most waters but usually at less than optimal levels. Since it is assumed that people in warmer climates drink more water than people in colder climates, the optimal level is lowest in the southernmost part of the United States. Therefore, the optimal fluoride level is calculated based on the annual average of maximum daily air temperature (5).

Since the introduction in 1945 of the practice of adjusting fluoride levels in community water systems, the number of people with access to water with dentally significant levels of fluoride (0.7 parts per million (ppm) or higher) has increased steadily to an estimated 123 million in 1983--approximately 52.2% of the total U.S. population (6,7). It is impractical to expect 100% coverage, because a portion of the population is not served by public water supplies (approximately 6% in 1983) (6,8). However, in some of these water supplies, fluoride occurs naturally at optimal levels, and the number of people served by naturally fluoridated water has remained fairly constant at approximately 10.7 million (Figure 3) (6,7). Excluding this portion, the estimated percent of the population on public water supplies receiving fluoridated water was 56.5% in 1983.

However, the number of people served by public water supplies is increasing (Figure 3). This trend can be explained by increased urbanization of the U.S. population. The population served by public water supplies varies from state to state and ranges from 29% in Oregon to 99% in Illinois and Maryland. The population served by public water supplies in Washington, D.C., is 100% (6,8).

Another national fluoridation and dental health objective for 1990 states: At least 95% of the population on community water systems should be receiving the benefits of optimally fluoridated water. Of the 60,000 public water supplies in the United States, only about 8,000 are fluoridated (6,8). Approximately 46,000 of these systems serve populations of under 1,000, and 150 systems serve populations of more than 100,000 (6,8). The public water systems of nine of the 50 largest cities in the United States are not fluoridated: Los Angeles, San Diego, and San Jose, California; Phoenix, and Tucson, Arizona; San Antonio, Texas; Portland, Oregon; Honolulu, Hawaii; and Newark, New Jersey (9). Past experience has shown that the length of time needed to implement fluoridation in a given community is not necessarily related to the size of the community but rather to other factors, such as how the decision to fluoridate is made (e.g., city council, referendum), and the effectiveness of public health education programs about the benefits of fluoridation.

The maintenance of the optimal level of fluoride is critical once a water system is fluoridated. It has been shown that the dental benefits from fluoridated water are significantly reduced if fluoride levels drop below the optimal concentration (10-12).

The results of the National Preventive Dentistry Demonstration Program conducted by The Robert Wood Johnson Foundation indicate that, "At an estimated cost of less than \$1 per child per year, fluoridation remains society's least expensive and most effective caries preventive measure" (13). Reported by Dental Disease Prevention Activity, Center for Prevention Svcs, CDC.

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