

Recommendations on Selected Interventions to Prevent Dental Caries, Oral and Pharyngeal Cancers, and Sports-Related Craniofacial Injuries

Task Force on Community Preventive Services

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Introduction

Despite substantial improvements in oral health for most people in the United States during the 20th century, an estimated \$60 billion is still spent annually on dental services.¹ About 500 million visits are made each year to dental offices,² and estimated inpatient hospital charges for diseases of the mouth and disorders of the teeth and jaw totaled \$451 million in 1996.² Dental caries, oral cancers, and sports-related craniofacial injuries are potentially preventable conditions. The financial and human costs associated with these conditions, including mortality, indicate the need for interventions that promote oral health and prevent disease throughout the human life span.

This report provides recommendations on community interventions to prevent dental caries, oral and pharyngeal cancers, and sports-related craniofacial injuries. These conditions were chosen because they are important health problems that contribute substantially to annual dental care expenditures, serve as selected indicators of the need for preventive services, are potentially preventable by strategies already in widespread use, and address several of the *Healthy People 2010*³ objectives (see Table 1 in Truman et al.⁴ in this supplement).

This report and other related publications (this volume is one in a series of AJPM supplements, reporting on findings of the Task Force on Community Preventive Services [the Task Force]) can provide guid-

ance from the Task Force to personnel in state and local health departments, managed care organizations, purchasers of health care, people responsible for funding public health programs, and others who have interest in or responsibility for improving oral and related general health in all segments of the population.

The specific methods for and results of the reviews of evidence on which these recommendations are based are provided in the accompanying article.⁴ General methods employed in evidence reviews for the *Guide to Community Preventive Services* (the *Community Guide*) have been published previously.⁵

Intervention Recommendations

The Task Force evaluated the evidence of effectiveness of five interventions in the following areas: (1) strategies to prevent or control dental caries; (2) strategies to prevent or control oral and pharyngeal cancers; and (3) strategies to prevent or control sports-related craniofacial injuries.

Interventions to Prevent or Control Dental Caries

Comprehensive population-based interventions to prevent or control dental caries aim to (1) increase public and professional awareness of opportunities for organized action; (2) promote practices that improve the oral environment (e.g., reducing consumption of refined sugar and brushing with fluoride toothpaste); (3) ensure optimal exposure to fluoride from all sources (including community water fluoridation); and (4) ensure access to and efficient use of regular dental care, both preventive and restorative, including optimal use of sealants delivered in school-based or school-

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linked settings.⁶ This report examines the evidence of the effectiveness of three interventions to prevent and control dental caries at the community level: community water fluoridation, school-based or school-linked pit and fissure sealant delivery programs, and statewide or community-wide sealant promotion programs.

Community water fluoridation: strongly recommended.

Community water fluoridation (CWF) is the controlled addition of a fluoride compound to a public water supply to achieve an optimal fluoride concentration.⁷ Since 1962, the U.S. Public Health Service has recommended that community drinking waters contain 0.7 to 1.2 ppm of fluoride.⁷ In 1992, more than 144 million people in the United States (56% of the population and 62% of those receiving municipal water supplies) were being supplied with water containing enough fluoride to protect teeth from caries. In 2000, a total of 38 states and the District of Columbia provided access to fluoridated public water supplies to $\geq 50\%$ of their populations.⁷ A national objective aims to ensure that at least 75% of the population will be served by community water systems providing optimal levels of fluoride by the year 2010.³

CWF is strongly recommended based on its effectiveness in reducing the occurrence of dental caries within communities. Other positive effects mentioned, but not systematically evaluated, include (1) reducing disparities in caries risk and experience across subgroups defined by socioeconomic status, race or ethnicity, and other predictors of caries risk⁸; and (2) the “halo” or “diffusion” benefits to residents of nonfluoridated communities by means of exposure to processed food and beverages made from fluoridated water.⁹

The safety of fluoride is well documented and has been reviewed comprehensively.^{6,8,10} Enamel fluorosis (visible discoloration of tooth enamel) is one of the potential adverse effects seen in children who ingest too much fluoride from any and all sources while tooth enamel is forming. Most cases of enamel fluorosis seen today are of the mildest form, which does not affect aesthetics or function. The most recent review of potential adverse effects of CWF showed no clear association between water fluoridation and incidence of mortality from bone cancers, thyroid cancer, or all cancers.⁸

Program costs of CWF are affordable. Median cost per person per year ranges from \$2.70 among 19 public water systems serving ≤ 5000 people to \$0.40 among 35 systems serving populations $\geq 20,000$. Estimated cost-effectiveness ratios (i.e., net cost per tooth surface spared from decay) indicate that CWF is cost saving (i.e., saves money from a societal perspective and also reduces caries).⁴

School-based or school-linked pit and fissure sealant delivery programs: strongly recommended. School-based or school-linked pit and fissure sealant delivery programs directly provide pit and fissure sealants to

children unlikely to receive them otherwise. School-based programs are conducted entirely in the school setting, and school-linked programs are conducted in both schools and clinic settings outside schools. Such programs define a target population within a school district; verify unmet need for sealants (by conducting surveys); get financial, material, and policy support; apply rules for selecting schools and students; screen and enroll students at school; and apply sealant at school or offsite in clinics. Many programs target what are referred to as high-risk children with high-risk teeth.^{3,6} High-risk children include vulnerable populations less likely to receive private dental care, such as children eligible for free or reduced-cost lunch programs.⁶ High-risk teeth (i.e., those with deep pits and fissures) are the first and second permanent molars that erupt into the mouth around the ages of 6 and 12 years, respectively. School-based and school-linked sealant delivery programs are strongly recommended on the basis of strong evidence of effectiveness in reducing caries on occlusal surfaces of posterior teeth among children.

Other potential positive and negative effects of school-based or school-linked sealant delivery programs have been mentioned but remain unsupported by empirical evidence of effectiveness. For example, successful programs may lead to the positive effects of (1) increased support for coordinated school-based programs to address related dental and nondental needs of children from low-income families (e.g., immunization and better nutrition); and (2) increased willingness of third-party payers to pay for sealants applied in all settings. Potential negative effects are expressed in concerns that (1) sealants containing Bisphenol-A may have estrogenic effects in the recipient; and (2) effective delivery of sealants (from all sources) might encourage recipients to ignore other anticaries interventions (e.g., use of fluorides).

Economic evaluation studies reported sealant program costs per person served ranging from \$18.50 to \$59.83 (median=\$39.10). The cost effectiveness ratios (adjusted cost per averted decayed surface) ranged from cost saving ($< \$0$) to \$487. A hypothetical school-based sealant program that sealed first permanent molars would be cost saving if unsealed molars were decaying at the average rate of > 0.47 surfaces per year.

Statewide or community-wide sealant promotion programs: insufficient evidence. Statewide or community-wide sealant promotion programs encourage sealant use among private practitioners and through community-based programs. Program activities include continuing education courses for dental health professionals; educational campaigns for consumers, community leaders, and third-party payers; and efforts to promote school-based or school-linked sealant delivery programs. Statewide or community-wide sealant promotion

programs aim to increase public and professional awareness of the health benefits of sealants, encourage third-party reimbursement for sealant application, increase appropriate use of sealants by practitioners, and increase access to sealants for disadvantaged populations who might not get them otherwise (e.g., through school-based programs). The one available study that evaluated a statewide sealant promotion campaign provided insufficient evidence to assess the program's effectiveness in changing public or professional behavior or in reducing dental caries statewide. The evidence was insufficient because of limitations in study design and execution, which did not allow valid attribution of reported changes in sealant use to the intervention.

Interventions to Prevent or Control Oral and Pharyngeal Cancers

Since 1992, organized efforts to develop and implement a national strategic plan for preventing and controlling oral and pharyngeal cancers have been gaining momentum in the United States.¹¹ In 1996, a coalition of national, state, and local health agencies began promoting coordinated strategies in five areas: (1) advocacy, collaboration, and coalition building; (2) public health policy; (3) public education; (4) professional education and practice; and (5) data collection, evaluation, and research. Despite the organized efforts described above, the effectiveness of population-based interventions to prevent and control oral and pharyngeal cancers, specifically to reduce mortality or improve quality of life, remains unknown.

Population-based interventions for early detection of pre-cancers and cancers: insufficient evidence. Population-based interventions for early detection of pre-cancers and cancers educate the public about risk factors, symptoms, signs, and the value of early detection; encourage high-risk or symptomatic individuals to examine themselves for suspicious lesions and to seek out a source of professional examination and follow-up; train health workers to detect suspicious lesions; examine people at the workplace, home, health fairs, field clinics, or the usual source of care; and refer eligible people with suspicious lesions (e.g., leukoplakia, erythroplakia, lichen planus, submucous fibrosis, and oral cancer) for follow-up and treatment.

The Task Force identified 19 studies with limited quality of execution. Those studies provide insufficient evidence of the effectiveness of early detection programs in improving stage distribution, morbidity, mortality, or quality of life at the population level.

Interventions to Prevent or Control Sports-Related Craniofacial Injuries

The consequences of sports-related injuries (e.g., bone fractures, tooth loss, concussions, brain damage) range

from something as simple yet frustrating as a loss of game time to the much more serious events of paralysis and death. Helmets, facemasks, and mouthguards protect users from injuries to the head, face, and mouth. Protective equipment is mandatory in some professional sports: baseball requires use of helmets, football requires helmets and facemasks, ice hockey requires helmets, and boxing requires mouthguards. In amateur sports, helmets, facemasks, and mouthguards are mandatory in boxing, football, ice hockey, and men's lacrosse, and mouthguards are mandatory in women's field hockey. *Healthy People 2010*³ established a developmental objective to increase the proportion of public and private schools that require use of appropriate head, face, eye, and mouth protection for students participating in school-sponsored physical activities.

Population-based interventions to encourage use of helmets, facemasks, and mouthguards in contact sports: insufficient evidence. Population-based interventions to encourage the use of helmets, facemasks, and mouthguards in contact sports aim to prevent injuries to the head, face, and mouth. Rules of play involving use of helmets, facemasks, goggles, and mouthguards vary by sport and position played. Intervention programs educate health professionals, parents, coaches, players, and officials of organized sports about the risks of injury and the potential benefits of protective equipment; offer incentives for regular use of protective equipment at both practice and formal competition; and encourage the enforcement of rules of play involving use of safety equipment. The Task Force identified four qualifying studies that evaluated the effectiveness of intervention programs in (1) increasing the frequency of correct use of helmets, facemasks, and mouthguards; and (2) reducing the incidence, prevalence, or recurrence and type and severity of sports-related injuries to the head, face, and mouth. Those studies provide insufficient evidence of the effectiveness of such programs in changing the behavior of players or in reducing the frequency of sports-related injuries to the head, face, and mouth. Although effectiveness could not be established, mainly because of inadequate number, design, or execution of studies, readers are reminded that the use of helmets, facemasks, and mouthguards is mandatory in many sports and encouraged by a *Healthy People 2010* objective.³

Interpreting and Using the Recommendations

Given that oral health conditions cause considerable morbidity and even mortality, and that activities to promote oral health are ongoing throughout the United States, the recommendations in this report should be relevant to most communities. Communities, school systems, healthcare systems, and oral health

practitioners should consider starting program planning and implementation cycles by

- Assessing their goals in light of national goals and objectives³;
- Assessing the current burden of oral health conditions in their populations;
- Reviewing the current status and history of intervention activities; and
- Identifying opportunities for improving intervention effectiveness and oral health status.

Subsequently, in deciding which combination of interventions is most likely to meet local objectives, decision makers should consider state and local laws and regulations, resource availability, administrative structures, economic and social environments of implementing organizations and practitioners, and recommendations and other evidence provided in this and other reports, including those of the U.S. Surgeon General^{6,12}; the National Health Service Centre for Reviews and Dissemination, University of York⁸; the Centers for Disease Control and Prevention^{7,11}; the Institute of Medicine¹⁰; and the Canadian Task Force on Preventive Health Care.^{13,14}

The Task Force has strongly recommended community water fluoridation and school-based or school-linked pit and fissure sealant delivery programs. Although the Task Force generally does not use economic information to modify recommendations, this information, provided in the accompanying article,⁴ can help local policymakers in the decision-making process. If local goals and resources permit, the use of these interventions should be initiated or increased. In addition, these particular interventions should be considered in the context of other community-wide, provider-based, and individual strategies for preventing or controlling dental caries in communities.^{3,6,7}

The Task Force's decision to make no recommendation for or against the use of three other reviewed interventions at the community level (statewide or community-wide sealant promotion programs; population-based interventions for early detection of precancers and cancers; and population-based interventions to encourage use of helmets, facemasks, and mouthguards in contact sports) indicates the need for high-quality research on their effectiveness. Until the results of such research become available, readers may judge the usefulness of these interventions based on other criteria. Although the effectiveness of community-wide sealant promotion programs remains unknown, the clinical safety and effectiveness of sealants have been established.^{15,16}

Where organized efforts are being considered to reduce the burden of oral cancer, the findings presented here should be considered together with recommendations of other groups.^{6,11,13,17,18} For example, more widespread use of effective strategies to reduce

tobacco use, an important cause of oral and pharyngeal cancer,^{6,18–20} should be encouraged and periodic oral examinations of people engaging in risk behaviors (tobacco use or excessive alcohol consumption) or manifesting suspicious symptoms may be considered by clinicians.^{6,13}

Finally, in the absence of a community-wide recommendation on use of protective head and face equipment in contact sports, it should be noted that the frequency and severity of head, face, and oral injuries have decreased in some sports since the use of helmets, facemasks, and mouthguards became mandatory in selected organized contact sports (e.g., football and ice hockey).^{21,22}

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