# Dental Public Health for the 21st Century: Implications for Specialty Education and Practice

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#### Abstract

A panel of public health practitioners sponsored by the Health Resources and Services Administration met December 6-8, 1994, to examine current roles and responsibilities for dental public health workers and to recommend changes in education and training to meet challenges posed by an evolving health care system. Overall, at least the same number, if not more, dental public health personnel will be needed in the future. While some new roles were identified, the panel felt that only small numbers of personnel will be needed to fill these new roles. Not all of these roles necessarily require a dental degree. The panel felt that a need exists for more academicians for dental schools, schools of public health, dental public health residencies, and dental hygiene programs; oral epidemiologists and health services researchers; health educators; and specialists in utilization review/outcomes assessment, dental informatics, nutrition, program evaluation, and prevention. To meet these personnel needs: (1) dental public health residency programs should be structured to meet the educational needs of working public health dentists with MPH degrees through on-the-job residency programs; (2) the standards for advanced specialty education programs in dental public health should be made sufficiently flexible to include dentists who have advanced education and the requisite core public health courses; (3) flexible MPH degree programs must be available because of the rising debt of dental students and the decreased numbers of graduating dentists; (4) loan repayment should be available for dentists who have pursued public health training and are working in state or local health departments; and (5) standards for advanced education in dental public health should be developed for dental hygienists. [J Public Health Dent 1998;58(Suppl 1):75-83]

Key Words: dental public health, dental education, dental manpower.

Dental public health is the smallest of the eight specialties recognized by the American Dental Association. Because most public health dentists practice in the public sector, income is, on average, lower than that of the other dental specialists, the majority of whom are in private practice. As the only population-based dental specialty, dental public health specialists serve the entire population. Thus, a shortage of dental public health specialists would redound to the detriment of the nation.

Both direct and opportunity costs result from pursuit of an education in any dental specialty. However, these costs are usually offset by the benefits accrued from the additional income stream of the specialist. This costbenefit approach does not work in the field of dental public health. Thus, there is a role for government intervention to correct this market imperfection by defraying some, if not all, the costs of dental public health training.

This paper reports the results of two contracts funded by the Health Resources and Services Administration (HRSA) designed to estimate the need for dental public health specialists in the 21st century. The contracts also examined the need for changes in the education and certification process for dental public health personnel and the need for innovative education programs to ensure an adequate supply of public health dentists for the future.

#### Background

In 1988 the Institute of Medicine (IOM) described a paradigm to view the public health infrastructure (1). Essential public health activities, or core functions of assessment, policy development, and assurance were identified as a means of evaluating and improving public health programs.

These essential public health activities can be used to assess the dental public health infrastructure. Oral health assessment is the collection of data on the prevalence and incidence of oral diseases and community resources, disease surveillance, and outcomes monitoring. It includes the investigation of oral health conditions, diseases, injuries, and health hazards such as fluoride status of drinking water, radiation control, infection control, and the recognition and reporting of child abuse (2). Policy development includes program development, oral health advocacy, collaboration and coalition formation, legislative and regulatory activities, and agency administration and management. Assurance is the control of oral health conditions, diseases, injuries, and health hazards. It includes the delivery of community-based and individual preventive services, oral screenings, health education and promotion, outreach services, quality assurance, and licensure (2).

The essential public health activities associated with oral health will require new skills. Isman (3) points out that outcomes research and other health services research will increase in im-

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portance for both public and private programs as the dental care delivery system moves toward a managed care environment. The breadth of skills necessary to perform these functions will go beyond the traditional dental public health competencies of program administration—oral epidemiology and statistics—to include the behavioral sciences, operations research, and economics. Not only will the breadth of required skills widen, but the depth will increase too, as analytic tools from the social and physical sciences become the norm.

The World Health Organization stresses the need for information systems to assist in monitoring "the effectiveness of the medical care system, to assess the costs of the health care system's interventions to prevent and treat disease, and to provide information critical to the design of prevention strategies" (4). A skill level from familiarity to expert in data automation (informatics) will be required "not only [to] enable oral health care professionals to monitor the health of individual patients, but will also [to] permit health planners to monitor the overall health of the community or specific subpopulations, and to identify groups at high risk for oral diseases" (4).

#### Dental Public Health Infrastructure Requirements

The need for training dental public health practitioners will increase because of changes in the health care system. The number of trained public health dentists, however, has decreased in the past 15 years. In 1979, approximately 1,600 dentists and 800 hygienists were engaged in public health activities in the United States (5). Of these 1,600 dentists, no more than 450 (and fewer hygienists) had received graduate training in dental public health.

Results from a 1994 survey of state health agencies conducted by the Association of State and Territorial Dental Directors also suggest a critical deficiency in the dental public health infrastructure at the state dental director level. Of 51 state and territorial health agencies, 35 (69%) had full-time, five (10%) had part-time, and 11 (21%) had no dental directors. Of the states with no dental director, four positions were vacant and seven reported that not having a dental director did not pose a problem (6).

The Department of Health and Human Services also monitors the status of health personnel. In "Health Personnel in the United States: Eighth Report to Congress," a shortage of public health personnel was noted along with a declining dentist population by the year 2000 (7). This prediction for a shrinking pool of dentists supports the need for active recruitment for the specialty of dental public health. In sum, the evidence suggests that the supply of public health dentists will not be sufficient to meet the increased demands by society on the dental public health infrastructure as its roles in prevention and primary care expand in a reformed health care system.

#### Competencies for Dental Public Health

In the mid-1970s, dental public health professionals identified a set of behavioral objectives, with the goal of providing the dental public health specialist with "an understanding of the general knowledge and skills specific to the processes of planning, implementation, operation, and evaluation of public health administration. Moreover, the specialist will understand and employ political and legislative skills which have application throughout all administrative processes." (8) The domains of these behavioral objectives were administration, research, prevention, finance, and resources. In the late-1980s, these behavioral objectives were updated and modified to competencies for dental public health (9). The domains of these competency objectives are: (1) health policy and program management and administration, (2) research methods, (3) oral health promotion and disease prevention, and (4) oral health services delivery system.

These competencies are the foundation for graduate dental public health education and for certification by the American Board of Dental Public Health (ABDPH). Although the competencies are broad, the avenues for meeting the educational requirements for specialty training are narrowly defined by the ADA's Commission on Dental Accreditation. The competencies also have great potential for serving as a training model to support core functions because they provide the knowledge, skills, and behaviors necessary to support these functions in the dental public health work force.

Competencies required for public health practitioners are changing and will continue to change. The draft report of a May 1997 dental public health competency workshop, sponsored by the American Association of Public Health Dentistry and HRSA, identified ten domains: (1) plan oral health programs for populations; (2) select interventions and strategies for the prevention of oral diseases and promotion of oral health; (3) implement and manage oral health programs for populations; (4) incorporate ethical standards with cultural and social sensitivity in oral health programs; (5) evaluate and monitor oral health programs for population dental care delivery systems; (6) design and use surveillance systems to monitor oral health; (7) communicate and collaborate with groups and individuals on oral health issues; (8) advocate for, implement, and evaluate public health policy, legislation, and regulations to protect and promote the public's health; (9) critique and synthesize the scientific literature; and (10) design and conduct population-based studies to answer oral and public health questions (10).

Numerous organizations have identified competencies necessary for health practitioners of the future (11). Many of the competencies identified by the Pew Foundation address public health knowledge and skills. The Public Health Faculty/Agency Forum, sponsored by HRSA and the Centers for Disease Control and Prevention, identified core competencies for public health practitioners in addition to competencies specific to the five areas of public health education (12). The forum also found that public health practitioners must be trained in collaboration with public health agencies.

#### Advanced Education in Dental Public Health

The Standards for Advanced Education Programs in Dental Public Health formulated by the Commission on Dental Accreditation (CDA) of the American Dental Association require two years of postdoctoral education for specialty education in dental public health. A dentist with an MPH from any school of public health accredited by the Council on Education for Public Health needs one additional year of training to be educationally qualified for the specialty. The second postdoctoral year usually consists of a oneyear residency in a program accredited by the CDA. Two-year training programs solely in schools of dentistry also are accredited by the CDA. These programs are responsible for providing a curriculum in general public health education in addition to dental public health.

Prior to 1976, specific support for training in dental public health was provided by federal grants. The Health Professions Educational Assistance Act of 1976 did not extend this targeted support. Rather, a pool of traineeship dollars was allocated to each school of public health to be distributed among all trainees.

Striffler (14) examined the education of public health dentists in the United States and Canada in the 1960s. Fourteen schools of public health granted MPH degrees at that time. Full-time dental public health specialists had minimal involvement in the training of these dentists. A survey of the status of dental public health programs in 1973 examined the types of programs in schools of public health based on a review of school bulletins and letters in response to an inquiry from a fictitious dentist (15). This study focused on the requirements for dentists and concluded that most schools did not provide a program for

dentists that met the standards established by the American Public Health Association or the American Board of Dental Public Health (16).

In 1985 Lotzkar studied the need for training, employment, and specialization in dental public health using published and anecdotal data sources (17). The Association of Schools of Public Health reported that between 1975 and 1984, 613 students with either a DDS or DMD degree were enrolled in schools of public health (Table 1). During the same period, the number of first-year enrollees decreased from 35 to 17 (18).

In 1985 Simon-Rusinowitz (19), in a paper completed as part of a doctoral program at the University of Illinois at Chicago, developed marketing forecasts for estimating the size of the dental public health market. Using relatively conservative estimates, she forecast the size of the dental public health market to be 2,140 full-time equivalent positions. She noted that the estimated market was more than twice the market supply and that this imbalance indicated a great need for a recruitment strategy. Subsequent to her study, the annual supply of dental school graduates decreased from a high of 6,000 to just less than 4,000 in 1996, suggesting an even more difficult recruiting problem for dental public health (20).

Despite these trends, the number of accredited dental public health residency programs has increased since 1990. Currently, 19 such programs are in operation. Of these programs, seven are sponsored by dental schools, seven by federal agencies, four by state and local health departments, and two by schools of public health [CO: Total = 20, not 19?). Table 2 shows the number of residency programs and first-year enrollments for 1990 to 1995. On average, 40 students were enrolled in dental public health programs nationwide each year. [CO: Table 3 not referenced in text; if it goes here you will need to reorder and renumber references?]

TABLE 2
Number of Residency Programs and First-year Enrollments, ADA-accredited
Dental Public Health Residencies, 1975-84

Year	No. of Programs	Dental School	Nondental School	Enrollment (First Year)
1975	16	6	10	35
1976	14	7	7	23
1 <b>97</b> 7	12	6	6	11
1978	10	5	5	20
1979	10	5	5	23
1980	11	5	6	22
1981	12	6	6	28
1 <b>982</b>	12	6	6	24
1983	12	6	6	20
1984	12	6	6	17
Total				233

TABLE 1
Number of Students with Prior
DDS/DMD Degrees Enrolled in
Schools of Public Health, 1975–84 (17)

Year	Number of Students
1975	65
1976	72
1977	70
1978	80
1979	‡
1980	74
1981	55
1982*	54
1983†	69
1984†	74
Total	613

\*Data from 19 schools reporting out of 23. Data collected for graduates rather than entering students.

<sup>†</sup>Data from 20 schools reporting out of 23. <sup>‡</sup>Data not collected in 1979 for DDS/DMD. TABLE 3

Dental Public Health Residency Enrollment in Accredited Programs, 1990-95 (23)

Year	First Year	Total	Graduates
1990	22	37	11
1991	14	38	12
1992	20	42	12
1993	24	43	13
1994	17	39	18

#### Supply of Public Health Dental Professionals

Trends in the employment of public health dentists also are maintained by the American Board of Dental Public Health. In 1997 the ABDPH had 127 active, 20 inactive (retired), and 31 life members, for a total of 178 members (Personal communication, Lotzkar S, executive secretary, American Board of Dental Public Health, Nov 11, 1997). The trend indicates an increasing number of diplomates of the board, with the number being the largest since 1978 (17).

A 1991 survey by Watson and Niessen asked the opinions of dental public health postdoctoral program directors about career opportunities for their graduates (21). Directors of dental public health education programs whose residents received stipends were more likely to think that career opportunities would be available for graduates regardless of the economy than directors of programs in which residents did not receive a stipend. The survey found a consensus that more advanced-degree specialists in dental public health are needed, and that the main barrier for training them is the availability of funds. Several programs have been terminated because of lack of funds.

In 1993 Wotman et al. (22) conducted a survey of public health dentists selected from the ADA's list of dentists who identified themselves as practicing in dental public health. Of the respondents, 6 percent had doctoral training, 20 percent had master'slevel training and a residency, 52 percent had master's-level training in public health alone, 53 percent had "experience," and 20 percent reported master's degrees in areas other than public health or a clinical dental specialty.

Under a contract from the Bureau of Health Professions, Wotman (23) convened an expert panel to examine methods to increase the number of public health trained dentists. The panel recommended the following:

1. Funds should be made available to support advanced education in public health at the MPH and residency levels.

2. Funds should be provided aimed at increasing the competency of dentists working in public health positions who are not eligible for board certification via off-site residencies. 3. Model programs in areas of great need (public health; management, administration, planning, and policy; prevention; environment; and research) should be developed that, in conjunction to a basic public health core, would satisfy the eligibility requirements of the American Board of Dental Public Health. This approach is modeled on the American Board of Preventive Medicine.

4. Loan forgiveness programs should be developed for dentists and dental hygienists working in public health.

5. Funds should be made available to facilitate the development of additional recognition (credentials) for dental public health workers.

A consistent theme appears in the various surveys reviewed here—a shortage of public health-trained dental professionals is imminent and creative methods will be needed to recruit and train future public health dentists. However, all of these surveys were done before the health care reform debate of the 1990s took shape, and any effect that it might have on dental public health training was not clear.

An equally acute shortage of dental hygienists with public health training exists, especially in the areas of health promotion, health education, and community intervention. These skills that hygienists possess will be even more important in the evolving health care environment.

Changes in the health care system may provide new opportunities for dental hygienists just as employment opportunities for registered nurses have increased with the growth of the managed medical care market. As quality assurance programs become ubiquitous, hygienists may serve as the data collectors and chart reviewers, similar to functions currently performed by nurses in medical quality assurance programs. Hygienists currently perform most of the utilization review functions in dental managed care organizations because of their dental knowledge and experience. The participation of dental hygienists in epidemiologic studies has shown that they can serve as clinical data collectors, coordinators, and administrators.

Many of these emerging roles for dental hygienists will require additional training or education at the graduate or postgraduate level in preparation for leadership positions in dental public health. These positions may be in state, county, or city government; private industry, as utilization managers; oral health research, as administrators of data collection efforts; and professional education, as faculty members in dental education institutions. In addition, dental public health residency training for hygienists that focuses on the Competency Objectives for Dental Public Health (8), with a path to some type of certification, should be considered. Of the 38 states with dental directors, six (16%) have dental hygienists in these positions (6).

#### Advanced Education in Dental Public Health

A strong dental public health infrastructure will be essential to meet the core public health functions within a changing health care system. With limited resources, future successful programs will require cooperation and collaboration. To examine these issues in depth, two contracts in addition to the one by Wotman and colleagues (22) were let by HRSA, one to examine dental public health activities in a changing health care system (24), the other to examine the requirements for education and certification in dental public health (25).

#### Methods

Both contracts called for a meeting to examine the issues and develop recommendations. Because Baylor College of Dentistry was the contractor for both contracts (24,25) HRSA suggested a common meeting of both groups. An additional day was funded to allow members on both groups to interact. The Appendix lists participants for the three-day meeting.

To obtain preliminary information about some of the issues to be discussed at the meeting, a survey was conducted of an advisory group for the [CO: for both contracts?; for all those listed in appendix?; n=??] one month before the meeting. Of primary interest was the identification of the skill level needed for the practice of dental public health in various roles. The survey consisted of a matrix of competencies taken from the Competency Objectives in Dental Public Health and seven dental public health roles (dental school faculty, epidemiologist, health services researcher, program director, master's-level

	Roles						
	Dental School Faculty	Epide- miologist	Health Services Research	Program Director	Master's- level Health Educator	UR/Ins Analyst	Clinician
Competencies	$\overline{\mathbf{x}}$ (SD)	x (SD)	x (SD)	x (SD)	x (SD)	x (SD)	x (SD)
Group 1—Health policy a	nd administra	tion					
Program planning	2.33 (0.71)	1.95 (0.79)	2.33 (0.78)	3.00 (0.00)	1.62 (0.65)	1.81 (0.73)	1.62 (0.65)
Program implementation	2.20 (0.68)	1.81 (0.73)	2.14 (0.83)	3.00 (0.00)	2.00 (0.69)	1.71 (0.76)	2.00 (0.69)
Program evaluation	2.50 (0.66)	2.38 (0.72)	2.62 (0.72)	2.95 (0.21)	1.76 (0.61)	2.14 (0.71)	1.76 (0.61)
Program management	2.30 (0.71)	1.95 (0.65)	2.24 (0.87)	2.95 (0.21)	1.90 (0.68)	1.95 (0.58)	1.90 (0.68)
QA/risk management	2.60 (0.58)	1.81 (0.79)	2.43 (0.79)	3.00 (0.00)	2.48 (0.59)	2.86 (0.35)	2.48 (0.59)
Health policy	2.50 (0.59)	1.71 (0.55)	2.33 (0.78)	2.95 (0.21)	1.71 (0.70)	2.10 (0.61)	1.71 (0.70)
Mean	2.41 (0.66)	1.94 (0.71)	2.35 (0.80)	2.98 (0.11)	1.91 (0.65)	2.10 (0.62)	1.91 (0.65)
Group 2-Research metho	ods			. ,		. ,	
Plan, conduct research	2.80 (0.39)	2.95 (0.21)	2.86 (0.64)	1.86 (0.47)	1.10 (0.29)	1.52 (0.66)	1.10 (0.29)
Biostatistics	2.50 (0.59)	3.00 (0.00)	2.81 (0.66)	1.95 (0.58)	1.14 (0.35)	1.62 (0.65)	1.14 (0.35)
Observational studies	2.70 (0.55)	2.95 (0.21)	2.81 (0.66)	1.95 (0.65)	1.29 (0.45)	1.52 (0.59)	1.29 (0.45)
Experimental studies	2.70 (0.63)	2.81 (0.39)	2.76 (0.68)	1.76 (0.68)	1.10 (0.29)	1.29 (0.45)	1.10 (0.29)
Health services research/ policy analysis	2.50 (0.59)	2.43 (0.66)	2.86 (0.64)	2.29 (0.63)	1.24 (0.43)	1.81 (0.66)	1.24 (0.43)
Lit eval/sci writing/info management	3.00 (0.00)	3.00 (0.00)	2.86 (0.64)	2.57 (0.75)	1.90 (0.49)	2.10 (0.68)	1.90 (0.75)
Ethics in DPH research	3.00 (0.00)	2.86 (0.35)	2.81 (0.66)	2.62 (0.93)	2.00 (0.49)	2.10 (0.81)	2.00 (0.93)
Mean	2.74 (0.39)	2.86 (0.26)	2.82 (0.65)	2.14 (0.50)	1.40 (0.57)	1.71 (0.64)	1.40 (0.50)
Group 3—OH prom/dz pr	evention						
Principles of Hp/dz prevent	2.90 (0.35)	2.29 (0.70)	2.38 (0.79)	2.90 (0.43)	2.76 (0.29)	1.86 (0.77)	2.76 (0.43)
Services promoting oral health	2.70 (0.47)	1.90 (0.81)	2.10 (0.87)	2.90 (0.55)	2.71 (0.29)	1.90 (0.66)	2.71 (0.55)
Provide community OH/dz program	2.40 (0.58)	1.52 (0.66)	1.48 (0.79)	2.95 (0.66)	2.57 (0.21)	1.33 (0.56)	2.57 (0.66)
Critical review of OH prom lit	2.80 (0.39)	2.62 (0.49)	2.57 (0.79)	2.95 (0.58)	2.43 (0.21)	2.00 (0.76)	2.43 (0.58)
Occ/envir health & safety	2.60 (0.58)	1.86 (0.77)	2.14 (0.83)	2.86 (0.45)	2.71 (0.35)	1.62 (0.72)	2.71 (0.45)
Mean	2.68 (0.47)	2.04 (0.69)	2.13 (0.81)	2.91 (0.53)	2.64 (0.27)	1.74 (0.69)	2.64 (0.53)
Group 4—OH services de	livery						
Assess community needs	2.12 (0.50)	2.33 (0.64)	2.52 (0.79)	2.95 (0.66)	2.19 (0.21)	1.76 (0.68)	2.19 (0.66)
OH services personnel	1.96 (0.71)	1.67 (0.71)	2.24 (0.97)	2.86 (0.90)	2.05 (0.64)	1.81 (0.91)	2.05 (0.90)
OH services	2.08 (0.50)	1.71 (0.63)	2.38 (0.84)	2.95 (0.49)	2.62 (0.21)	2.38 (0.72)	2.62 (0.49)
Financing	2.00 (0.58)	1.48 (0.50)	2.57 (0.85)	2.95 (0.65)	1.95 (0.21)	2.86 (0.47)	1.95 (0.65)
Purchasers	2.00 (0.58)	1.52 (0.50)	2.52 (0.79)	2.90 (0.29)	1.90 (0.68)	2.67 (0.71)	1.90 (0.68)
Organizational configurations	1.96 (0.64)	1.52 (0.59)	2.05 (0.95)	2.90 (0.29)	1.67 (0.56)	2.29 (0.76)	1.67 (0.56)
Facilities	2.04 (0.58)	1.52 (0.59)	2.00 (0.98)	2.86 (0.47)	2.05 (0.72)	1.71 (0.70)	2.05 (0.72)
Professionalism	2.48 (0.21)	1.95 (0.79)	2.33 (0.89)	2.90 (0.29)	2.81 (0.39)	2.48 (0.66)	2.81 (0.39)
Mean	2.08 (0.54)	1.71 (0.62)	2.33 (0.88)	2.91 (0.33)	2.16 (0.63)	2.25 (0.70)	2.16 (0.60)

 TABLE 4

 Competencies for Dental Public Health Personnel (as Determined by Advisory Group)

health educator, utilization review or insurance analyst, and clinician). Members of the advisory group were asked to assign a level of skill (high=3, medium=2, low=1) to each of the listed dental public health competencies and roles. The results of the survey were tabulated; means and standard deviations for each of the four major competency groups as well as for subcompetencies are presented in Table 4. Results are summarized as follow: (1) health policy and administration skills were felt to be important for program directors (x=2.98) and of low importance for utilization review/insurance analysts (x=2.10), epidemiologists (x=1.94), and master's-level health educators (x=1.91); (2) research methods skills were important for epidemiologists

Core Function	Critical Subelement
Assessment	Oral health status and treatment needs (study design, data collection, data anlysis)
	Access, utilization, outcomes
	Fluoridation status and monitoring
	Knowledge, attitudes, behaviors, and preferences of individuals, providers, institutions, and organizations
	Resources (personnel, facilities, funding)
Policy development	Program planning/advocacy
	Integration of dental programs into existing nondental programs (collaboration)
	Community organization
	Modeling
	Strategic planning
	Social marketing
	Development of guidelines, legislation, and regulations
Assurance	Prevention and control of oral disease
	Health promotion/education/outreach
	Promote and implement fluoridation
	Community and school-based programs
	Institution-based programs
	Train health professionals and public health work force (continuing competence)

(x=2.86), health services researchers (x=2.82), and dental school faculty (x=2.74), and of low importance for clinicians and master's-level health educators (=1.40); (3) oral health promotion/disease prevention skills were important for program directors (x=2.91), dental school faculty (x=2.68), master's-level health educators and clinicians (x=2.64), and of low importance\_for health services researchers (x=2.13), epidemiologists (x=2.04), and utilization review/insurance analysts (x=1.74); and (4) oral health services delivery skills were important for program directors (x=2.91) and of low importance for epidemiologists (x=1.71) and dental school faculty (x=2.08).

The project team provided an orientation to the project in a plenary session of the meeting. Participants were divided into four groups that sequentially addressed the same five issues in separate sessions, each of which was followed by a plenary session where results of the group work were presented. The five work sessions addressed: (1) attributes of a reformed health care system, (2) critical subelements of the core public health functions, (3) roles and responsibilities of dental public health personnel, (4) estimates of personnel needs, and (5) changes and modifications needed to the current system of education for dental public health workers. To keep the small group discussions on track, orienting instructions (charges) were provided prior to each phase of small group deliberation along with examples to serve as a point of departure.

## Results

Attributes of a Reformed Health Care System. The objective of the first work session was to develop assumptions about the characteristics of the oral health care delivery system in the year 2000. The group felt that the oral health delivery system in the year 2000 would require a similar number of personnel as is currently in the work force. The work groups felt that the most flexible and cost-effective means to augment today's oral health personnel inventory to meet potential increased demand lies with allied health personnel. Market-driven reform with an increase in managed dental care programs will continue to proliferate. In addition, while the level of government regulation may remain the same

or decrease, regulation by nongovernmental entities (e.g., managed care organizations) will increase. The need for preventive services will continue as people retain more of their dentitions throughout their lifetimes. Access to dental care will become a problem for people who lose their dental insurance with corporate downsizing. As states and the federal government constrict their spending on social programs, access to dental care for traditionally underserved populations will be more difficult.

Critical Subelements of Core Public Health Functions. To help the working groups identify roles (job titles) required to support the public health core functions (essential public health activities), the groups divided each core function into critical subelements (Table 5). For example, the assessment function included not only oral health status and treatment needs, but knowledge, attitudes, behaviors, and assessment of resources for improving oral health. These subelements became the basis for examining the roles of future dental public health personnel.

Defining Roles and Responsibili-

ties of Dental Health Personnel. The groups reviewed existing roles and responsibilities of dental health personnel and suggested new roles, opportunities, responsibilities, knowledge, skills, and behaviors to support the critical subelements of the core functions. This review resulted in the identification of several new roles, including environmental/occupational specialist, fluoridation engineer, and ombudsman. The review also identified the potential for specialists in dental informatics, program evaluation, social marketing, and prevention. In addition to these new roles, the dental school faculty member category (academician) was expanded to include faculty members in schools of dental hygiene and public health and dental public health residencies.

Estimating Personnel Needs. Table 6 shows estimates made during one of the plenary sessions of personnel needs in the year 2000 for each of the identified roles, and for some of the roles suggests a basis of allocation and a level of training. Overall, the same number, if not more, dental public health personnel will be needed. Participants felt that only small numbers

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Category	Need	Basis of Allocation
Academician		
Dental school	*	1 diplomate/1 board-eligible per school
School of public health	*	1 diplomate per school
DPH residency	*	1 diplomate per program
Dental hygiene program	*	1 MPH per program
Oral epidemiologist	*	12 per year
Health services research	*	2 at each center of excellence
Program administrator	*	1 per program
Health educator	*	
UR/outcomes assessment	*	
Clinician in PH setting	Same	
Environmental occ. specialist	Same/*	
Dental informatics	*	
Fluoridation engineer	Same/*	
Social marketing	Same/*	
Nutrition	*	
Ombudsman	Same/*	
Program evaluator	*	
Prevention	*	

TABLE 6 Work Groups' Estimates of Personnel Needs\*

\*More personnel needed.

of personnel will be needed for the new roles identified, and that not all of these necessarily will require a dental degree. The group recognized that, in the future, more linkages with various public health and community personnel than exist now will be necessary to support the dental component of the core functions.

Modifications in Dental Public Health Education and Certification. The work groups identified changes and modifications needed to the current system of educating dental public health personnel. The recommendations of the participants are presented here according to the major categories in which they fell.

Midcareer Training. A pool of dentists with MPH degrees is actively employed in dental public health. Because they are currently employed and many are in the middle of their careers, they cannot afford to leave their jobs for a year to pursue a specialty educational program. However, of all potential candidates they are most able to benefit immediately from dental public health residency training by incorporating such training into their work activities. Therefore, dental public health residency programs should be structured to accommodate the educational needs of working public health dentists through on-the-job residency programs.

Standards for Advanced Specialty Training. The standards for advanced specialty education programs in dental public health were last revised in 1985 and updated in 1990. These standards should be reexamined in light of the core public health functions and new types of educational programs that have developed since 1990, such as PhD degree programs in oral epidemiology. Standards will need to reflect the diversity of training experiences that dentists entering dental public health likely will have, due in part to greater linkages and integration of oral health with other health areas required by the core functions in public health. The participants recommended revision of the standards for advanced specialty education programs in dental public health. The standards should be flexible enough to permit dentists who have advanced education and the requisite core public health courses-for example, someone with a PhD, DrPH, MPP, or MBA degree-to be educationally gualified to take the American Board of Dental Public Health examination. A core public health curriculum and a series of tracks to accommodate specialists should be identified.

Dental Hygienists. The participants discussed the role of public health dental hygienists. No education standards presently exist for advanced training for hygienists in dental public health. The participants recommended that standards for advanced education in dental public health for dental hygienists be developed. Hygienists are a valuable asset to public health, and with additional formal training they can make even greater contributions. Currently, a number of dental hygienists have obtained MPH degrees. Some are, in fact, in dental public health leadership positions. The participants discussed the need for a dental public health, residencytype experience for dental hygienists with MPH degrees.

Dental Public Health Certification. The participants considered changes in the certification process that might be needed to meet future needs for dental public health specialists. After deliberation they recommended that the American Board of Dental Public Health and the American Association of Public Health Dentistry review the requirements for board eligibility in dental public health, particularly with regard to advanced training and years of experience.

**Funding.** MPH Education. To develop future dental public health personnel, flexible MPH degree programs must be available because of the rising education debt of dental students and the decreased numbers of graduating dentists. Trends in public health education suggest that most students are in midcareer and schools of public health are developing flexible educational degree programs to meet their needs. For example, current models for such programs exist at the University of North Carolina and the University of Michigan.

To stimulate demand for such degree programs, the Bureau of Health Professions, HRSA, could develop a grant program for dentists pursuing an MPH degree to help defray tuition and travel costs associated with this education. Because dentists who pursue careers in dental public health often sacrifice income potential associated with private dental practice, the participants recommended loan repayment to dentists who have pursued this training and who work in state and local health departments. Training grants through schools of public health should be available to dentists pursuing MPH programs. As an alternative, loan repayment for a dentist practicing public health in an underserved area should be considered by the federal government.

Dental Public Health Residency Training. A grant program for the development of on-the-job residency programs for working individuals will be the most the cost-effective way to produce an increase in the number of public health trained dentists. The grant program would not require the development of new dental public health residency programs, but could build on the existing infrastructure of residency programs, leveraging the government's investment. Funds could be provided to existing residency programs to defray the marginal costs of training an additional resident off-site. These costs could be as low as \$5,000 to \$10,000 per resident per year and could include tuition, travel, and supply expenses.

#### Conclusions

The conference accomplished several things. A large, representative group of public health practitioners and specialty training program directors met to identify the dental public health infrastructure needed for the 21st century. The conferees estimated the type and number of dental public health workers needed and changes and modifications to the education and certification systems for public health dentists. It was further recommended that training grants be made available to dentists in MPH programs and dental public health residencies and loan repayment be made available for dentists practicing public health in underserved areas. The conferees suggested the need for a dental public health residency-type experience for dental hygienists possessing an MPH degree. Finally, it was recommended that flexible MPH and dental public health residency programs be developed.

#### Acknowledgments

The project team gratefully acknowledges the advice and assistance of E. Joseph Alderman, DDS, MPH, whose guidance throughout the contract was invaluable. We further thank the expert panel from this contract and the advisory group from the "Requirements for Education and Certification for Dental Public Health" contract for donating their time and energy. The project team acknowledges the assistance of Leah Pockrus and Lori Dees in assisting the daily activities of the contract.

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## Appendix

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