

Dental Public Health Research in Action: Population and Community-Based Research

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ABSTRACT

Dental public health investigators conduct research from a population and societal perspective. Population-based epidemiologic studies are at the heart of dental public health research, as well as many other types of clinical and translational studies that aim to benefit dental practice, influence oral health policies, and improve the oral health and health of the public.

This article gives examples of dental public health research in action, including many ongoing or recently completed studies conducted in California.

In their quest to improve oral health, dental practice and health policy, dental public health researchers often venture far from dental offices to conduct their field work. They sometimes take on the persona of a detective and may find themselves in unexpected places and puzzling situations. In at least one instance, a public health team found itself escorted by armed guards.

The scene of this particular “adventure” occurred on an island in the middle of the St. Lawrence River: half in United States territory and half in Canada. It began when the New York State Health Department received reports of a high prevalence of enamel defects in children’s teeth presumed to be “dental fluorosis,” allegedly caused by an aluminum plant emitting particles containing fluoride into the environment. Local cows were eating contaminated grass, presumably consuming large quantities of fluoride, which led to skeletal fluorosis in some of these animals. To further complicate the issue, three different Mohawk tribal councils resided on the island, giving this potential environmental issue an international and inter-tribal setting. A dental public health team from the New York State Health Department conducted an epidemiologic investigation of children residing on and off the St. Regis reservation. During the course of the investigation, violence broke out between two feuding tribal councils, unrelated to dental concerns.

At this time, the author was in the process of moving to Albany, N.Y., to begin her dental public health residency with that state’s health department. She received newspaper clippings showing the research team being escorted to the dental examination site by armed guards. Their epidemiologic investigation subsequently revealed that the children did not have fluorosis, but instead exhibited tetracycline staining on their teeth, a finding confirmed histologically. Interviews with parents led the team to a pediatrician who had been prescribing tetracycline. Many families with young children routinely kept a bottle of the antibiotic in their refrigerator for use when their children were sick.¹ Mystery solved.

This example of dental public health research in action is more dramatic than most. As with most types of research, there is a problem to be solved, often involving some detective work. Information is gathered and subsequent analysis leads to the thrill of discovery. For dental public health investigators, the problem often focuses on an aspect of oral health that involves a community or population-based approach to determine the answer. Unlike the clinical practice of dentistry that focuses on the individual patient,



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dental public health focuses on the larger population and societal perspectives. It may include people with or without access to dental care. Dental public health considers many determinants of oral health including behavioral, biologic, environmental, health care delivery systems, and other contextual factors, and seeks to understand how these factors interact over time. Often, dental public health research begins with an epidemiologic survey or needs assessment to identify the oral health status of a community. With this information, oral health problems are identified and interventions designed. Many types of research may be included under the dental public health umbrella including, but not limited to, epidemiologic studies, clinical trials, qualitative and evaluation research, oral health promotion and health education, as well as health services research and health policy research.

The California Oral Health Needs Assessment of Children, conducted in 1993-1994 by Pollick and colleagues, is an example of an epidemiologic survey designed to determine the oral health status of preschool and schoolchildren in the state.² This assessment revealed a high prevalence of early childhood caries in some California population groups. Among all preschool children, the prevalence of early childhood caries was 14 percent. However, among low-income families, Asian children enrolled in Head Start programs had a prevalence of 39 percent; and Hispanic children had a prevalence of 44 percent. Another study conducted by Ramos-Gomez and Martinez near the U.S.-Mexico border showed the prevalence among Hispanic children between the ages of newborn and 5 to be 58 percent.³ This dental public health problem provided the focus for the NIH-funded Center to Address Disparities in Children's Oral Health, nicknamed the CAN DO Center,

based at the University of California San Francisco (www.ucsf.edu/cando). The mission of the CAN DO Center is to conduct research to understand, prevent, and reduce oral health disparities. It is one of five such centers across the nation.⁴

Public health research often involves a multidisciplinary team working together. The CAN DO Center is a good example. In addition to public health dentists, the team includes experts in epidemiology,

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biostatistics, cariology, health psychology, pediatric dentistry, medicine, health policy, information systems, health economics, microbiology and anthropology. The center currently works closely with its two community partners, the San Francisco Department of Public Health and the San Ysidro Community Health Center, located at the U.S.-Mexico border, as well as the National Institute for Dental and Craniofacial Research.

The center uses an octahedron model as the framework for organizing its research themes (Figure 1). The horizontal plane has four corners that represent the child, the family, the community and the health care system. The Y-axis represents the continuum between health and disease. A combination of factors can interact in different ways to determine where a child might be on the health status continuum. It is important to study not only individual factors, like those the patient will present in the dental chair, but also the contextual factors that may change over time. For example, a dentist's recommendations about lifestyle factors, such as eating a healthy, noncariogenic diet and getting sufficient

exercise are more feasible to implement for a family in a high socioeconomic status neighborhood with access to fresh produce, and safe, well-lit streets and parks, than a family living in an unsafe neighborhood without nearby access to a full grocery store.

The CAN DO studies include two randomized clinical trials, the gold standard of clinical research, to test ways to prevent early childhood caries. One trial, conducted at the San Francisco Chinatown Public Health Center and the San Francisco General Hospital Family Dental Center, has been testing the efficacy of fluoride varnish and parental counseling to prevent early childhood caries.⁵ Young children, mean age 22 months old, were randomized to one of three treatment arms:

assigned to receive either fluoride varnish once or twice a year along with parental or caregiver oral health counseling, or counseling only without fluoride varnish. Data collected at enrollment indicated that the low-income, mostly Hispanic families seen at San Francisco General Hospital were more likely to report giving the child a pacifier dipped in honey, while their mothers were more likely to have recent dental caries experience than those at the Chinatown Public Health Center. However, at the Chinatown Public Health Center, caregivers were more likely to report that they do not brush their child's teeth; and if they do, they do not use fluoride toothpaste.⁶ These differential caries risk indicators and cultural practices are important to identify when planning health promotion and caries prevention activities. All low socioeconomic status communities are not the same and "one-size-fits-all" programs to prevent oral disease may be inappropriate.

The second CAN DO clinical trial focuses earlier in the disease prevention pathway, with pregnant women instead of young children. This study is being conducted by Ramos-Gomez at the San

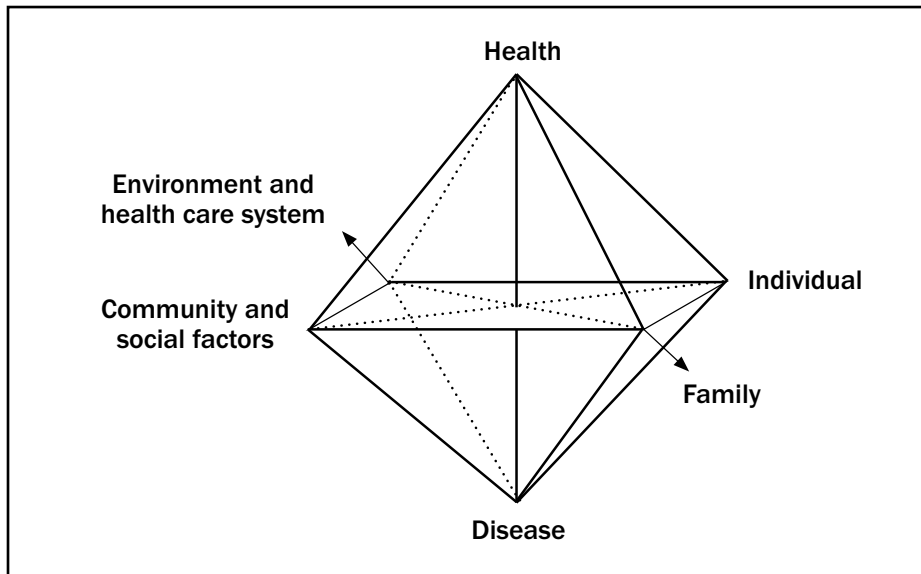


Figure 1. Octahedron model: a multifaceted approach for studying health and disease.

Ysidro Community Health Center.⁷ Pregnant women are recruited and receive oral health counseling. One recruitment strategy is hosting baby showers at the health center by the research team. For some of these women, this is their only baby shower; and they are very appreciative. Once the babies are born, the women are randomized to either “usual care” or the “intervention group.” The women in the intervention group receive a chlorhexidine rinse regimen beginning four months postpartum. The intent is to reduce their salivary levels of cariogenic bacteria and thus the potential for transmitting the bacteria by shared foods and utensils to their babies. The children, once they are old enough, will receive fluoride varnish applications. Mother and child both receive periodic oral health screenings and referral for dental care as needed. This caries management model is conducted in conjunction with well-child visits and integrated with other health center programs and activities.

Another CAN DO study, initiated by the late Dr. Patricia Evans and later completed by Hilton and Stephen at the San Francisco Department of Public Health, is an example of qualitative

research designed to determine access and cultural barriers to preventive dental care for children.⁸ Focus groups were conducted among San Francisco parents and caregivers of 1- to 5-year-old children in four race/ethnic groups: Chinese, Filipino, Hispanic, and African-American. Separate groups were conducted for younger and older caregivers, U.S. born and not U.S. born, as well as in English and other languages. Different attitudes toward prevention and beliefs regarding oral health care were elucidated. For example, when asked when was the best time to take their child to the dentist, non-U.S. born caregivers were more likely to respond with older ages than U.S. born caregivers. Many parents indicated that they have tried to overcome their personal bad dental experiences to provide good dental experiences for their children and grandchildren. Unfortunately, several of the parents told stories of their children being strapped down, criticized and being denied services because of “poor behavior.” Ironically however, although children’s bad behavior (kicking, hitting, crying, etc.) was described to a lesser extent by other ethnic groups

in the study, African Americans were the only parents who openly spoke of being sanctioned by dental staff. This raises a serious concern about how the racial or social perceptions held by dental staff affect their behavior toward African American clients, versus their treatment of similar or same behaviors in clients from other ethnic backgrounds. A different perspective was provided by an older Chinese immigrant caregiver who noted “My grandkids sometimes lose their teeth while brushing so there is no need to go to the dentist.” She also brought up the idea that plaque increases bodily “heat,” and discussed traditional Chinese dietary and herbal remedies for tooth problems, a discussion enjoined readily by the other participants in the focus group. This discussion about diet and eastern “medicine” beliefs was useful as it points to the role of cultural values, age, and immigrant status in linking beliefs about teeth and preventive care (or conditions associated with oral health). These “invisible” cultural perspectives are often difficult for dentists to uncover and understand as, in turn, these are such taken-for-granted cultural ideas that patients may not be able to articulate them very fully even when asked. The long-term goal is to use these types of information to design culturally appropriate programs, interventions, and oral health services.

Not all dental public health research is focused on children or prevention. Each age group across the lifespan has unique dental concerns and challenges. Other types of research focus on the relationships between oral health and systemic health. The research is often designed to be translational in nature, evaluating the effectiveness of new techniques, diagnostic tools, or materials, with implications for dental practice or health policy. For example, an NIH-funded randomized clinical trial comparing methods of getting dentists to provide tobacco cessation to their patients is currently being conducted by Walsh and colleagues at

UCSF in conjunction with Delta Dental of California. This study will compare the effects of low vs. high intensity cessation training for dentists and their staff and whether or not they receive third-party reimbursement. Three types of outcomes will be measured: 1) patients' report of their dentists' assessment and treatment of tobacco use behaviors during target visits, 2) dentists' knowledge, attitudes and behaviors related to assessment and treatment of tobacco use, and 3) patients' report of their compliance with dentists' tobacco control recommendations. The results of this study will have important implications for incorporation of tobacco cessation activities in dental practice and subsequent prevention of tobacco-related oral and other diseases.

In another project, results of a survey showed that most dentists did not routinely ask their patients about family violence, even when injuries around the head and neck were present.⁹ Dentists who reported some education about the issue were more likely to ask. The investigators designed an engaging and very brief multimedia tutorial specifically targeted to dentists. To address the lack of published studies reporting on ways of helping dentists address this issue, the investigators conducted two rigorous controlled trials, one with a sample of University of California San Francisco and University of the Pacific dental students and the second with practicing dentists.^{10,11} The study results found strong evidence that the tutorial helps dentists to provide an effective and compassionate response when their patients exhibit signs of domestic violence.

Sometimes, dental public health researchers analyze an oral health component of a larger health-oriented study. For example, the 2001 California Health Interview Survey included several questions about dental utilization and dental insurance. Dental public health researchers used this statewide survey to make population estimates of the number of

children and adults who utilize dental care on an annual basis and the type of care received. They have been able to estimate that 2 percent of California adults, age 18 and older, and 18 percent of California children ages 2 to 11 have never been to a dentist.^{12,13} In a state as large as California, these percents translate into thousands of people: about 553,000 adults and 954,000 children. Children with any dental insurance were more than twice as likely to have a dental visit in the past year than uninsured children, (95 percent CI=2.3-3.1), and twice as likely to have had a preventive dental visit in the past year (95 percent CI=1.9-2.4).

Dental public health researchers are also involved with evaluation research

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and concerned about outcomes such as oral health related quality of life, cost of care, and patient satisfaction. A project conducted by Hyde and colleagues investigated these issues in a new, unique program initiated by the San Francisco Departments of Human Services and Public Health that provided rehabilitative dental care to adults in the "welfare-to-work" Personal Assisted Employment Services Program program.¹⁴ Completed dental treatment was associated with improved oral health related quality of life, measured by positive changes in dimensions, such as psychological discomfort and disability, physical pain and social disability.

Dental public health researchers encourage young investigators to enter the field. Last summer, UCSF dental student Jung Park, along with UCSF mentors and assistance from the California Department of Health Services, the SF dental public health agency, and the San Francisco Health Plan, evaluated the new "universal health care program" for low-income children in San Francisco County,

called "Healthy Kids."¹⁵ This public program, which includes financing for dental care, was initiated in the county in 2002, the second California county, after Santa Clara, to do so. Information was gathered to describe the program, assess dental utilization and provider participation, and the types of services being provided. Some comparisons could be made with the Denti-Cal program, the long-standing publicly financed program for low-income children, though the eligibility requirements are different for the Healthy Kids program. This example of dental health services research accrued information that can be used by other counties deciding whether or not to initiate similar programs.

Another UCSF dental student, Tiffany Hsu, spent a summer conducting a survey of dental and medical patients, and parents of pediatric dental patients, attending the four San Francisco health centers

that provide dental services.¹⁶ In addition to dental care for children, two centers do and two do not also provide adult dental services. This project is an example of dental health policy research because at the time, there was concern that the programs for adult dental services would be cut, thus, this project had health policy implications. She wanted to compare the oral health status and dental utilization patterns of patients at these different types of centers, and determine the patient perceptions of the ramifications of eliminating adult dental services.

A final example of the intersection of dental public health research and dental practice was the Florida investigation of the potential transmission of HIV from an infected dentist to several of his patients following invasive dental procedures.¹⁷ The dental public health team from the Florida Department of Health and the Centers for Disease Control and Prevention were able to review dental records, develop appropriate interview questions for the dental office employees and evaluate the



sterilization and infection control techniques, and other practices used in the dental office. The investigative procedures developed were subsequently used in other investigations. Although lapses in infection control and other dental office practices could not explain these transmissions, findings led to increased awareness among the dental community and public about recommended procedures.¹⁸ Ultimately, improved compliance with infection control and development of universal precautions changed the practice of dentistry.

Conclusion

The American Association of Public Health Dentistry and the Oral Health Section of the American Public Health Association have developed a detailed

research agenda for dental public health.¹⁹ The mission statement for the American Association of Public Health Dentistry is "Optimal Oral Health for All!" Similarly, the ultimate goal of dental public health research is to improve the oral health of the public and obtain optimal oral health for all. **CDA**

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