

The Role of Evidence in Formulating Public Health Programs to Prevent Oral Disease and Promote Oral Health in the United States

**Barbara F. Gooch, DMD, MPH^a,
Susan O. Griffin, PhD^a, Dolores M. Malvitz, DrPH^b**

From the ^aDivision of Oral Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control Prevention, and ^bPublic Health Consultant, Atlanta, GA

A major goal of federal, state, and local health agencies is to reduce the burden of disease in populations. To obtain sufficient resources to achieve this goal, they must document the importance of the health problems addressed and the impact and efficiency of programs. CDC supports core activities within state and local health departments to promote health and prevent disease. This presentation will focus on the need for evidence to document the effectiveness of these activities that include routine monitoring of oral health, risk behaviors, and other factors; implementing effective population-based interventions; and evaluating programs to ensure successful translation of interventions. CDC supports research to build the evidence for innovative strategies to promote oral health in communities. This presentation should increase awareness of evidence-based tools and activities that are supported by CDC to strengthen public health practice within states.

INTRODUCTION

A major goal of public health agencies is to reduce the burden of disease. To advance this effort, programs need resources to develop, improve, and expand strategies and services that work. To justify the need for appropriate resources and compete successfully within public health agencies, oral health programs first must establish the burden of oral diseases and conditions by providing compelling data that are easily understood by decision makers. Proponents must identify interventions that have been determined to be effective and cost-effective through comprehensive reviews and then translate these into evidence-based community programs that demonstrate both impact and efficiency.

Support for public health programs from the Centers for Disease Control and Prevention (CDC) is shaped by its mission that focuses on preventing and controlling disease and promoting healthy behaviors.¹ The importance of prevention, health promotion, and, most recently, health protection has

been highlighted in several recent publications.²⁻⁵ A few key points will be reviewed here.

Although it has been estimated that less than 1% of the \$1.9 trillion spent on health care annually in the United States is directed toward protecting health and preventing illnesses and injuries,⁴ people universally value health and, given a choice, would prefer not to have a disease at all. Major health risks include genetics and gestational factors, socioeconomic circumstances, environmental conditions, behavioral choices, and quality or use of health services.²⁻⁴ When each of these factors is examined in isolation, behavior has the largest impact of the 5—accounting for about 40% of premature deaths.² An oral health example of the substantial effect of behavior is the elevated risks for periodontal diseases and oral and pharyngeal cancers among those who use tobacco.^{6,7}

We also know that these health risks are interconnected.²⁻⁵ Expression of specific genes can be influenced by environmental or behavioral factors. Behavior and use of health services are strongly associated with socioeconomic conditions and policies. These relationships suggest that while delivery of effective clinical preventive services remains an essential strategy for reducing health risks, important

influences that support or hinder individual behavior lay outside the clinic.

Personal behavior change is best achieved when reinforced not only at the level of the individual, but through family and social networks; through policies and procedures at schools, workplaces, health facilities, and other organizations; and through community environments and public policy.⁸ To implement approaches that succeed, public health agencies must work not only with clinicians and researchers, but must reach beyond the clinic and the health sector to engage affected communities, policy makers, and partners in organizational settings.²⁻⁵ Such approaches can create policies and environments that support behavior changes at the individual, community, and population levels and promote health broadly.

CDC supports activities that reflect its mission of disease prevention and health promotion. These activities include (1) monitoring health status, risk behaviors, and other associated factors; (2) implementing prevention strategies for which there is evidence of effectiveness; (3) evaluating programs to ensure that implementation has been successful; and (4) supporting public health research that directly applies to policies and programs. We will discuss the importance of these activities for oral health programs, the need for evidence, and examples of success stories.

MONITORING ORAL HEALTH

Monitoring or surveillance of oral health is the ongoing, systematic collection, analysis, and dissemination of data for use in public health practice.⁹ Surveillance and epidemiology provide the foundation for establishing the burden of disease, framing the problem, selecting appropriate interventions, and assessing program outcomes.⁵ In contrast to established protocols for detailed and resource-intensive visual-tactile clinical examinations with multiple data fields, monitoring in public health requires less costly and simpler methods that can routinely document the extent and severity of disease and risks.¹⁰ These methods should present findings in formats that are understood by nondental decision makers and provide data for inclusion in publicly available Web-based information systems. Such systems would include the National Oral Health Surveillance System¹¹ and the Behavioral Risk Factor Surveillance System.¹²

Innovative methods for ongoing monitoring must be reliable and valid when tested against current “gold” standards. CDC continues to work with key partners, such as the Association of State and Territorial Dental Directors (ASTDD) and American Academy of Periodontology (AAP), to develop simplified approaches to monitoring caries and periodontal disease, respectively. These approaches measure disease, risk factors, and infection at the person—rather than tooth—level and provide estimates of disease for communities or populations. We will look at 2 examples.

Basic Screening Survey

In the 1990s CDC and ASTDD developed a protocol for assessing caries and sealant prevalence, commonly known as

the Basic Screening Survey, to facilitate statewide monitoring of schoolchildren.¹³ The protocol uses a visual assessment and Stop-After-First-Encounter design for documenting the presence of caries and sealants. With appropriate sampling frames, the screening survey can provide prevalence estimates for specific populations. When tested against findings of a comprehensive visual-tactile examination as a reference standard, validity of the screening protocol was high for detection of both untreated decay and restorations with more than 90% for sensitivity, specificity, and predictive values in a population with 30% to 40% prevalence of caries (treated and untreated).¹⁰ Sensitivity was lower for presence of sealants (59%)—reflecting the lack of tactile reference for sealants that were not tinted. Modified methods to estimate severity have been examined.¹⁴

Self-Reported Measures for Periodontal Infections

In partnership with the AAP, CDC has assembled an expert work group of periodontists and epidemiologists to recommend acceptable self-reported measures for surveillance of periodontal infections. The process for identifying feasible measures has included completion of a literature review on the validity of self-reported measures for periodontal disease,¹⁵ development of population-based case definitions of severe and moderate periodontitis acceptable to clinicians, and analysis of research databases that collected both clinical and self-reported measures. The validity of a combination of several potential self-reported measures currently is being assessed in the Australian National Survey of Adult Oral Health (ASAOH). This pilot study should be completed in 2006. Feasibility testing of these questions to generate U.S. population-based estimates is being considered.

Original Research

In addition to research on surveillance methods, CDC has conducted original research to address gaps in knowledge about the state of oral health in the United States. One example is the development of national estimates of caries incidence among older adults. Investigators completed a systematic review of incidence studies of selected groups and found that, on average, older adults developed about one new carious surface annually.¹⁶ This rate is about 30% higher than rates for children¹⁷ and suggests that older adults could benefit from prevention programs.

IMPLEMENT EFFECTIVE PREVENTION STRATEGIES

Systematic Reviews and Evidence-Based Recommendations

Implementation of effective prevention strategies is best supported by documented effectiveness of community- or population-based interventions as well as models and tools that facilitate translation into effective and efficient programs. Resources that provide systematic reviews or narrative

summaries of the best available evidence for community interventions to promote oral health are *Oral Health in America: A Report of the Surgeon General*,¹⁸ CDC's *Recommendations for using fluoride to prevent and control dental caries in the United States*,¹⁹ and *The Guide to Community Preventive Services* (the Community Guide).^{20,21}

Inclusion of oral health in the Community Guide—with more visible public health topics, such as vaccine-preventable diseases, motor vehicle injuries, and tobacco use—reflected the opinion of the Task Force on Community Preventive Services that “promoting oral health is solidly in the mainstream of public health practice and not exclusively the concern of dental health practitioners” (p. 21).²¹ The Task Force is an independent, nonfederal body appointed by the director of CDC.²² The Community Guide provides a set of recommendations for action based on systematic reviews of the scientific evidence of effectiveness. Staff at CDC coordinate the reviews under the direction of the Task Force, which makes decisions about recommendations. In general, strength of the evidence of effectiveness links directly to the strength of the recommendation. Community Guide methods have been summarized elsewhere.²³ For selected community interventions to promote oral health the Task Force recommended water fluoridation and school-based and school-linked dental sealant programs on the basis of strong evidence of effectiveness in preventing dental caries.^{20,21} Decision makers should consider these recommendations in the context of local needs, goals, and constraints.

Other sections of the Community Guide also are relevant for the promotion of oral health, eg, those focusing on alcohol use, diabetes, substance abuse, and tobacco use.²⁴ As one example, key elements of interventions recommended by the Task Force to prevent tobacco use include increasing the unit price for tobacco products, provider reminder systems with provider education, and telephone quit lines.^{25,26} At federal and state agencies these interventions are coordinated through tobacco control units. However, oral health programs play an important role in ensuring, for example, that toll-free numbers for telephone quit lines and opportunities for provider education are disseminated to dental providers.

Best Practices in State and Community Oral Health Programs

Translation of effective interventions into state and local programs that can improve the oral health of communities demands evidence-based models and evaluative tools. The ASTDD Best Practices Project²⁷ was organized to develop effective, state-of-the-art oral health programs through the promotion of best practices, ie, a service, function, or process that has been fine-tuned to produce superior results. Dental directors and lead dental consultants of 47 state/territorial health agencies identified and ranked the following criteria as key indicators of a best practice: evidence of effectiveness, cost and resource efficiency, program sustainability, partnership development, and supporting rationale or objectives.

The most visible activity of the Best Practices Project has been the development of comprehensive Best Practice Approach Reports for essential program strategies.²⁸ Each report describes key activity areas for each strategy and documents the strength of supporting evidence, ie, research, expert opinion, field lessons from program evaluation, and theoretical rationale. Evidence of effectiveness is strong for 2 strategies, community water fluoridation and school sealant programs. Evidence for other strategies, eg, state coalitions and state program mandates, are considered promising and require additional studies that demonstrate improved outcomes.

State and community practice examples are provided for each strategy and illustrate different, successful implementation methods. To date, 45 states and 2 US territories have submitted their success stories to support analysis of best practices and the development of resource information (Association of State and Territorial Dental Directors, ASTDD Best Practices Project, unpublished data, 2005). One important project outcome has been the identification of the need to strengthen program evaluation to further the development of implementation criteria and models.

EVALUATE PROGRAMS TO ENSURE SUCCESSFUL IMPLEMENTATION

Evaluation has been defined as “a systematic process for an organization to obtain information on its activities, its impacts, and the effectiveness of its work so that it can improve its activities and describe its accomplishments” (p. 3).²⁹ Public health programs are increasingly held accountable for timely information, collected through established systems, which measure program implementation, efficiency, and progress toward goals and objectives. Most state oral health programs, however, have limited capacity to collect and analyze data or to use findings. CDC has responded to state requests for practical evaluative tools with the development and implementation of interactive software systems such as the Water Fluoridation Reporting System³⁰ and the Sealant Efficiency Assessment for Locals and States,³¹ described briefly below. Additional tools for other essential program components (eg, surveillance, state plans, and coalitions) are under development.

Water Fluoridation Reporting System (WFRS)

This national Web-based data system assists states in administering water fluoridation programs. WFRS ensures that states have the capacity to monitor the fluoridation status of community water systems, the maintenance of optimal fluoride levels for caries prevention, and the accuracy of state testing of water fluoride levels. Currently, 37 states and 17 tribes use WFRS (Centers for Disease Control and Prevention, Division of Oral Health, unpublished data, 2005). This system also calculates the percentage of the US population receiving fluoridated drinking water—a measure necessary to track progress toward the national objective of 75% of persons on community water systems

with optimally fluoridated water.⁷ Publicly available information on the fluoridation status of water systems in participating states can be found at *My Water's Fluoride*,³⁰ an additional interactive feature of WFRS.

Sealant Efficiency Assessment for Locals and States (SEALS)

This evaluation software package helps individual communities and states measure the effectiveness and efficiency of their school sealant programs.³¹ SEALS software automates the capture, storage, and analysis of data on oral health status, types and numbers of services delivered, program costs, and logistics (eg, personnel, equipment, materials, travel). Reports generated by SEALS can be used to benchmark programs, evaluate current practices, and justify the program to policy makers. Examples of summary and performance measures generated by SEALS are cost per child sealed, averted caries estimated from baseline caries attack rates and sealant retention data, and number of children sealed per chair hour.

SUPPORT PUBLIC HEALTH RESEARCH

Public health research is research that is directly applicable to public health policy and practice. As previously noted, the Task Force on Community Preventive Services found evidence of effectiveness for community water fluoridation and school sealant programs.^{20,21} The Task Force also reviewed other population-based strategies, such as programs to encourage use of mouth guards and protective equipment in contact sports and early detection of oral and pharyngeal cancers. For these community interventions the Task Force found that there was insufficient evidence to make a recommendation. Their findings are just one reflection of the enormous need to design and test strategies that not only will build the evidence for established interventions, but will translate new discoveries from biomedical, social science, and communications research as well as other disciplines (eg, economics, informatics, and systems analysis) into policies, programs, and tools that have the potential to reach all persons in all communities.⁴

In 2005 CDC developed its first-ever public health research agenda to identify broad and cross-cutting research areas and themes critical for protecting the nation's health.³² The agency has engaged staff, external partners, stakeholders, and the public to ensure that key areas are addressed, to encourage multidisciplinary collaborations that focus on communities as well as individuals, and to facilitate translation of discoveries into effective tools to support the needs of a diverse constituency.

One way in which CDC's Division of Oral Health has responded to the call for translational, community-based research has been by supporting projects through CDC's largest research center program—the Prevention Research Centers (PRCs).³³ This national network of 33 university-based centers works with diverse groups in geographically

distinct areas to focus on key health problems. The centers engage communities as partners and participants in research and collaborate with state and local public health agencies. Currently funded projects aim to improve the oral health of vulnerable communities by evaluating innovative interventions designed to increase awareness of oral health and to change behaviors among the key population.³⁴

CONCLUSION

Initiating and sustaining programs to prevent disease and improve the oral health of populations demands evidence that documents the importance of the health problem, the effectiveness of proposed interventions, and the impact and efficiency of programs. CDC works with its partners to strengthen the evidence base for public health practice. This presentation highlighted development of innovative and simplified measures for routine monitoring of oral diseases, implementation of prevention strategies shown to be effective, development of practical evaluation tools for state and local programs, and support of community-based research.

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