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Washington State's Oral Health Workforce

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by

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EXECUTIVE SUMMARY

National attention to the growing silent epidemic of oral diseases has increased in recent years, resulting in more focus on the importance of having a health workforce that can effectively address the oral health needs of the population. Washington State benefits from having many programs and initiatives to enhance the capacity, flexibility and diversity of its oral health workforce. This report presents comprehensive information on that workforce, to the extent data are available, and factors that affect its future.

Oral health disparities still persist in Washington State. Communities of color, non-English speaking families, low-income households, special populations, and the uninsured, among others, continue to harbor higher rates of oral diseases and difficulty accessing dental care. Despite the innovative approaches used in the state to overcome these gaps, further development is needed to make the oral health workforce even more effective and efficient.

The oral health workforce in Washington includes dentists, dental hygienists, expanded function dental auxiliaries (EFDAs), dental assistants, denturists, primary care medical providers (physicians, physician assistants, advanced practice nurses), and other supporting caregivers. All have important and complementary roles to play in providing oral health care to Washington's residents. Varying amounts of information are available to describe the number, distribution and characteristics of these provider groups. Recent survey findings showed that 81% of dentists and 79% of dental hygienists with Washington licenses were in practice 2007, and their average ages were 49 and 45 years, respectively. Among the practicing dentists, 77% were in general practice, 4% were in pediatric practice, and less than 2% specialized in public health. Three-quarters (74%) of Washington's dentists were in independent or solo practices. Most (96%) dental hygienists practicing in Washington were in private dental offices/clinics. In 2007, at least 42% of the state's dentists and 79% of dental hygienists reported they had received their initial professional education in Washington. The current workforce of dentists and dental hygienists is not as diverse as the state's population. There remains an uneven distribution of dental professionals across the state, with 35 out of 39 counties having all or part of the county designated as a dental Health Professional Shortage Area (HPSA).

Less information is available on the characteristics of dental assistants, denturists and other supporting caregivers. Expanded function dental auxiliaries are a new profession in Washington, and the first graduates of the new education programs were entering practice in 2009. Primary care providers (including physicians, physician assistants and advanced practice nurses) have been reimbursed by Medicaid to deliver preventive oral health services for more than a decade.

Washington's oral health workforce has been steadily increasing in absolute numbers and relative to the state's population. The size of the workforce may not keep pace, however, with the increasing oral health needs of the

state's population as it grows and ages and as professionals from the baby boom generation retire. A workforce is needed that can respond to the rising rate of childhood caries through mass preventive measures as well as treatment of individual children. At the same time, more oral health professionals will be needed to provide dental care for the elderly as those over 65 live longer and retain more of their own teeth than did their predecessors. Washington's population is expected to grow by 24% between 2009 and 2025, and by 80% for seniors. To maintain or increase the number of providers in the future will require increases in capacity at Washington's dental education programs and/or higher rates of in-migration of dentists and dental hygienists to the state. This projected growth in demand will also cause growth in demand for professions that increase the size and efficiency of the dental team, such as dental assistants, EFDAs, and possibly new types of professionals. There will also be growing attention to the use of primary care medical providers for preventive oral health services.

Current programs to increase access to oral health care in Washington include those that encourage providers to work in underserved areas, such as state and federal loan and scholarship programs, the federal HPSA designation program, the University of Washington School of Dentistry educational and outreach programs (including the Regional Initiatives in Dental Education [RIDE] program), and health career camps. Efforts to directly increase access to oral health care for underserved populations include the state's Medicaid program, and free and low-cost care provided by various private organizations and educational institutions (including community health clinics, general and pediatric dental residencies, mobile dental clinics, tribal clinics, and dental clinics operated by dental hygiene schools and the school of dentistry).

The state's current and future oral health needs call for a multi-pronged, strategic and collaborative approach to workforce planning with the goal of ensuring an adequate oral health workforce that can provide needed dental public health measures and high-quality care for all residents of Washington. To accomplish this goal, health planners, policymakers and educators have an array of options to affect the size, characteristics and distribution of the state's oral health workforce. Given the long educational pipeline for some health professions, increases in capacity must be planned well in advance. At the same time, the current workforce must be used efficiently to prevent disease and increase access to oral health care. The following strategies emphasize oral health prevention, education of efficient teams, and better distribution of the workforce of the future.

- ***Promote interest in oral health professions*** among young people, especially those from underrepresented populations.
- Support education programs that ***improve the capacity of the workforce to care for underserved and special populations*** through training of more professionals in general dentistry, pediatric dentistry, and in dental public health. In addition, support educational programs with service learning and clinical rotations in rural and underserved populations that can improve the capacity of the workforce to care for these populations.
- ***Support early prevention*** of caries through provider education and by increasing resources for promoting and implementing public health measures.
- Continue and expand programs that ***promote practice in primary care shortage areas***, such as loan repayment, scholarships, and programs that reduce barriers for volunteer and retired providers to donate services.
- ***Support collaborative and inter-professional medical and oral health education and practice*** in order to improve the effectiveness and efficiency of care through greater communication and coordination among providers.
- ***Explore new ways to use allied health dental providers and alternative dental providers*** to increase dental workforce capacity and efficiency.
- ***Monitor trends*** in the state's oral health workforce through commitment of resources for ongoing data collection and analysis.

Washington State's Oral Health Workforce

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BACKGROUND

Good oral health is a prerequisite for people's general health and well-being. Oral health affects people both physically and psychologically. Despite advances in oral health for several population groups, many Americans still lack optimal oral health. The landmark 2000 *Oral Health in America: A Report of the Surgeon General* envisioned improved oral health for all and elimination of oral health disparities (U.S. Department of Health and Human Services, 2000b). The document showed that: oral diseases and conditions affect general health and well-being throughout the lifespan, safe and effective measures exist to prevent the most common oral diseases, and there are profound oral health disparities among the U.S. population. In the 2000 report, the Surgeon General called for:

- an oral health workforce with racial and ethnic diversity that matches the general population in order to enrich the talent pool and enhance access and utilization of care by racial and ethnic minorities,
- public health practitioners knowledgeable about oral health who can help build partnerships to fill the gaps in oral health prevention and care in communities, and
- equitable geographic distribution of oral health care providers.

The follow-up Surgeon General's *National Call to Action to Promote Oral Health* in 2003 (U.S. Department of Health and Human Services, 2003) proposed 5 strategies to address the nation's oral health problems: change the public perception regarding oral health, accelerate the building and transfer of science knowledge to improve oral health, build an effective health infrastructure that meets the oral health needs of all Americans and integrates oral health effectively into overall health, remove known barriers between people and oral health services, and use public-private partnerships to improve the oral health of those who still suffer disproportionately from oral diseases.

In 2001, the American Dental Association's Future of Dentistry Report adopted a vision of "improved health and quality of life for all through optimal oral health" and made recommendations to help achieve that vision (American Dental Association, 2002). This report's recommendations included establishing and supporting partnerships across health professions and public and private sectors; aggressively addressing the oral health needs of the public; strengthening and expanding dentistry's research and education capabilities; ensuring the development of a responsive, competent, diverse, and elastic workforce; and developing strategies to address the fiscal needs of the practice, education and research sectors of dentistry to ensure their viability and vitality.

Among the many goals to improve oral health included among the Healthy People 2010 objectives for improving the nation's health, there were specific goals to increase racial and ethnic representation in the dental profession and to increase the number of dental programs with a public health trained director (U.S. Department of Health and Human Services, 2000a). A report by Tomar (2004) called for more professionals and educational programs in the United States focused on dental public health.

The summary from the Institute of Medicine's recent workshop, "The U.S. Oral Health Workforce in the Coming Decade," stated that the nation's oral health workforce fails to meet the needs of many segments of the U.S. population (Institute of Medicine, 2009). Challenges cited include: lack of coordination and integration among the oral health, public health and medical health care systems; misaligned payment and education systems that focus on the treatment of disease rather than prevention; the lack of a robust evidence base for many dental procedures and

workforce models; and regulatory barriers that prevent the exploration of alternative models of care.

The comprehensive picture provided by these reports creates a context for assessing the oral health workforce in Washington State. To be effective in eliminating oral health disparities, the oral health workforce must deliver both mass preventive activities (as in public health), as well as preventive and restorative practices (as in public and private dental clinics) to individuals.

According to data cited by the Washington Department of Health in 2007, there is evidence that Washington suffers from significant gaps in the provision of oral health services to portions of the population (Byrappagari et al., 2007). In 2005, 59% of surveyed second and third graders in Washington had caries experience and 20% had untreated decay. While the CDC recommends that sealants be provided to children through school-based programs, only 45% of surveyed second and third graders in 2005 had received sealants. Washington State met the national Healthy People 2010 objective for untreated caries (a proxy for access to care) for second and third graders, but not for other groups of children, including those from communities of color, non-English speaking families, and low-income families. These groups continue to have the highest levels of caries experience and untreated caries among children in the state.

Understanding who delivers oral health care services in the state, what kinds of services they deliver, and where they are located is an important step toward the goal of mobilizing the oral health workforce to become more efficient and effective in delivering needed services. This report describes the key components of Washington State's oral health workforce and how each contributes to the delivery of oral health services in the state. It also describes how the oral health workforce reaches underserved populations in the state and provides information that could serve as a foundation for projecting the future of the workforce. The final chapter synthesizes findings that characterize the oral health workforce in Washington State and forwards options for educators, planners and policymakers to consider in developing programs that will enhance oral health service delivery.

WHO PROVIDES ORAL HEALTH SERVICES IN WASHINGTON STATE?

Following are descriptions of the roles of the clinical providers who comprise Washington's oral health workforce. Table 1 provides an overview of these providers and Table 2 compares the scope of practice of each provider.

DENTISTS

Dentists diagnose and treat problems pertaining to the teeth and tissues of the mouth. They are trained to provide advice and administer appropriate care to help prevent future problems. Supervising dentists also oversee dental hygienists, dental assistants and expanded function dental auxiliaries (EFDAs). Dentist education usually involves 4 years of post-baccalaureate training in a dental school, with additional education required for specialist training. There are 9 dental specialties: dental public health, endodontics, oral and maxillofacial pathology, oral and maxillofacial radiology, oral and maxillofacial surgery, orthodontics and dentofacial orthopedics, pediatric dentistry, periodontics, and prosthodontics. Masters and doctoral programs are also available in dentistry.

DENTAL HYGIENISTS

Dental hygienists remove soft and hard deposits from teeth, provide preventive dental care such as instruction on how to practice good oral hygiene, and apply sealants and topical fluorides. They can also assess patients' teeth and gums for symptoms of diseases or abnormalities. In Washington State, dental hygienists provide unsupervised preventive services in schools, senior centers, and nursing homes. Dental hygienists have received their training through several alternate routes, including a 2-year certificate program (no longer available in Washington), an associate's degree program, or a 4-year baccalaureate degree program. Master's and doctoral programs are also available in dental hygiene.

EXPANDED FUNCTION DENTAL AUXILIARIES

Expanded function dental auxiliaries (EFDAs) perform regular dental assistant duties and are also qualified to provide limited restorative functions and dental assistant functions under general supervision. EFDAs are a new profession in Washington (state licensure became effective December 1, 2008) and were initiated with the goal of expanding the capacity of dental offices, particularly those serving low-income clients, by increasing the skills of dental team members. Dental assistants can become EFDAs by completing a 6-month EFDA education program and passing the required exams. Dental hygienists can become EFDAs by completing training in taking impressions.

DENTAL ASSISTANTS

Dental assistants work under the close supervision of dentists, and provide supportive clinical services in direct relationship to treating a patient. As of January 2009, all dental assistants must be registered in order to practice in the State of Washington. Dental assistant education ranges from on-the-job training to bachelor's degree programs.

Table 1. Washington State's Oral Health Workforce

Provider Type	Years and Type of Education Required	Credential Required to Practice in Washington	Estimated Number in Washington
Dentists	4 years of dental school post-bachelor's degree; specialists receive additional education	License; residents can obtain a limited license for practice within approved educational settings	5,819 (as of 7/09)
Dental hygienists	Associate degree (2 years following prerequisites) or bachelor's (4 years) or master's in dental hygiene	License	5,014 (as of 7/09)
Expanded function dental auxiliaries (EFDAs)	EFDA certificate following completion of dental assistant program	License (new profession in Washington as of 12/08)	0 licensed, 35 pending licenses (as of 6/09)
Dental assistants	Range: from on-the-job training to bachelor's degree	Registration	9,327 (as of 6/09)
Denturists	1-2 years, associate degree or completion of technical program	License	138 (as of 9/09)
Primary care medical providers (physicians, physician assistants [PAs], advanced practice nurse practitioners [APNs])	No specific oral health education required beyond medical degree; to be reimbursed by Medicaid, must have training through Washington Dental Service Foundation	Professional medical license	Of the total estimated 3,300 primary care pediatricians and family medicine physicians, 850 primary care PAs and 2,000 primary care APNs, >1,000 received special training in pediatric oral health prevention (as of 8/09)
Supporting caregivers, such as in-home caregivers for people with disabilities and older adults	Oral health is a component of initial short-term training for in-home caregivers, and continuing education in oral health (10 hours) is available	None	Of the estimated 60,000 in-home caregivers in Washington, 2,500 received special training in oral health (as of 8/09)

Data sources: Washington Dental Service Foundation; Washington State Department of Health, Health Systems Quality Assurance; UW CHWS; personal communications with general practice residency directors and administrators.

The Washington administrative code describing licensure and registration requirements and scopes of practice for dentists, dental hygienists, EFDAs and dental assistants can be accessed at http://apps.leg.wa.gov/wac/default.aspx?dispo=true&cite=246-817 and http://apps.leg.wa.gov/WAC/default.aspx?cite=246-815.

DENTURISTS

Denturists are licensed oral health providers that not only fit and place dentures but also construct, alter, and repair them. They must examine the patient's oral cavity prior to placing the dentures. Denturists must complete 1 to 2 years of education to receive an associate degree or complete a technical education program in denturist training before sitting for the state licensing exam. The Washington laws and administrative code describing licensure and registration requirements and scopes of practice for denturists can be accessed at http://apps.leg.wa.gov/RCW/default.aspx?cite=18.30 and http://apps.leg.wa.gov/WAC/default.aspx?cite=246-812-001.

PRIMARY CARE MEDICAL PROVIDERS

In Washington State, primary care medical providers (physicians, physician assistants and advanced practice nurses) can receive Medicaid reimbursement for preventive oral health services including screening examinations, application of fluoride varnishes and parent education if they have completed training through the Washington Dental Service Foundation (WDSF). Medical providers also encounter patients with gingivitis, oral pain, broken teeth, other orofacial trauma and other oral health problems in clinics and emergency rooms and serve as first-line providers by treating trauma and infections and making referrals to oral health professionals. Physicians may perform most dental procedures under the scope of practice of their medical license, but rarely do they perform more than preventive services, infection control and pain relief. Physician assistants and advanced practice nurses have more limited scopes of practice compared with physicians, but are able to deliver the same oral health preventive, infection control and pain relief procedures.

Table 2. Clinical Capacity of Oral Health Providers in Washington

	Procedures	Dentists	Dental Hygienists	Expanded Function Dental Auxiliaries	Dental Assistants	Denturists	Primary Care Medical Providers†	In-Home Caregivers
Diagnostic	Taking medical & dental history	●	●	●	●	●	●	
	Dental screening and assessment	●	●	●	●	●*	●	
	Dental charting, oral inspection	●	●	●	●	●*		
	Vital signs	●	●	●	●	●	●	
	Dental diagnosis and treatment planning	●				●		
	Referral to dentists, other providers, specialists	●	●			●	●	
	Assess for sealants	●	●					
Clinical support	X-rays	●	●	●	●			
Primary prevention	Oral hygiene instruction	●	●	●	●		●	●
	Dietary counseling	●	●	●	●		●	●
	Topical fluorides	●	●	●	●		●	
	Dental sealants	●	●	●	●			
Removal of deposits from teeth	Coronal polishing	●	●	●	●			
	Dental prophylaxis (scaling)	●	●					
	Nonsurgical therapeutic periodontal procedures	●	●					
Preventive anti-microbial therapy	Apply antimicrobials	●	●					
Anesthesia	Topical anesthetics	●	●	●	●			
	Local anesthetics	●	●					
	Nitrous oxide	●	●					
	General anesthesia for surgery	●						
Cavity treatment	Atraumatic Restorative Technique (ART)	●						
	Placement of temporary restorations	●	●	●				
	Pack and carve restorations (amalgam or resin)	●	●	●				
	Extractions	●						
	Prefabricated crowns	●						
	Laboratory processed crowns	●						
	Pulpotomy	●						
	Pulp capping	●						
	Root canal therapy	●						
Other services	Denture fabrication	●				●		
	Denture repair and adjustment	●				●		
	Impressions for models and guards	●	●	●	●			
	Impressions for crowns	●		●				
	Other oral surgery	●						
	Placement of orthodontic appliances	●						
	Orthodontic adjustment	●						
	Check for loose bands, wires	●	●	●	●			
	Periodontal dressings	●	●	●	●			
	Other periodontal surgery	●						
Prescriptive authority	Prescribe antimicrobials, infection control	●					●	
	Prescribe controlled substances (pain medication)	●					●	
	Dispense medications by doctor's order		●					

* Limited application of practice.

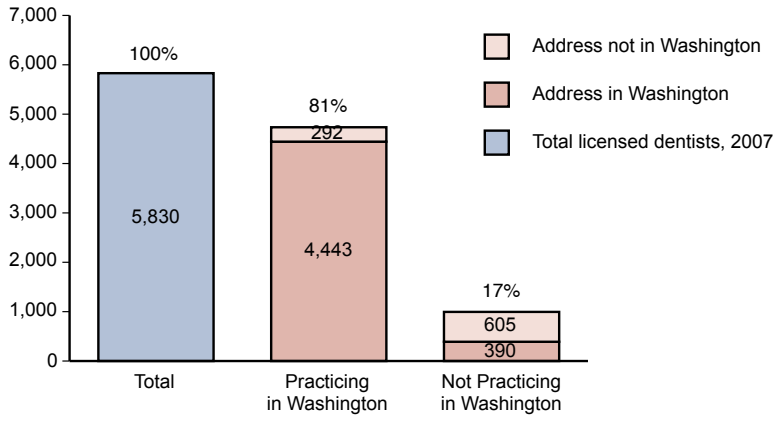
† Increasingly, primary care medical providers are delivering the identified preventive oral health services during well-child exams. Physicians may perform all listed procedures under the scope of practice of their license, but rarely perform more than the functions shown. Physician assistants and advanced practice nurses have more limited scopes of practice than physicians, but when delivering oral health services, they deliver the same procedures as physicians.

Adapted from Pew Center on the States (2009).
Data sources: Washington Department of Health, Health Systems Quality Assurance; professional associations.

SUPPORTING CAREGIVERS

In-Home Caregivers: In 2004, the WDSF developed a 10-hour oral health training curriculum for agencies who train caregivers to assist older adults and people with disabilities in the home setting. The curriculum meets the continuing education requirements that have been set by the state for paid caregivers. The curriculum contains 6 modules: Tooth Decay, Gum Disease, Dry Mouth, Denture Care, Nutrition, and Oral Cancer. In the training, caregivers are taught to prompt, assist, or perform oral health prevention home care services, how to identify signs of potential oral health problems, and ways to seek professional care for their clients.

Figure 1. Practice* and Residence Characteristics of Dentists with Washington Licenses, 2007



* Practice status was not available for 2% of dentist survey respondents.

Data source: 2007 Washington Department of Health survey of dentists, as analyzed by the UW CHWS.

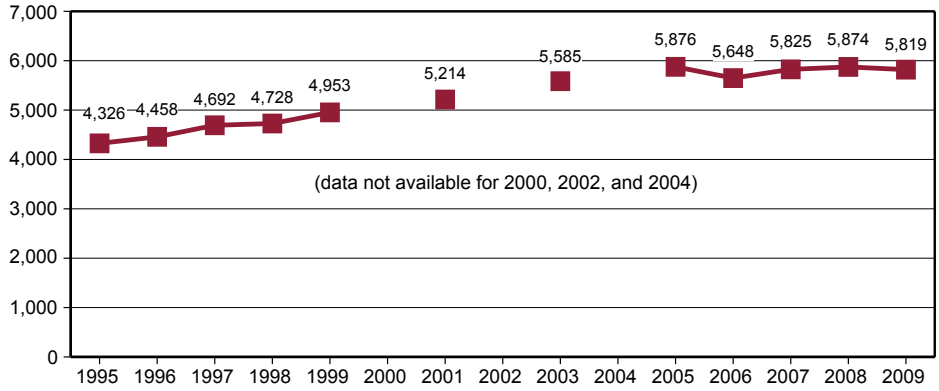
CHARACTERISTICS OF THE ORAL HEALTH WORKFORCE

Following are descriptions of the characteristics of Washington's dentists, dental residents, dental hygienists, dental assistants, EFDAs, denturists, medical professionals and caregivers who provide oral health care. The amount of information varies by profession because comparable data are not collected across the professions. Where available, the number of providers, percentage practicing in their field, demographic characteristics, practice patterns and education are presented. The greatest amount of data was available for dentists and dental hygienists: the Washington Department of Health sponsored surveys of licensed health professionals, including these 2 professions, in 2007. The University of Washington Center for Health Workforce Studies (UW CHWS) was provided access to the 2009 license data and 2007 survey results for dentists and dental hygienists, and analyzed these data for this report. The survey questionnaires are included in Appendix A. Tables showing detailed findings from UW CHWS analyses of the 2007 dentist and dental hygienist surveys are included as Appendices B and C, and a description of the methods used for the analyses is included as Appendix D.

DENTISTS

Size of Dentist Supply: In 2009 (for which only license data were available) there were 5,819 total dentists with Washington State licenses. The 2007 survey of licensed dentists in Washington provided more detailed information about the dentists' characteristics. UW CHWS's analyses found 83% of dentists in 2007 with Washington licenses had addresses in Washington. As shown in Figure 1, based on responses to the survey question "Are you currently practicing as a dentist in Washington State?" an estimated 81% of the 5,380 licensed dentists in 2007 practiced in Washington.

Figure 2. Number of Dentists with Washington State Licenses, 1995-2009



Data source: Washington Department of Health, Health Systems Quality Assurance, as analyzed by the UW CHWS.

The total number of dentists with Washington licenses increased between 1999 and 2005, but has remained about the same since then (Figure 2). The number of licensed dentists per 100,000 Washington population grew slightly between 1999 and 2009 from 85 to 87. The estimated number of practicing dentists per 100,000 population was 71 in 2009 (UW CHWS analyses using U.S. Census estimates for Washington).

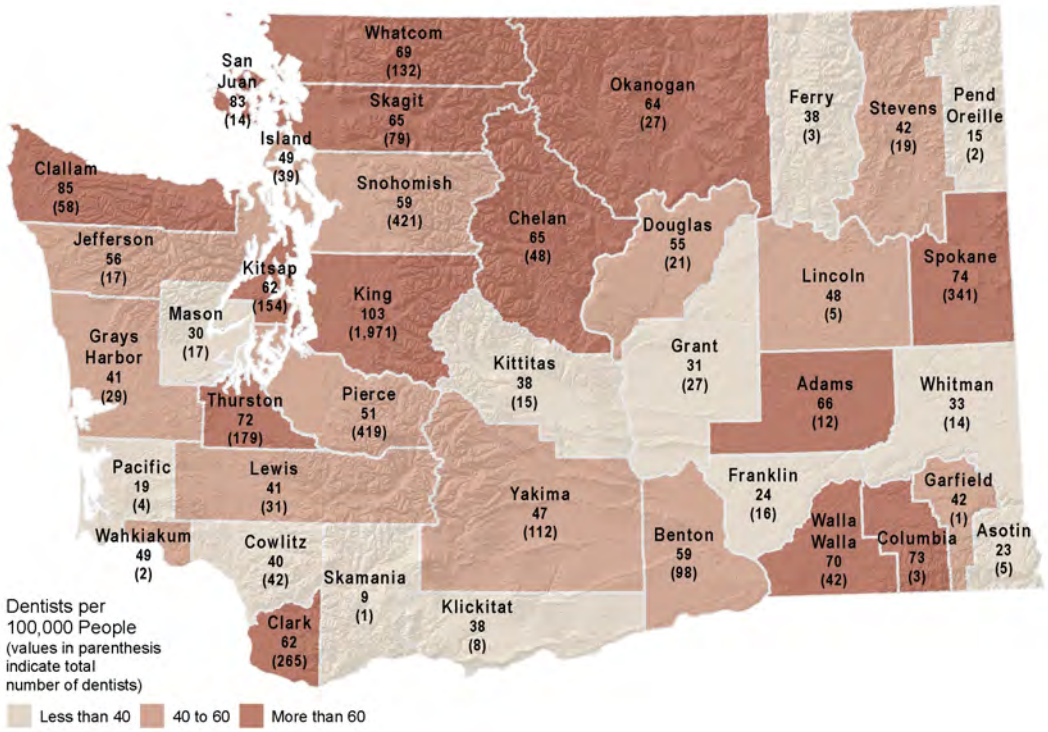
Distribution: The number of licensed dentists in each Washington county in 2009 and the number per 100,000 population are shown in Figure 3. The number of dentists per 100,000 population by county ranged from 9 (Skamania County) to 103 (King County).

rural and urban areas of the state, 14% of the state's population in 2004 lived in rural areas.

Demographics: In 2007, the average age of all licensed dentists in Washington was 49, and the average age of those practicing in Washington was 48 years. In 2001 a survey of private-practice dentists in the state found their average age to be 48 years (Hart, 2001). In 2007 18% of Washington's practicing dentists were female, 80% were white (with another 14% Asian and 6% other races), and 3% were Hispanic.

Practice Characteristics: Among dentists practicing in Washington in 2007, 77% were in general practice,

Figure 3. Licensed Dentists per 100,000 Population and Number of Licensed Dentists in Washington Counties*, 2009



* "In Washington counties" was determined from license mailing ZIP code.

Data sources: Washington Department of Health, Health Systems Quality Assurance; U.S. Census, as analyzed by the UW CHWS.

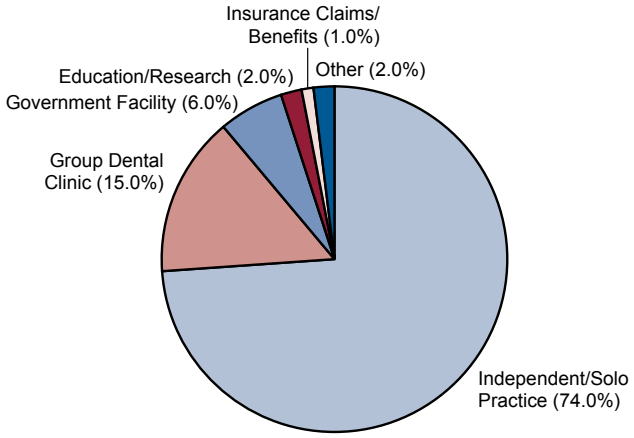
In 2007, 12% of dentists practicing in Washington practiced in rural areas. This compares with 13% of full-time generalist dentists and 9% of full-time specialist dentists who practiced in rural areas in 2001 (Hart, 2001).[1] Using the same taxonomy to define

4% in pediatric practice, 2% in public health, and 17% in other specialties. In 2001, 84% of private practice dentists in Washington were in general practice (including pediatrics) (Hart, 2001).

Three-quarters (74%) of dentists practicing in Washington in 2007 were in independent or solo practices (Figure 4). Another 15% worked in group dental clinics. Eighty-one percent of all practicing dentists in 2007 worked full time (32 hours or more per week), and 85% practiced in a single location.

1. Rural was defined for both 2001 and 2007 analyses using the Rural-Urban Commuting Area (RUCA) taxonomy as a combination of "large rural," "small rural" and "isolated small rural" groupings of RUCA codes. More information is available at http://depts.washington.edu/uwruca/.

Figure 4. Work Setting of Dentists Practicing in Washington, 2007



Data source: 2007 Washington Department of Health survey of dentists, as analyzed by the UW CHWS.

Dentists practicing in Washington in 2007 had worked as a dentist for 20 years on average, 17 of which were in Washington.

Dentist Education: Among all licensed dentists in Washington in 2007, 42% reported they obtained their initial dentist education in Washington State and 5% obtained their initial dentist education outside the United States. Thirty-one percent of practicing dentists in 2007 had completed postdoctoral dentist education. Reliable estimates of the percentage of dentists receiving postdoctoral education in Washington were not available, but if known, the number of dentists with Washington licenses who received some of their dental education in-state would likely reach or exceed 50%.

DENTAL HYGIENISTS

In 2009 there were 4,973 total dental hygienists with Washington State licenses, and 88% had addresses in the state. Using data from a 2007 survey of licensed dental hygienists in Washington, from which more detailed information about the dental hygienists and their characteristics was available, 87% had addresses in Washington. As shown in Figure 5, 79% of the 4,796 dental hygienists in 2007 practiced in-state. A 2004 survey of Washington's dental hygienists found 88% of licensed dental hygienists in Washington were practicing (Andrilla & Hart, 2007).

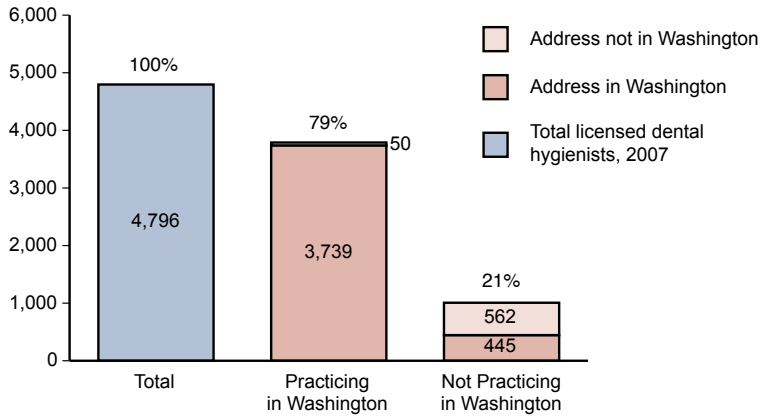
The total number of dental hygienists with Washington licenses has increased by 1,158 (30%) since 1999 (Figure 6). The number of licensed dental hygienists per 100,000 Washington residents grew from 66 in 1999 to 75 in 2009. The estimated number of practicing dental hygienists per 100,000 population was 59 in 2009 (UW CHWS analyses using U.S. Census estimates for Washington).

Distribution: The number of licensed dental hygienists in each Washington county in 2009 and the number per 100,000 population are shown in Figure 7. The number of dental hygienists per 100,000 population by county ranged from 13 (Ferry County) to 86 (Spokane County). Nine percent of dental hygienists practiced in rural areas in 2007. In 2004, 12% of dental hygienists had mailing addresses in rural areas of the state (where 14% of the state's population resided in 2004).

Demographics: In 2007, the average age of all licensed dental hygienists in Washington was 45, and the average age of those practicing in Washington was 44 years. In 2007, 97% of Washington's practicing dental hygienists were female, 92% were white (with another 4% Asian and 4% other races), and 2% were Hispanic. A 2004 survey of the state's dental hygienists found the same average age and percent female as the 2007 survey (Andrilla & Hart, 2007). A similar percentage (93%) in 2004 reported being white, and 2% Hispanic.

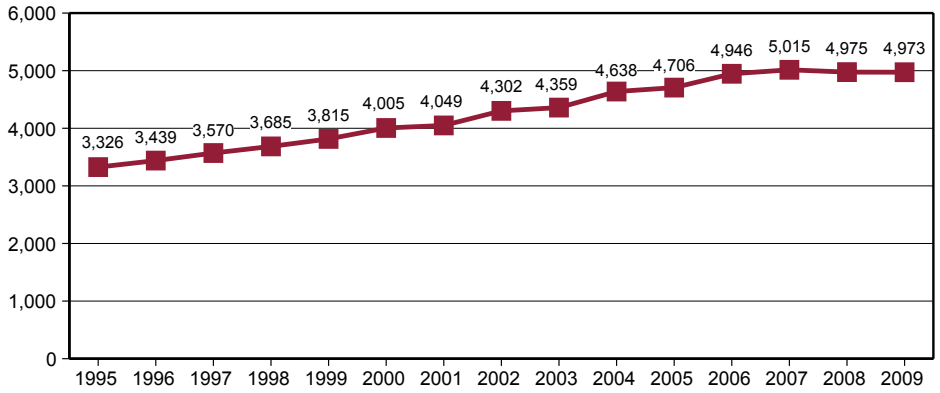
Practice Characteristics: Among dental hygienists practicing in Washington in 2007, 88% were in general practice. Most (96%) of the dental hygienists practicing in Washington in 2007 were in private offices or clinics, and 94% were in supervised clinical practices

Figure 5. Practice and Residence Characteristics of Dental Hygienists with Washington Licenses, 2007



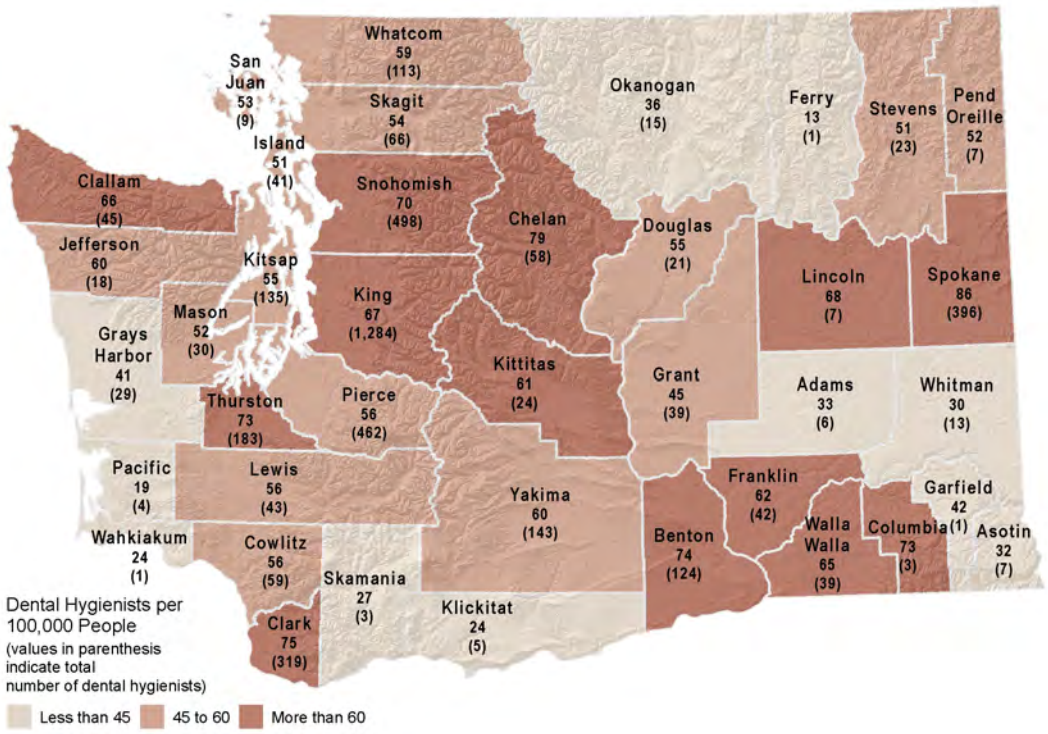
Data source: 2007 Washington Department of Health survey of dental hygienists, as analyzed by the UW CHWS.

Figure 6. Number of Dental Hygienists with Washington State Licenses, 1995-2009



Data source: 2007 Washington Department of Health, Health Systems Quality Assurance, as analyzed by the UW CHWS, and Washington State Dental Hygienists' Association.

Figure 7. Licensed Dental Hygienists per 100,000 Population and Number of Licensed Dental Hygienists in Washington Counties*, 2009



* "In Washington counties" was determined from license mailing ZIP code.

Data sources: Washington Department of Health, Health Systems Quality Assurance; U.S. Census, as analyzed by the UW CHWS.

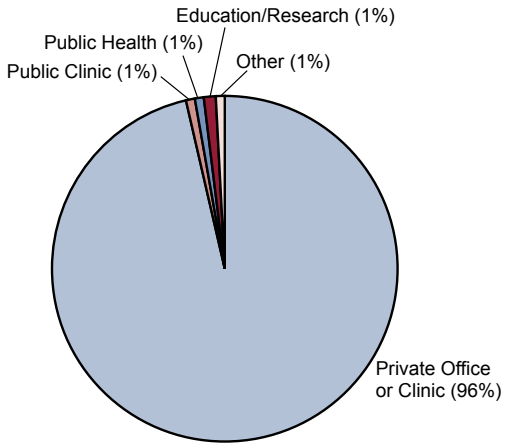
(Figure 8). Just 1% practiced unsupervised, as allowed by Washington law. In response to the 2004 survey, 3% of dental hygienists reported they were in unsupervised practices. Half (51%) of all practicing dental hygienists in 2007 worked full time (32 hours or more per week). Three-quarters of dental hygienists in 2007 reported working in only one practice location compared with 77% who responded similarly to the 2004 survey.

Among dental hygienists practicing in Washington, the average number of years (in 2007) that they had worked as dental hygienists was 17, and 16 of those years were in Washington.

Dental Hygienist Education: Dental hygienists in Washington practice could have obtained their initial education to become a dental hygienist through a certificate program, an associate's degree, or a bachelor's degree. Nearly half (47%) of the 2007 dental hygienist workforce entered the profession through associate degree-level education. There are also opportunities for post-baccalaureate education in dental hygiene. Figure 9 shows the initial and highest dental hygiene education among practicing dental hygienists in 2007.

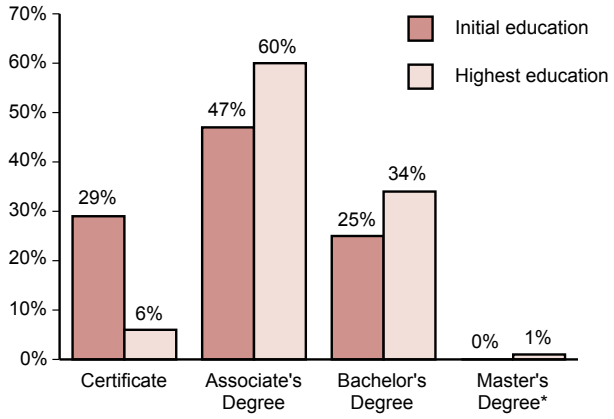
Overall, 79% of dental hygienists in 2007 reported they obtained some of their dental hygiene education in Washington State. Among those with associate's degrees (the most common education type), 81% obtained that education in Washington. Two percent of dental hygienists in Washington obtained their initial dental hygiene education outside of the United States.

Figure 8. Work Setting of Dental Hygienists Practicing in Washington, 2007



Data source: 2007 Washington Department of Health survey of dentists, as analyzed by the UW CHWS.

Figure 9. Initial and Highest Dental Hygiene Education Among Dental Hygienists Practicing in Washington, 2007



* A very small number (0.2%) of survey respondents reported having a Master's degree as their initial dental hygiene education.

Data source: 2007 Washington Department of Health survey of dental hygienists, as analyzed by the UW CHWS.

EXPANDED FUNCTION DENTAL AUXILIARIES

Because expanded function dental auxiliary (EFDA) is a new profession in Washington (licensure was authorized as of December 1, 2008), there were no EFDAs licensed as of June 2009. Students from the 3 new education programs across the state were expected to complete the programs and obtain licenses beginning in mid-late 2009.

DENTAL ASSISTANTS

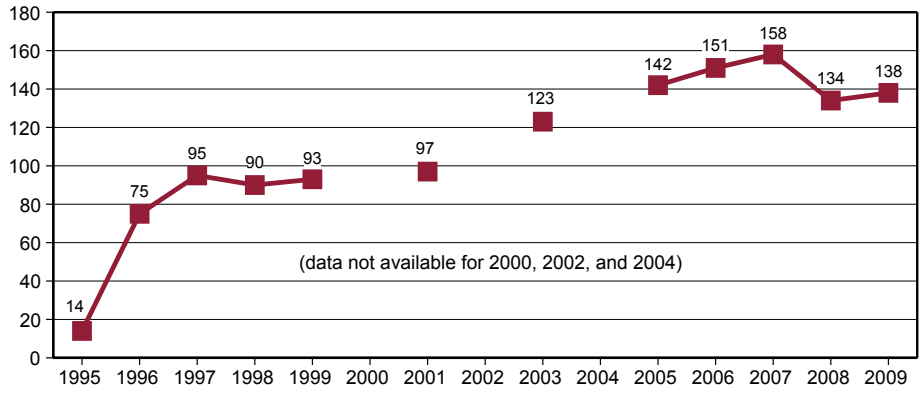
In 2009, there were 9,538 dental assistants registered in Washington. As of July 1, 2008, dental assistants were first required to be registered by the state. Due to the recent implementation of the registration requirement, historical data on the number of dental assistants in Washington are not available, nor are data on their average age and gender.

DENTURISTS

The number of licensed denturists in Washington has grown from 14 in 1995 to 138 in 2009 (Figure 10).

Distribution: The number of licensed denturists in 2009, by county, is shown in Table 3.

Figure 10. Number of Denturists with Washington State Licenses, 1995-2009



Data source: Washington Department of Health, Health Systems Quality Assurance and Community Health Systems.

Table 3. Number of Licensed Denturists in Washington* by County†, 2009

County	Licensed Denturists
Adams	1
Asotin	0
Benton	2
Chelan	1
Clallam	2
Clark	11
Columbia	0
Cowlitz	1
Douglas	0
Ferry	0
Franklin	1
Garfield	0
Grant	0
Grays Harbor	1
Island	2
Jefferson	0
King	36
Kitsap	7
Kittitas	0
Klickitat	0
Lewis	4
Lincoln	0
Mason	0
Okanogan	0
Pacific	1
Pend Oreille	0
Pierce	22
San Juan	0
Skagit	0
Skamania	0
Snohomish	7
Spokane	13
Stevens	0
Thurston	7
Wahkiakum	0
Walla Walla	0
Whatcom	4
Whitman	0
Yakima	4

* County assignment was determined from license mailing ZIP code.

† 5 licensees had out-of-state addresses, and addresses for 7 licensees were unknown.

Data source: Washington Department of Health, Health Systems Quality Assurance.

PRIMARY CARE MEDICAL PROVIDERS

Increasingly, primary care medical providers are delivering preventive oral health services in Washington State. By the time children reach their third birthday, many have already visited their primary care medical provider 11 times for routine well-child checks. Medical offices that have early and frequent contact with infants and toddlers are in ideal positions to also address oral health. Early prevention of dental disease may increase the likelihood of good oral health for life. With increasing rates of caries among young children in Washington, increased prevention efforts are needed. This can be accomplished by encouraging primary care medical providers to perform oral health screenings, risk assessments, oral health anticipatory guidance, application of fluoride varnish, dental referral and collaboration (Mouradian et al., 2005). Washington State's Medicaid program was one of the first in the nation to reimburse primary care providers for applying fluoride varnish on children's teeth (Riter, Maier, & Grossman, 2008). In 2008, Medicaid also began reimbursing trained and certified providers for delivering oral screenings and family oral health education. As of June 2009, 1,085 medical providers (including physicians, advanced registered nurse practitioners and physician assistants) had been trained to deliver dental disease preventive services during well-child exams (WDSF, personal communication, August 18, 2009.)

SUPPORTING CAREGIVERS

In-Home Caregivers: Since 2004, caregivers of seniors and adults with disabilities have been trained to prompt, assist or perform oral health prevention services with their clients. The primary caregiver training agency delivering the oral health curriculum (developed by WDSF) is the Professional Registry of Nursing. By August 2009 the training had been delivered to more than 2,500 caregivers in 9 different languages.

LICENSING BOARDS AND PROFESSIONAL ASSOCIATIONS

Licensing Boards: The following boards and commissions govern the practice of oral health professionals:

Dental Quality Assurance Commission: The Dental Quality Assurance Commission (DQAC) works in collaboration with the Department of Health, Health Professions Quality Assurance to regulate the competency of dental health care providers. The commission oversees the qualification criteria for licensure and seeks to maintain a consistent standard of practice. As of July 1, 2009, DQAC consists of 16 members, including dentists, dental auxiliaries, and the general public. The DQAC acts as a disciplinary hearing panel and also may investigate and make recommendations when complaints against dentists arise. Information about the DQAC may be found at http://www.doh.wa.gov/hsqa/professions/Dental/commission.htm.

Dental Hygiene Examining Committee: The Dental Hygiene Examining Committee (DHEC) works in collaboration with the Secretary of the Department of Health in adopting rules necessary to prepare and conduct dental hygiene examinations, including setting standards for the examinations. DHEC also has the authority to determine continuing education requirements for renewing the dental hygiene license. DHEC consists of 3 licensed dental hygienists and 1 public member. Information about the DHEC may be found at http://www.doh.wa.gov/hsqa/professions/Dental_Hygiene/.

Board of Denturists: The Board of Denturists deals with all processes for licensure as a denturist in the state, including the administering of examinations and determining a passing grade. Schools from which graduation is required for licensure are evaluated and approved by the board. The board also has the authority to require demonstration of continued competency in order for denturists to renew their licenses. Information about the Board of Denturists may be found by contacting hpqa.csc@doh.wa.gov.

Professional Associations: Professional associations in Washington that promote oral health professions and provide professional resources for their members include the following organizations:

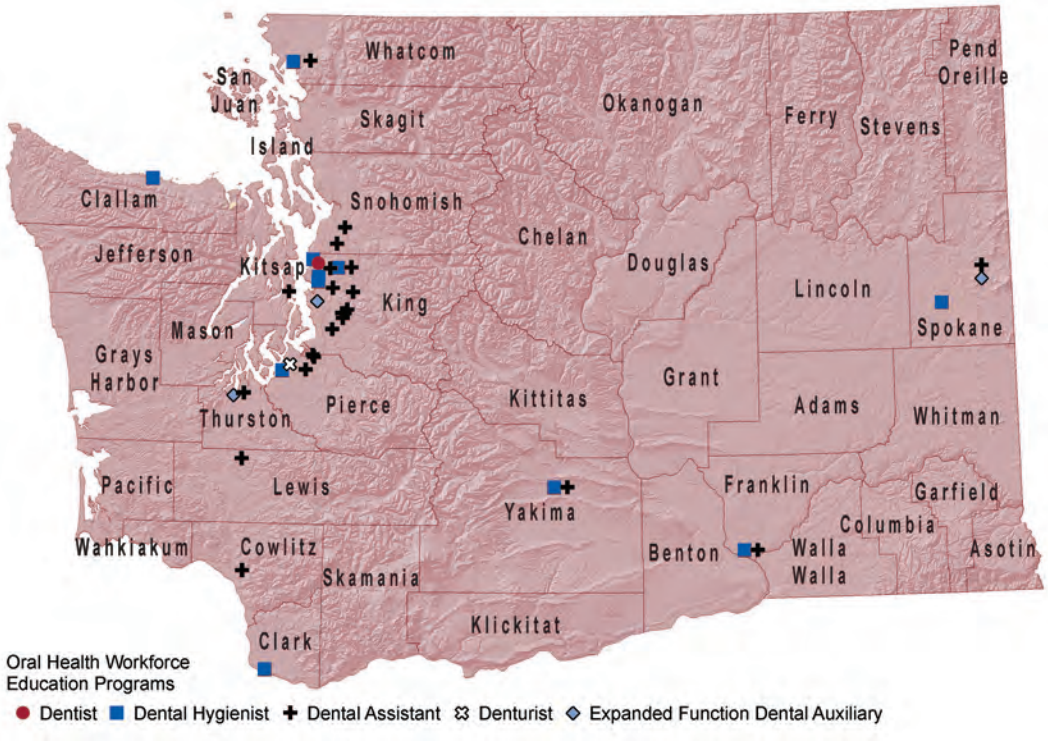
Washington State Dental Association: The Washington State Dental Association (WSDA) has operated in Washington since 1887, and its membership includes more than 80% of practicing dental professionals in the state. The WSDA helps to determine ethical standards for the profession, and develops and supports oral health care services for underserved groups. WSDA supports continual learning programs for its professionals. The WSDA coordinates its activities with local component societies and the American Dental Association. Information about the WSDA may be found at http://www.wsda.org.

Washington State Dental Hygienists Association: The Washington State Dental Hygienists' Association (WSDHA) acts as a professional resource for dental hygienists. It forms a 3-part organization with the national American Dental Hygienists' Association and local component societies, and all work to increase access to quality oral health care. The WSDHA's Web site address is http://www.wsdha.com.

Alliance of Dental Hygiene Practitioners: To improve oral health quality in communities, dental hygienists created the Alliance of Dental Hygiene Practitioners in 2000. This organization supports dental hygienists and also has aimed to increase access to oral health care and education. The members have created preventive programs such as Senior Smiles for Life and Washington State SmilePartners. The Alliance also holds continuing educational forums for dental hygienists focusing on community practices, small businesses, and networking. More information about the Alliance may be found at http://www.eldercaredentalhygieneservices.com/ADHP.html.

Washington State Denturist Association: The Washington Denturist Association promotes unity and professional standards among denturists in Washington. The association provides information on new developments in the field and encourages continuing education in denturism among its members. Information about the association may be found at http://www.wadenturist.com.

Figure 11. Location of Oral Health Provider Education Programs in Washington, 2009



Data sources: Integrated Postsecondary Education Data System, U.S. Department of Education; personal communication with educational institutions.

MAJOR FACTORS AFFECTING FUTURE ORAL HEALTH WORKFORCE SUPPLY IN WASHINGTON

ORAL HEALTH PROVIDER EDUCATION

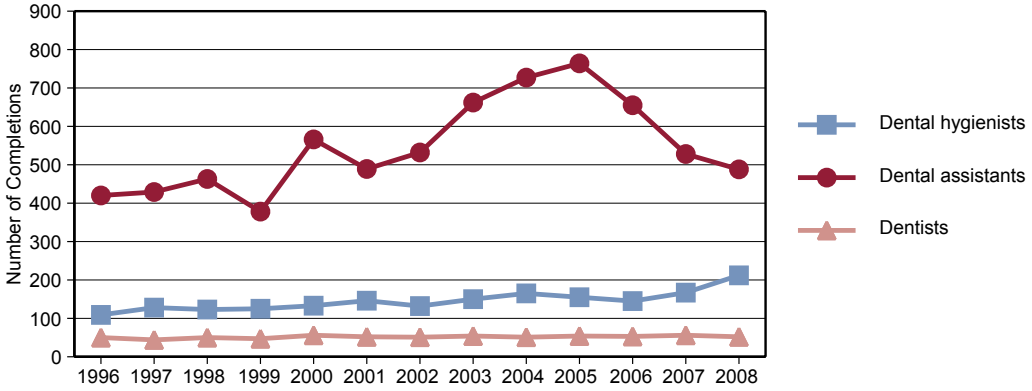
Trends in Oral Health Provider Education: A major contributor to Washington's oral health workforce supply is the state's education system. Within Washington there are education programs for dentists, dental hygienists, dental assistants, expanded function dental auxiliaries (EFDAs), and denturists. Figure 11 shows where education programs for these professions are located across Washington. Education trends in Washington for dentists, dental hygienists and dental assistants are shown in Figure 12.

Dentist Education: Washington has one dental school, the University of Washington (UW) School of Dentistry, established in 1945 and based in Seattle. In addition to the Doctor of Dental Surgery (DDS) degree, the school offers Master of Science, DDS/PhD programs and clinical residencies. The school enrolls 55 dental students a year, and its clinics, with 230 dental chairs, provide 66,000 patient visits a year. Some dentistry students spend their first year of dental school in Spokane through the "Regional Initiative in Dental Education" (RIDE) program (designed to increase the number of dentists in rural and underserved parts of the state). These students return for 4-6 months of community training experiences at clinical sites across eastern Washington. The number of new dentists graduating from the University of Washington dentistry program increased slightly between 1996 and 2000, followed by a plateau of approximately 50 new graduates from 2001 to 2008 (Figure 13). Beginning in 2012, the RIDE program will increase the number of dentist graduates by 15%.

While the number of dental school graduates has remained fairly constant since 1996, in relation to the state population the number of dentistry graduates has decreased slightly. New dentistry graduates per 100,000 state population were 0.90 per 100,000 in 1996 and 0.79 per 100,000 in 2008 (Figure 14).

Approximately one-third of dentistry graduates were female each year from 2003 to 2008 (Table 4), which is much lower than the percentage of the overall state population that is female (50% in 2008). The proportion of dentistry graduates who were from underrepresented communities of color (e.g., Blacks, American Indians/Alaska Natives, Hispanics) has

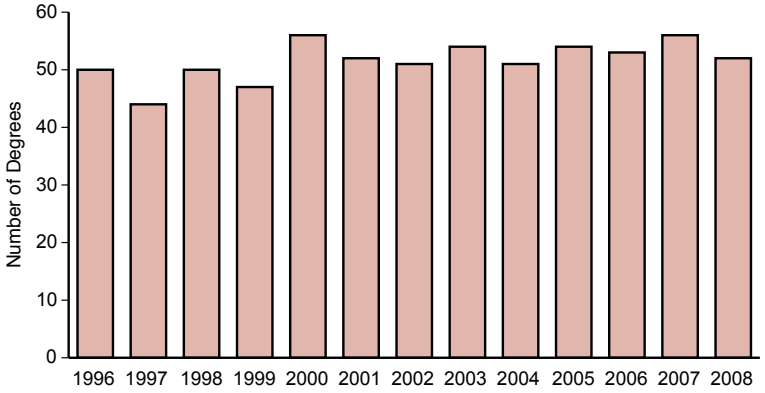
Figure 12. Oral Health Education Completion Trends in Washington, 1996-2008



Data source: Integrated Postsecondary Education Data System, U.S. Department of Education.

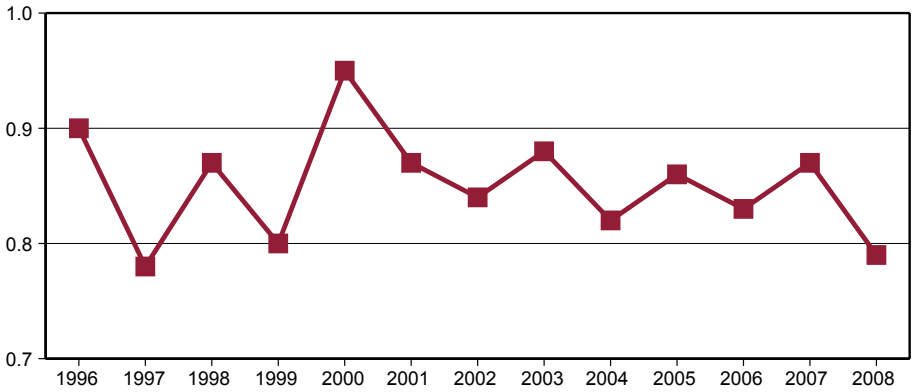
consistently been lower than their representation in the general population (Table 4). The average percentage of dentistry graduates who were white/Non-Hispanic is roughly comparable to the percentage of the state population that is white/Non-Hispanic (76% in 2008). There has been a much larger percentage of Asian dentistry graduates from 2003-2008 than occurs within Washington State's population (23% average Asian dentistry graduates compared with 7% Asian/Pacific Islanders in the state in 2008). These comparisons should be viewed with caution,

Figure 13. Number of Dentistry (DDS) Degrees Awarded in Washington, 1996-2008



Data source: Integrated Postsecondary Education Data System, U.S. Department of Education.

Figure 14. Number of Dentistry Graduates per 100,000 Washington State Population, 1996-2008



Data sources: Integrated Postsecondary Education Data System, U.S. Department of Education, and Washington State Office of Financial Management Forecast of the State Population, November 2008.

Table 4. Sex and Race/Ethnicity of Dentist Graduates in Washington, 2003-2008

Year	% Female	Race/Ethnicity					
		White Non-Hispanic	Black Non-Hispanic	Asian	American Indian	Hispanic	(% Not Reported)
2008	33%	88%	0%	12%	0%	0%	(4%)
2007	30%	64%	4%	30%	0%	2%	(9%)
2006	43%	78%	2%	18%	0%	2%	(6%)
2005	33%	71%	2%	27%	0%	0%	(4%)
2004	31%	71%	2%	27%	0%	0%	(4%)
2003	35%	75%	0%	21%	2%	2%	(4%)

Data source: Integrated Postsecondary Education Data System, U.S. Department of Education.

however, because of the different ways in which the race/ethnicity data were collected. State numbers include a category for persons of 2 or more races, while the IPEDS data are reported by individual racial group.

Dentists in Advanced Dental Education: The main programs for advanced education in general dentistry are the general practice residency (GPR) and the advanced education for general dentistry (AEGD) programs. Residencies for general practice dentists (including AEGD programs and GPRs) allow dentists to gain experience treating patients with diverse and complex oral health needs and expand their skills through mentoring from highly experienced dentists. AEGD and GPR dental residencies, such as those offered through the Northwest Dental Residency and the University of Washington, provide dental services to low-income populations and/or those with complex medical, mental and physical challenges. Completing a general dental residency in an underserved area is an alternate route to Washington State licensure (instead of completing the regional dental board examination).

The UW School of Dentistry also offers advanced training in pediatric dentistry. Completion of the 2-year pediatric dentistry residency leads to either a Certificate in Pediatric Dentistry through the Yakima track or a Certificate in Pediatric Dentistry and a Master's of Science in Dentistry (MSD) degree through the Seattle program. Completion of the 3-year pediatric dentistry residency can lead to a Certificate in Pediatric Dentistry, an MSD degree and a Master's in Public Health (MPH) degree.

Other graduate degree programs offered at the UW School of Dentistry include Master's programs in endodontics, oral medicine, oral pathology, orthodontics, periodontics, and prosthodontics, and PhD programs in oral biology and oral pathology. Most of these programs admit 4-5 students each year. The UW School of Dentistry also offers a residency program in oral and maxillofacial surgery that admits 4 students a year for this 4-year program. Public health degrees include a Masters in Public Health through the UW School of Public Health and a PhD program in Dental Public Health Sciences from the UW School of Dentistry.

Dental Hygienist Education: There were 7 community and technical colleges and 2 state universities that offered dental hygiene education programs in Washington at the end of 2008. A new program at Bellingham Technical College was expected to have its first graduates in late 2009. These programs graduated dental hygienists at the associate degree or baccalaureate degree level. Advanced dental hygiene education at the Masters level is offered at 2 schools, University of Washington and Eastern Washington University, and the University of Washington offers a doctorate in dental hygiene. The overall number of dental hygiene graduates from 1996 to 2008 by type of program is shown in Figure 15 and the number of graduates by program are shown in Table 5. Total annual graduates increased by 94% from 1996 (109) to 2008 (212). The number of dental hygienists completing bachelor's degrees nearly doubled from 35 in 2003 to 66 in 2008. During the same time period, the number of dental hygiene associate's degrees varied by year, ranging from 114 in 2003, to a 12-year low of 95 in 2006 and a high of 146 in 2008.

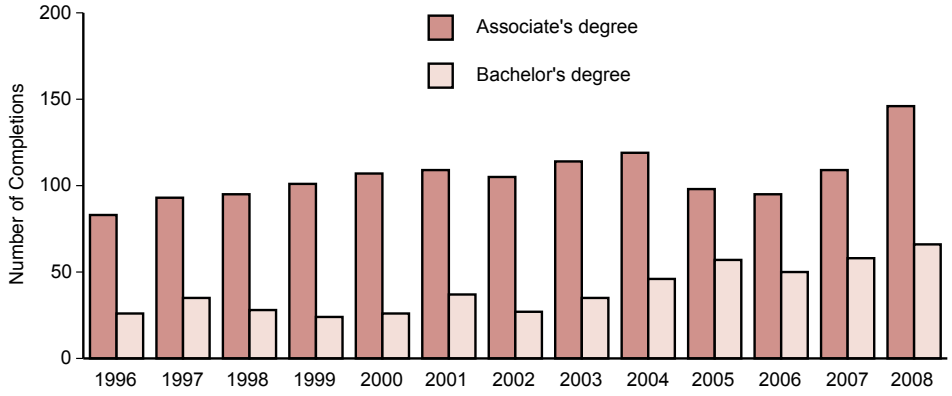
Total dental hygienists educated since 1996, relative to the state population, is shown in Figure 16. Overall, this ratio has increased by 60% (with some fluctuations) from 2.0 dental hygienist graduates per 100,000 state population in 1996 to 3.2 in 2008.

Among dental hygienist program graduates, the percent who were female ranged from 95% to 97% between 2003 and 2008 (Table 6), higher than the 91% who were female in 1996. The percent of dental hygienist program graduates who were Hispanic or non-white increased during this span of time, but race and ethnicity reporting was inconsistent and for some years the amount of missing data was large which reduces the precision of these estimates

(Table 6). The average percentage of dental hygienist graduates who were white/non-Hispanic was higher than found among the state's overall population, while Asian graduates were slightly over-represented compared to the state population (7% to 10% among dental hygienists graduates compared with 7% in Washington's population).

Expanded Function Dental Auxiliary Education: Since EFDAs became a licensed profession in Washington in 2007, 3 colleges have initiated EFDA education programs. The inaugural classes at Spokane

Figure 15. Number of Dental Hygienist Education Program Completions in Washington, 1996-2008



Data source: Integrated Postsecondary Education Data System, U.S. Department of Education.

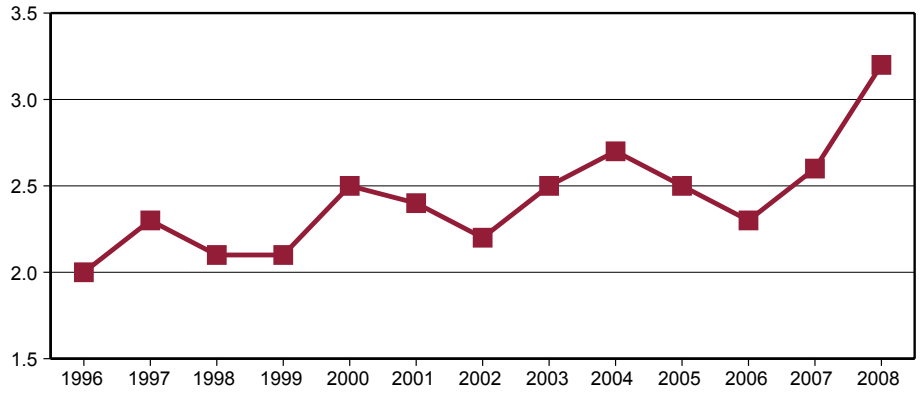
Table 5. Dental Hygienist Education Program Completions by Programs in Washington, 1996-2008

County	Institution	Program Level	2003	2004	2005	2006	2007	2008	Total
Clark	Clark College*	Associate Degree	25	22	25	22	23	25	142
Franklin	Columbia Basin College	Associate Degree	14	14	14	16	12	23	93
King	Lake Washington Technical College	Associate Degree	21	28				28	77
King	Seattle Community College-Central Campus	Associate Degree					15	15	30
King	Shoreline Community College	Associate Degree	25	24	22	23	23	22	139
Pierce	Pierce College at Lakewood*	Associate Degree	15	16	21	21	17	20	110
Clallam	Pierce College at Port Angeles*	Associate Degree					5	3	8
Yakima	Yakima Valley Community College	Associate Degree	15	16	18	16	18	17	100
King	University of Washington-Seattle Campus	Bachelor's Degree†	1	4	4	3			12
Spokane	Eastern Washington University	Bachelor's Degree‡	35	42	53	47	58	66	301

* Program completions information supplemented by the college.
† All graduates were dental hygienists completing bachelor's degrees.
‡ Some completers were dental hygienists who sought bachelor's degree completions. The number of new dental hygienists, by year, 2003-2008, were 23, 31, 30, 28, 31 and 35.

Data source: Integrated Postsecondary Education Data System, U.S. Department of Education.

Figure 16. Number of Dental Hygienist Graduates per 100,000 Washington State Population, 1996-2008



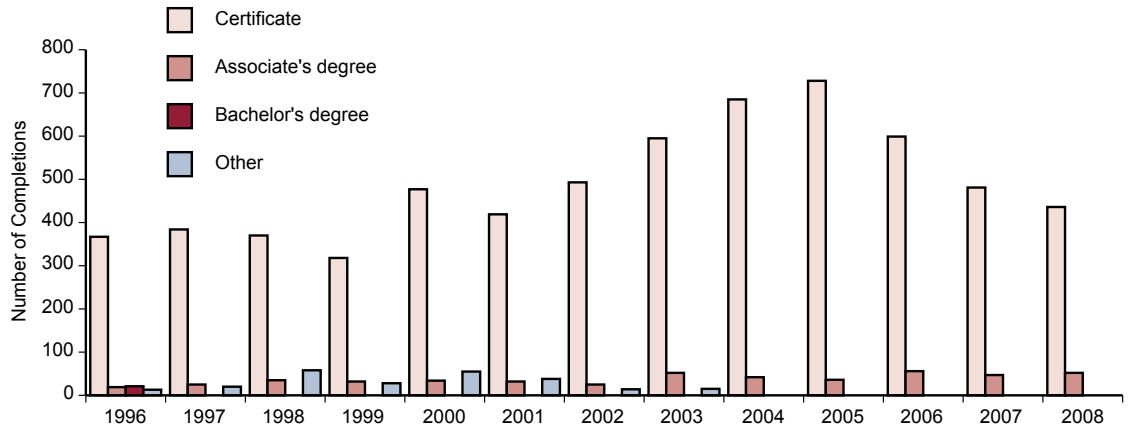
Data sources: Integrated Postsecondary Education Data System, U.S. Department of Education, and Washington State Office of Financial Management Forecast of the State Population, November 2008.

Table 6. Sex and Race/Ethnicity of Dental Hygienist Education Graduates in Washington, 2003-2008

Year	% Female	Race/Ethnicity					
		White Non-Hispanic	Black Non-Hispanic	Asian	American Indian	Hispanic	(% Not Reported)
2008	96%	82%	2%	9%	2%	5%	(10%)
2007	97%	83%	1%	10%	1%	5%	(10%)
2006	97%	83%	2%	9%	1%	5%	(3%)
2005	97%	88%	0%	7%	1%	4%	(6%)
2004	97%	90%	1%	8%	0%	1%	(5%)
2003	95%	85%	0%	10%	1%	3%	(16%)

Data source: Integrated Postsecondary Education Data System, U.S. Department of Education.

Figure 17. Number of Dental Assistant Education Program Completions in Washington, 1996-2008



Data source: Integrated Postsecondary Education Data System, U.S. Department of Education.

Community College (Spokane) and South Puget Sound Community College (Olympia) commenced in early 2009. Seattle Central Community College initiated an EFDA education program in June 2009. The South Puget Sound Community College program had 14 students complete the program in June 2009, and 29 students completed Spokane Community College's program in 2009. The first 14 students in the new EFDA program at Seattle Central Community College are expected to complete their education in 2010.

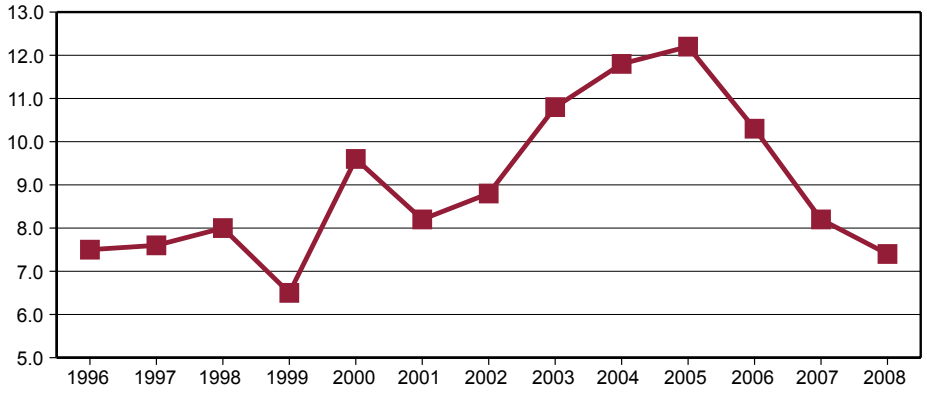
Dental Assistant Education: Seventeen community and technical colleges and institutes offered dental assistant programs in Washington at the end of 2008. These programs granted either certificates or associate's degrees in 2008, but prior to 2004 dental assistants could obtain education through bachelor's degree programs, and short programs without certificates at completion. The number of program completions from 1996 to 2008 by type of program is shown in Figure 17. Total annual dental assistant education program completions have varied considerably between 1996 and 2008. In 1996 there were 420 completions, and this number dropped to 378 in 1999. The number of completions increased to 764 in 2005 before dropping to 488 in 2008.

Table 7 shows the number of completions by location, institution, and program type. In 2008, certificate-granting programs included 12 that could be completed in less than 1 year, 13 that required education that generally took more than 1 but less than 2 years to complete, and 2 that required between 2-4 years to complete. Six programs in the state in 2008 granted associate's degrees to dental assistants.

The fluctuation in annual education program completion rates for dental assistants is shown in the graph of dental assistant completions per 100,000 population in Figure 18. This rate has ranged between 6 and 12 completions per 100,000 population since 1996.

Among the students who completed dental assistant education programs in Washington, the percent female ranged from 92% to 98% between 2003 and 2008 (Table 8). The percent of dental assistant program completers who were white/non-Hispanic ranged between 69% and 77% from 2003 to 2008, but for some years the amount of missing data was large,

Figure 18. Number of Dental Assistant Program Completions per 100,000 Washington State Population, 1996-2008



Data sources: Integrated Postsecondary Education Data System, U.S. Department of Education, and Washington State Office of Financial Management Forecast of the State Population, November 2008.

Table 7. Dental Assistant Education Program Completions by Programs in Washington, 1996-2008

County	Institution	Program Type*	2003	2004	2005	2006	2007	2008	Total
King	Cambridge College-Seattle	Certificate Program <1yr				8	22		30
King	Everest College-Renton	Certificate Program <1yr	147	148	142	48	27	33	545
King	Pima Medical Institute – Seattle	Certificate Program <1yr	43	33	9	19	16	14	134
King	Pima Medical Institute – Renton	Certificate Program <1yr				25	22	32	79
King	Seattle Vocational Institute	Certificate Program <1yr		2		7			9
Kitsap	Everest College-Bremerton	Certificate Program <1yr	41	36	80	76		43	276
Pierce	Bates Technical College	Certificate Program <1yr					12	25	37
Pierce	Everest College-Tacoma	Certificate Program <1yr				108	75	61	244
Snohomish	Bryman College	Certificate Program <1yr	80	22					102
Snohomish	Bryman College-Lynnwood	Certificate Program <1yr	1	105	99	55	39		299
Snohomish	Everest College-Everett	Certificate Program <1yr	80	98	89	76	64	54	461
Yakima	Yakima Valley Community College	Certificate Program <1yr	8	10	9	9	10	7	53
Cowlitz	Lower Columbia College	Certificate Program 1yr<2yrs	1						1
Franklin	Columbia Basin College	Certificate Program 1yr<2yrs		1	1				2
King	Highline Community College	Certificate Program 1yr<2yrs	12	1					13
King	Kaplan College-Renton	Certificate Program 1yr<2yrs					8	10	18
King	Lake Washington Technical College	Certificate Program 1yr<2yrs	19	22			1	12	54
King	Renton Technical College	Certificate Program 1yr<2yrs	36	17	32	15	33	29	162
King	Seattle Vocational Institute	Certificate Program 1yr<2yrs	21	38	35	29	25	24	172
Lewis	Centralia College	Certificate Program 1yr<2yrs			1	1			2
Pierce	Bates Technical College	Certificate Program 1yr<2yrs	23	29	33	27	9		121
Pierce	Clover Park Technical College	Certificate Program 1yr<2yrs	29	20	12	15	13	16	105
Pierce	Everest College-Tacoma	Certificate Program 1yr<2yrs		30	110				140
Spokane	Spokane Community College	Certificate Program 1yr<2yrs	30	28	25	35	28	21	167
Whatcom	Bellingham Technical College	Certificate Program 1yr<2yrs	24	38	39	33	74	41	249
Pierce	Bates Technical College	Certificate Program 2yrs<4yrs		1		2	1		4
Thurston	South Puget Sound Community College	Certificate Program 2yrs<4yrs	15	6	12	11	2	14	60
King	Lake Washington Technical College	Associate's Degree	10	17	2			12	41
King	Renton Technical College	Associate's Degree		3	2	3	5	2	15
Pierce	Bates Technical College	Associate's Degree	16	7	5	8	7	2	45
Pierce	Clover Park Technical College	Associate's Degree			11	24	13	12	60
Spokane	Spokane Community College	Associate's Degree	8	4	2	7	3	10	34
Thurston	South Puget Sound Community College	Associate's Degree	18	11	14	14	19	14	90

* The lengths of certificate programs are indicated as "<1yr" (less than 1 year), "1yr<2yrs" (at least 1 year but less than 2 years) and "2yrs<4yrs" (at least 2 years but less than 4 years).

Data source: Integrated Postsecondary Education Data System, U.S. Department of Education.

Table 8. Sex and Race/Ethnicity of Dental Assistant Education Program Completers in Washington, 2003-2008

Year	% Female	Race/Ethnicity					
		White Non-Hispanic	Black Non-Hispanic	Asian	American Indian	Hispanic	(% Not Reported)
2008	96%	69%	7%	12%	2%	9%	(10%)
2007	92%	72%	7%	11%	1%	9%	(17%)
2006	97%	73%	9%	9%	1%	7%	(6%)
2005	96%	77%	7%	9%	1%	5%	(6%)
2004	96%	72%	9%	11%	1%	6%	(8%)
2003	98%	74%	9%	7%	1%	5%	(4%)

Data source: Integrated Postsecondary Education Data System, U.S. Department of Education.

reducing the precision of these estimates (see Table 8). The reported percentage of black/non-Hispanic students completing dental assistant programs between 2003 and 2008 (7% to 9%) is higher than black/non-Hispanics occur in the general state population (3% in Washington in 2008). In 2007 and 2008, Hispanic dental assistant program completers appear to be approximately representative of the general population (9% in Washington in 2008).

Denturist Education: Bates Technical College in Tacoma is the single Washington institution offering denturist education. Since initiated in 1997, 108 students have completed the program: approximately 10 new denturists per year.

Education Capacity—Ensuring Adequate Faculty and Clinical Training Sites: Education programs that train health professionals need to have adequate teaching resources, including faculty and clinical training sites, to meet the demand for new graduates of their programs. In most health professions schools, including those training the oral health workforce, the impending retirement of large numbers of members of the baby boom generation is expected to limit or reduce faculty supply. Exacerbating the problem are the higher salaries often available in clinical practice, which cause many potential faculty to choose clinical over academic careers.

Future Plans for Oral Health Education Capacity: At the time this report was prepared, the following plans for increases in dental education capacity had been reported:

Dentists: The UW School of Dentistry is exploring the impact and costs of increasing dental school class size in future years through the RIDE program.

Dental Residencies: Expansion of the general practice dental residencies is being considered, as well as tracks in dental public health.

Dental Hygienists: Bellingham Technical College is initiating an associate degree dental hygiene program in 2010.

Dental Assistants: Clark College in Vancouver received federal American Recovery and Reinvestment Act (2009 federal stimulus) funding to launch a dental assistant education program in fall 2009.

Education programs for oral health professions will expand and contract in future years, depending on funding and enrollment. These programs are a major factor in determining the size and composition of Washington's future oral health workforce.

IN-MIGRATION AND OUT-MIGRATION

An important contribution to any state's health care workforce supply comes from individuals who enter from another state or another country. In-migrants may be new graduates from education programs in other states, or may be experienced professionals who relocate from one state to another. Conversely, not all new graduates from a state's health profession education programs remain there to launch their careers, and, for a variety of reasons, experienced health professionals may leave the state where they have been working during any given year. The extent to which in-migration and out-migration affect workforce supply varies by profession and may be influenced by factors such as comparative wages, licensing requirements, and job availability.

Information on the number of oral health professionals entering and leaving the state each year is not available. From the 2007 surveys of dentists and dental hygienists, however, we know that 42% of all licensed dentists and 79% of all licensed dental hygienists reported they obtained their initial oral health professional education in Washington. These findings indicate that the state has more control over the production of its dental hygienist supply through

education programs than it does for its dentist supply. Recent changes in licensing requirements for dentists have made it easier for out-of-state dentists to become licensed in Washington, and may increase the rate of in-migration of dentists into the state.

RETIREMENT

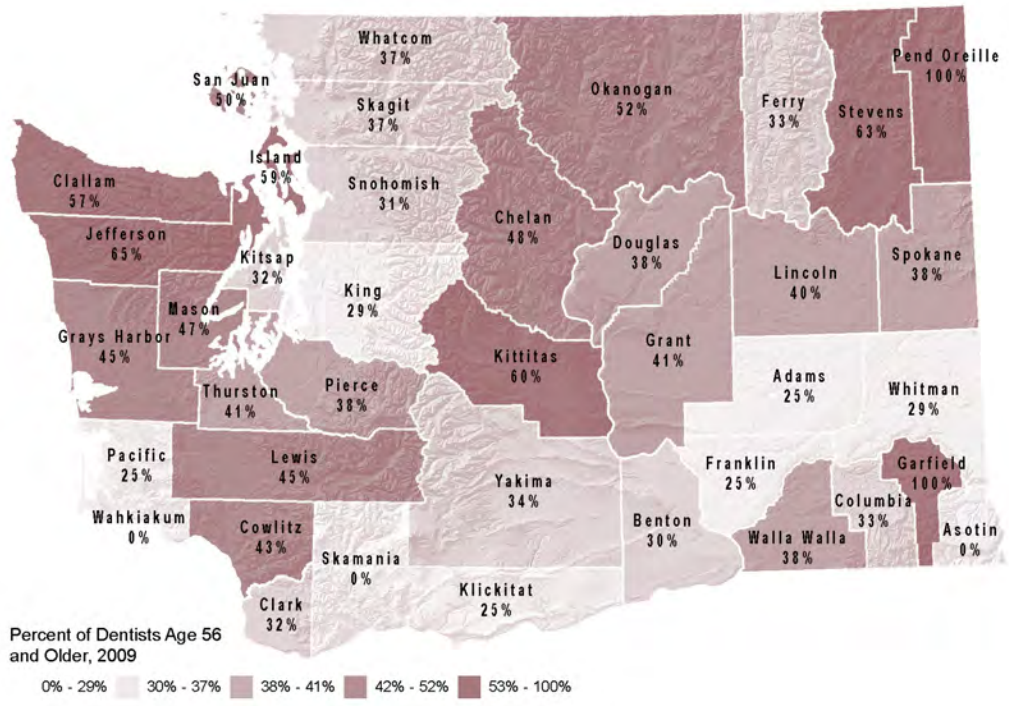
Aging of the Workforce: Age is a critical factor in the analysis of the oral health workforce. Knowing the extent to which retirement in the near future will likely reduce provider supply is important for workforce planning. It is also useful to have that information for specific geographic areas and provider groups.

The average age in 2007 of the state's dentists was 49 years. If it can be assumed that most dentists will retire by about age 65, approximately half the state's current dentist supply will have retired within 15 years. Figure 19 shows the percent of Washington's dentists, by county, who in 2009 were age 56 or older. Most of these older dentists can be expected to retire from practice within 1 to 10 years. In 8 of Washington's 39 counties, more than half of the licensed dentists were age 56 or older, including Pend Oreille and Garfield counties, where all the dentists were in this age group.

Figure 20 shows the percent of Washington's dental hygienists, by county, who in 2009 were age 56 or older. In only 2 counties, Skamania and Wahkiakum, were more than half of the dental hygienists age 56 or older. The average age of dental hygienists in 2007 was 45 years.

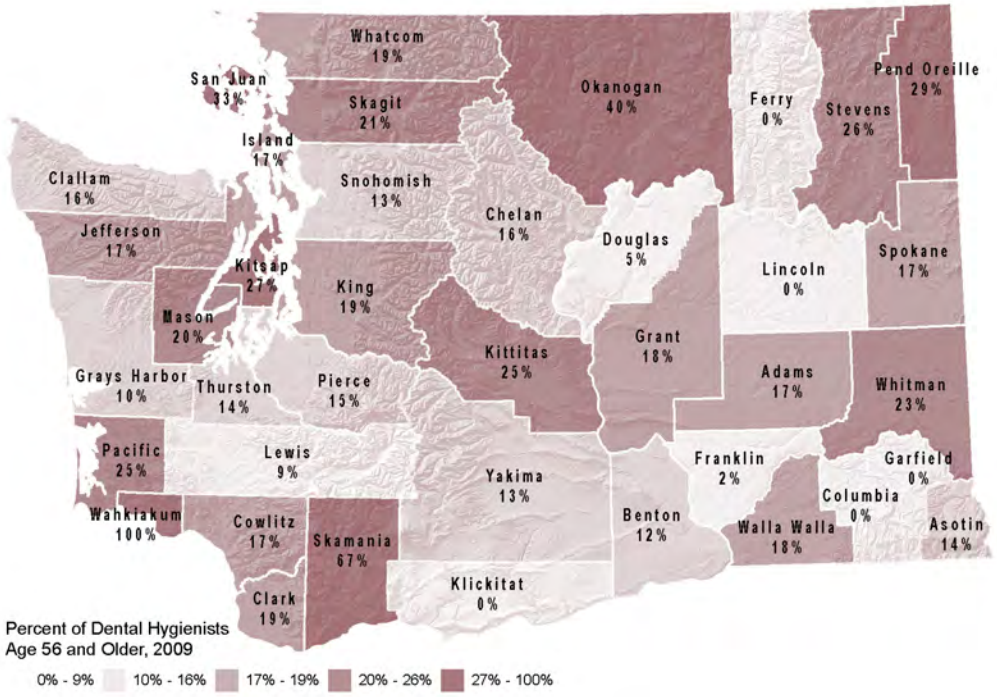
Plans for Retirement—Dentists: A more direct method to estimate the impact of retirement on workforce supply is to ask providers when they plan to retire. Many factors may influence retirement decisions, such as the economy and personal/family health issues. The precision of such direct measurement is likely to be greater for individuals close to retirement than for those anticipating what their situation will be a decade or more in the future. Nonetheless, it is useful to make use of this information as another factor to be considered when anticipating workforce supply needs for the future.

Figure 19. Percent of Washington's Dentists Age 56 and Older by County, 2009



Data source: Washington State Department of Health, Health Systems Quality Assurance, as analyzed by the UW CHWS.

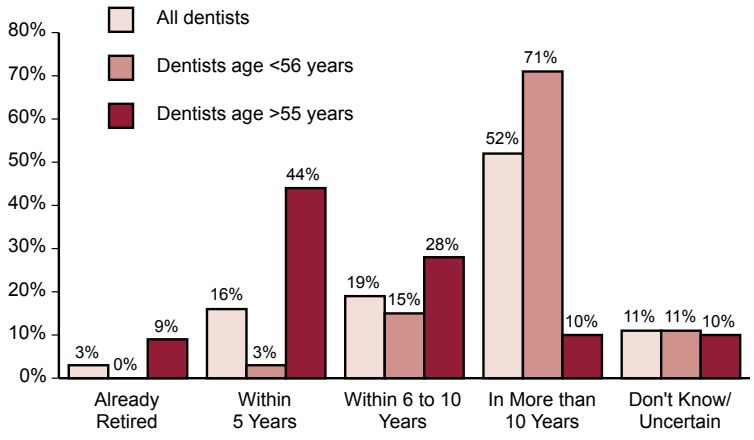
Figure 20. Percent of Washington's Dental Hygienists Age 56 and Older by County, 2009



Data source: Washington State Department of Health, Health Systems Quality Assurance, as analyzed by the UW CHWS.

In 2001, the WSDA survey of Washington's dentists found that half the private practice dentists at that time reported that they planned to retire by the end of 2013 (within 12 years). In response to the 2007 survey of dentists sponsored by the Department of Health, 16% of all dentists practicing in Washington said they intended to retire within 5 years (by 2012), and 35% said they planned to retire within 10 years (by 2017). Figure 21 shows the retirement plans of Washington dentists as measured in 2007. Among practicing dentists age 56 and older, 72% said that they planned to retire within 10 years and another 9% reported that they were already retired (presumably members of the latter group were practicing as volunteers). A question about retirement plans was not included on the dental hygienists survey questionnaire.

Figure 21. Retirement Plans of Dentists Practicing in Washington, 2007



Data source: 2007 Washington Department of Health survey of dentists, as analyzed by the UW CHWS.

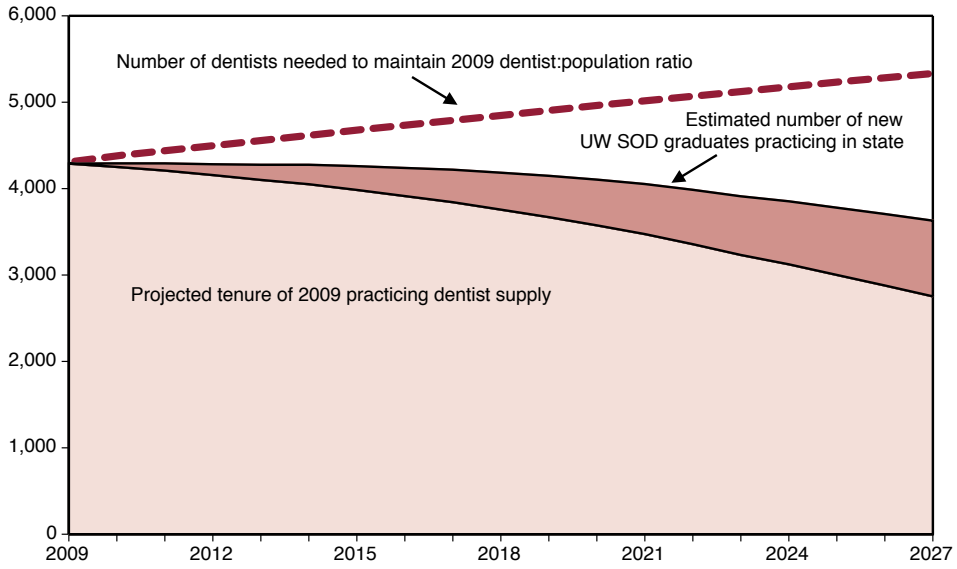
PROJECTIONS OF DENTISTS REQUIRED TO MAINTAIN SUPPLY STATEWIDE: 2009 TO 2027

Many factors influence the future supply of health professionals, including population dynamics, disease patterns, economic issues, changes in education capacity, and changes in regulations and legislation affecting health providers' practices. Because data on all of these factors are not available for all oral health professions, the UW CHWS analyzed available data on dentists and obtained estimates from key stakeholders in order to build a workforce supply projection model that would provide estimates of:

- the number of practicing dentists needed to maintain the 2009 dentist-to-population ratio in the state to 2027,
- tenure of the existing state supply of practicing dentists to 2027,
- the likely contribution to practicing dentist supply of UW School of Dentistry graduates to 2027, and
- the number of dentists that would be needed to bridge the gap between the remaining 2009 supply of dentists combined with new graduates, and the total required to maintain the 2009 dentist-to-population ratio.

Figure 22 shows the results of these analyses. Using estimated population growth numbers for the state (Washington State Office of Financial Management, 2008), 5,311 practicing dentists would be required in 2027 to maintain the ratio of 71 per 100,000 population that was in place in 2009. It should be noted that this ratio is for comparative purposes only, and does not imply that this is the best supply ratio for the state. The assumptions used to make projections of practice patterns for the 2009 dentist workforce included the assumption that as they grow older, their workforce participation rates will be the same as those of Washington's dentists surveyed in 2007. In other words, if 86% of licensed dentists who were 60 years old in 2007 reported they were practicing, the model projected that the 86% of dentists who became 60 years old in 2027 would be practicing. Table 9 shows the workforce participation rates, by age group, of Washington dentists in 2007. No dentists older than 74 years were included in the projections.

Figure 22. Projections of Practicing Dentists Required to Maintain Supply Statewide: 2009 to 2027



Data sources: analyses by the UW CHWS of data from Washington Department of Health, Health Systems Quality Assurance; Washington State Office of Financial Management (2008b); and 2007 Washington Department of Health survey of dentists.

Table 9. Percent of Licensed Dentists, by Age Group, Practicing in Washington in 2007

Age Category	Percent Practicing in Washington
25-29	93%
30-34	98%
35-39	100%
40-49	96%
50-54	96%
55-59	90%
60-64	86%
65-69	73%
70-74	66%

Data source: 2007 Washington Department of Health Survey of dentists, as analyzed by the UW CHWS.

With regard to dental school graduates, the model is built on the presumption that 55 dentists will graduate from the UW each year to 2011, and 63 per year thereafter (taking into account the additional graduates from the RIDE program expansion). The number of graduates entering the supply in the model are discounted to reflect the estimate (from the UW School of Dentistry) that approximately 80% of UW School of Dentistry general graduates and 90% of RIDE graduates remain in Washington to practice.

The result of this model is a projection that among all graduates from the UW School of Dentistry from 2010 to 2027, 876 will be practicing in-state in 2027. Combined with the 2,753 dentists from the 2009 supply who the model estimates will be practicing in 2027, the model shows there would be 3,629 dentists in the state in 2027, before considering the number who will migrate into Washington from other states. The projection illustrates that 1,682 additional dentists would be needed to reach the 5,311 dentists required to maintain the 2009 dentist-to-population ratio.

Washington's dentist supply relies on a significant amount of in-migration of dentists from outside the state. In 2007, 58% of the state's dentist supply were estimated to have obtained their initial dental education from an institution outside of Washington (see Appendix B, Table B-15). The model that produced the projection shown in Figure 22 indicates Washington would continue to rely on in-migration of dentists for 62% of its dentist supply if it were to maintain the same dentist-to-population ratio as it had in 2009.

These analyses are not meant to imply that the 2009 dentist-to-population ratio reflects the best or ideal dentist workforce supply for Washington. It does not take into account any workforce shortages in 2009, maldistribution of the supply, changes in the number of dentists needed if insurance coverage rates were to increase, greater reliance on non-dentist oral health providers, or if other policy or practice changes were to occur that had an impact on the demand for dentists. This ratio simply provides a benchmark from which to compare future trends in dentist supply. If more dentists are needed, then one or more of the following inputs to the state dentist supply would be required: more graduates from the UW School of Dentistry, higher rates of graduates practicing in-state, delays in retirement, increases in workforce participation of the current supply of dentists, and/or more dentists from other states moving to Washington to practice.

ORAL HEALTH FOR UNDERSERVED POPULATIONS IN WASHINGTON

Untreated oral diseases and access to preventive oral health care persist as problems for many Washington residents. There are a variety of programs and services in the state that are working to help meet the oral health needs of these underserved populations.

PROGRAMS TO ENCOURAGE PROVIDERS TO WORK IN UNDERSERVED AREAS

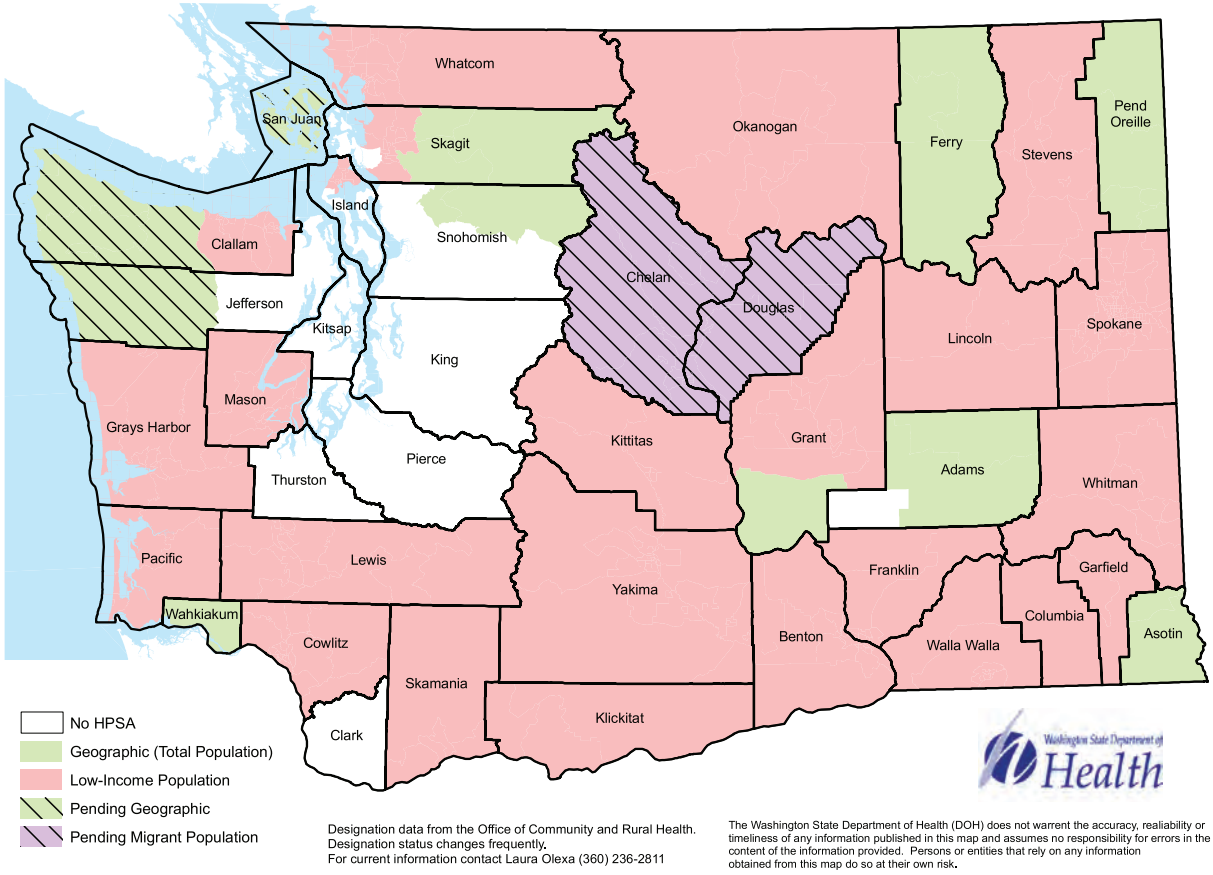
Dental HPSAs: The U.S. Health Resources and Services Administration (HRSA) has developed shortage designation criteria that are used to decide whether or not a geographic area, population group or facility within a state is a Health Professional Shortage Area (HPSA) or a Medically Underserved Area or Population. The federal HPSA designation (which involves assessments of shortages of primary care medical and dental personnel) serves to meet the initial eligibility requirements of over 30 federal and state programs. The Washington Department of Health's Rural Health Programs (RHP) plays an active role in working with local partners and health jurisdictions to determine an area's eligibility for a federal HPSA designation. This collaboration involves gathering data on the supply of primary care providers (medical and dental) for analysis, and when an area meets the shortage area requirements, the RHP prepares and submits designation requests for review to the Shortage Designation Bureau at HRSA. The shortage area requirements are quite complex. Qualifications typically are related to the number of providers relative to the area's population and the extent to which demand can be met by the provider capacity of surrounding areas. All designations are voluntary and can be renewed every 4 years.

In Washington, areas designated as HPSAs meet one of the eligibility criteria to participate in programs such as the National Health Service Corps, Certified Rural Health Clinics, the J-1 Visa Waiver, and many others.

In 2009, 34 of the state's 39 counties submitted requests or were designated as whole- or partial-county dental HPSAs (see Figure 23).

Loan Repayment and Scholarship Programs:
Washington State Health Professional Loan Repayment and Scholarship Programs: One way in which oral health workforce capacity is expanded in Washington is through the state's primary care loan repayment and scholarship programs. Recipients of these program funds must commit to providing primary care in underserved areas of the state. The Health Professional Loan Repayment and Scholarship Programs are

Figure 23. Federally Designated Health Professional Shortage Areas for Dental Care, September 2009



delivered through the State Higher Education Coordinating Board and the Washington Department of Health oversees the application process (see http://www.doh.wa.gov/hsqa/ocrh/slrp/default.htm for detailed descriptions and application instructions for these programs).

Loan Repayment Program: Licensed primary care health professionals eligible to apply for Washington's competitive educational loan repayment assistance include dentists and dental hygienists as well as most medical providers. Recipients must agree to serve at an approved practice location for a minimum of 3 years in return for a $25,000 per year award. Recipients may be eligible for additional loan repayment for serving as many as 2 additional years.

For a site to become eligible for loan repayment for its primary care providers, it must apply through a competitive process. A site may apply for multiple professions and for recruitment and/or retention of a current employee.

Scholarship Program: The Washington State Health Professional Scholarship Program provides financial assistance to students training to become primary care health professionals. Eligible applicants include dentists and dental hygienists, as well as most medical providers.

Scholarship recipients agree to provide primary care health care in rural or underserved urban areas with designated shortages for a minimum of 3 years. Of the 56 health services areas in the state, 33 were designated as dentist shortage areas and 33 (not all the same as for dentists) were dental hygienist shortage areas in 2009-2010. Awards recipients must be U.S. citizens training to become a primary care health professional in an eligible profession. The program carries financial penalties if the recipient does not complete the minimum service requirement after completing his or her education.

Figures 24 and 25 show the number of dentist and dental hygienist loans and scholarships sought and awarded through these programs from 1998 through 2008.

National Health Service Corps (NHSC) Loan Repayment and Scholarship Programs:
NHSC Loan Repayment Program: The NHSC, based in the U.S. Health Resources and Services

Figure 24. Washington State Health Professional Loan Applications and Awards: Dentists and Dental Hygienists, 1998-2008

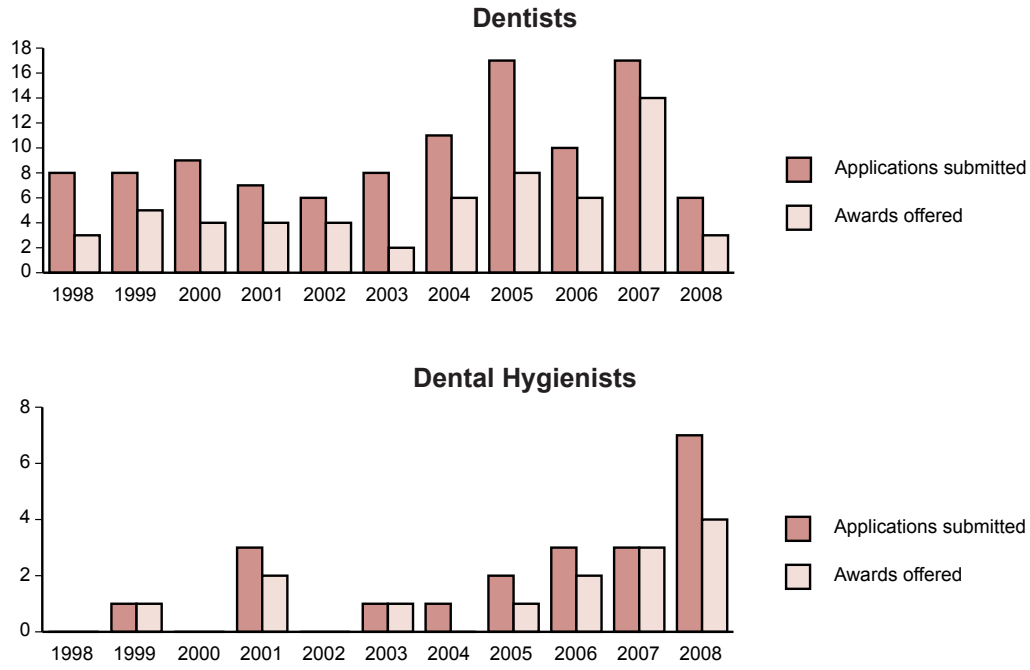
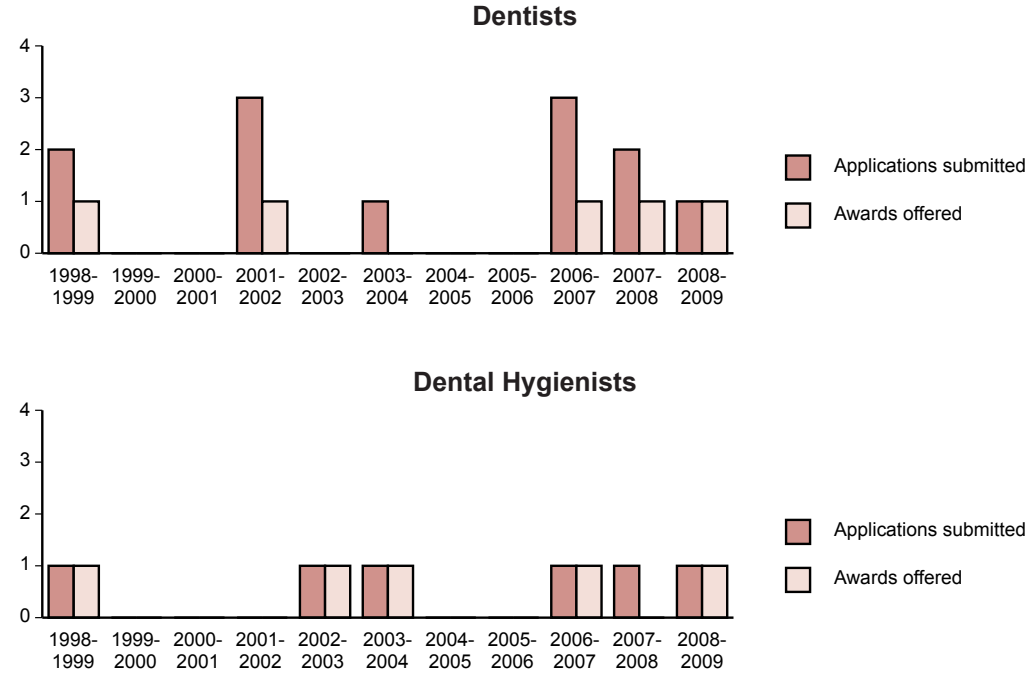


Figure 25. Washington State Health Professional Scholarship Applications and Awards: Dentists and Dental Hygienists, 1998-2008



Data source: Washington State Department of Health and Higher Education Coordinating Board.

Administration, is a federal program established to improve the health of underserved populations by coordinating recruitment and retention of health care providers to serve these groups. The NHSC provides loan repayment for dentists and dental hygienists committed to providing 2 years of service at an approved site in a HPSA. These sites must accept Medicare and Medicaid and provide services on a sliding fee scale or other method that allows poor and uninsured patients to receive care whether or not they are insured or able to pay. Nationwide, approximately half of NHSC clinicians fulfill their service commitment at federally-supported health centers. Other types of NHSC-approved sites include rural health clinics, Indian Health Service clinics, public health department clinics, hospital-affiliated primary care practices, managed care networks, prisons, and U.S. Immigration, Customs & Enforcement sites. There are also some situations where loan recipients may fulfill their service commitment in their own or an established private practice in a HPSA, if approved by the NHSC.

Oral health professions eligible for the NHSC loan repayment program include general practice dentists, pediatric dentists, and dental hygienists. Dental hygienists must have either graduated from a 4-year bachelor's degree program or have completed a 2-year program and had at least 1 year of experience. There were 21 dentists and 1 dental hygienist in 2009 who were carrying out their obligated service in Washington for NHSC loans.

NHSC Scholarship Program: The NHSC also supports a scholarship program that provides support for primary care providers, including general practice and pediatric dentists, who are enrolled in eligible accredited programs in the United States. The scholarships pay tuition, required fees, and other related costs including living stipends to successful applicants for as many as 4 years. NHSC scholars are committed to serve 1 year for each year of support (minimum of 2 years of service) at an approved site in a high-need HPSA soon after they graduate and serve in a general or pediatric dentistry residency. Eligible service sites are the same as for the NHSC loan repayment program.

There were 2 dentists in 2009 who were carrying out obligated service in Washington in return for receiving NHSC scholarships.

Public Health:
Washington State Department of Health—State and Local Oral Health Programs: The Washington State Department of Health—Oral Health Program is staffed with two public health dentists who assess the state's oral health needs, develop collaborative policies, and promote mass preventive measures (e.g., oral health education, community water fluoridation, school-based sealants, topical fluorides, tobacco cessation, oral cancer screening, dental referrals for the underserved). This work is made possible through partnership with 35 local oral health programs across the state.

Washington State Department of Health—Rural Health Programs: This program of the Washington State Department of Health helps rural and underserved communities have access to health services, including oral health. Its staff administers grant programs, recruits and connects health professionals with clinics and hospitals, and supports efforts statewide to bring needed health services to rural and underserved communities.

University of Washington School of Dentistry:
The Office of Educational Partnerships and Diversity's primary goal is to recruit, support and retain students from underrepresented backgrounds and those expressing an interest in serving underserved populations in the field of dentistry.

The Office of Regional Affairs Outreach Program arranges dental student rotations in clinical sites in rural and underserved communities in the state to increase access to dental care and expose students to the dental needs in these regions. Dental students also have outreach experiences in pediatric and geriatric dentistry and participate in hospital rotations as part of the regular curriculum.

The Regional Initiatives in Dental Education (RIDE) program in Washington is a partnership between University of Washington, Eastern Washington University and Washington State University to increase the dental workforce in the eastern part of the state. Dental students train in Spokane alongside medical and dental hygiene students and at various clinical training sites.

Health Careers Camps and Internships: Health career camps and internships are a vehicle to provide youth with exposure to future careers in health care. Early exposure and mentoring can be effective in channeling young people, including those from underserved groups, into careers they otherwise may not have considered.

Project HOPE: Project HOPE (Health Occupations Preparatory Experience) offers 6-week paid internships at local health facilities for underrepresented high school students. The internships (50 per year) include oral health professions. Project HOPE is funded through the Department of Health by the Higher Education Coordinating Board and administered by the Western and Eastern Washington Area Health Education Centers (AHECs). The Western Washington AHEC offers a mini-camp at the University of Washington that provides students with campus life experience. The Eastern Washington AHEC provides a post-internship meeting at Washington State University

to introduce students and their parents to college life. The programs estimate that 96% and 85% of students participating in the Western and Eastern Washington Project HOPE programs, respectively, go on to pursue health careers. In addition, the Eastern Washington AHEC estimates that 25% of its students are hired on at their internship sites.

ConneX: ConneX is a program to help educationally and economically disadvantaged middle school, high school, and college students succeed in health careers. Through Saturday academies and a 6-week summer program, ConneX delivers a math and science camp, mentoring, internships, health career exploration, financial aid and scholarship information, and visits to university health career programs. Among the 301 students enrolled from 2002 to 2006, ConneX found that alumni perceived the program to be very helpful in reaching their goals, more than 90% went on to college, and over 40% went on to pursue a health career. ConneX is a program of the Northwest Community Action Center, an affiliate of the Yakima Valley Farm Workers Clinic.

Dental Camp: Dental Camp provides adolescents from communities that have traditionally been underserved by the dental profession with opportunities to explore careers in the dental field. Participants perform dental procedures and training exercises in a simulation laboratory environment. This "hands-on" curriculum is designed to stimulate an interest in dentistry and related oral health careers, promote academic achievement in math and science, and expand the dental knowledge of adolescents. The overall aims of the program are to increase the diversity of the dental profession and reduce the magnitude of oral health inequities and disparities. Dental Camp was founded by the UW School of Dentistry and the Washington Dental Service Foundation in 2002, and now receives funding from the Washington Department of Health.

PROGRAMS TO INCREASE ACCESS THROUGH DIRECT SERVICE DELIVERY

Medicaid Oral Health Services Providers: Oral health services are delivered to many low-income residents through Washington's Medicaid insurance program. Medicaid, jointly funded and administered by states and the federal government, provides health care coverage to low-income, financially needy populations. In general, Medicaid covers medical and dental care for low-income children, pregnant women (up to 2 months postpartum) and some adults with disabling conditions. Dental and medical providers who receive Medicaid reimbursement for providing oral health care include dentists, oral surgeons, orthodontists, dental hygienists, and primary care providers (physicians, physician assistants and advanced practice nurses).

Table 10 shows the number of providers and facilities (Federally Qualified Health Clinics [FQHCs], public health and other clinics) delivering Medicaid oral health services from 2005 to 2008. The table also shows the number of Medicaid clients served by these providers and facilities. FQHCs provide medical and dental services in designated medically underserved areas and accept all insurance payers, including Medicaid, as well as serve uninsured clients.

Table 10. Facilities/Providers Delivering Medicaid Oral Health Services and Number of Users in Washington, by Year

	Number of Facilities or Providers				Number of Users of Medicaid Services			
	2005	2006	2007	2008	2005	2006	2007	2008
Facilities								
Clinic	53	58	56	55	9,907	10,506	10,468	11,780
FQHC*	71	77	83	81	115,101	122,804	131,872	147,942
Public health	10	11	9	9	505	763	470	480
Providers†, by type (outside of facilities above)								
Dentist	1,386	1,369	1,361	1,342	309,722	315,392	313,506	328,077
Oral surgeon	68	64	61	56	20,570	16,791	16,650	16,423
Orthodontist	33	32	30	35	3,002	3,442	3,194	4,812
Dental hygienist	25	22	22	23	6,433	8,532	17,168	15,782
Denturist	71	70	72	66	7,705	8,281	8,650	8,071
Physician‡	29	30	33	34	4,537	4,547	4,271	4,909

* Federally Qualified Health Center.
† These counts of providers are based on billing provider identifications. In some cases, one provider ID number is used for a group, such as a clinic. As a result, the number of providers in this table likely underrepresents the number of providers delivering services.
‡ Includes family practitioners, pediatricians, general practice, and other physician specialties.

Data source: Washington State Department of Social and Health Services, Office of Medical Benefits & Clinical Review, Division of HealthCare Services.

Public health and other clinics also provide Medicaid oral health services. Because the data reported to Washington's Medicaid offices can refer to a clinic facility as the billing "provider" without reference to the type of provider delivering services (such as a dentist, physician, etc.), it is not possible to report the quantity of services by types of providers within these clinics. Dentists, outside of community and public health clinics, provide oral health care to the majority of Medicaid recipients in Washington: they provided Medicaid services to 61% of recipients in 2008 (328,077 out of 538,276). Another 27% of recipients of Medicaid oral health services (147,942) received their care in FQHCs in 2008.

Community and Migrant Health Centers: In 2008 there were 25 community and migrant health centers in Washington, with a total of 130 sites of which 53 offered dental services. These community health centers served more than 20,000 patients through a workforce of dentists (165 FTEs), dental hygienists (36 FTEs), and dental assistants, aides and technicians (329 FTEs combined).

Corrections Dental Facilities: Of Washington's 15 correctional facilities, 10 have their own dental clinics. The Department of Corrections employs 14 dentists and 3 dental hygienists who are full-time employees and contract an additional 6 dentists and 2 dental hygienists to provide services to inmates.

Dental Hygiene Clinics: There were 9 dental hygiene clinics that provided free or low-cost care to underserved populations in 2009. The clinics are associated with dental hygiene education programs in the state and may select patients that correspond with teaching needs of the program.

Dental Residencies:
General and Pediatric Dental Residencies: The general dental (AEGD and GPR) and pediatric dental residencies in Washington are committed to serving underserved populations. The University of Washington and Swedish general dental residencies accept Medicaid-insured patients and target their practices to patients with complex medical, mental and physical challenges who may have obstacles to obtaining dental care from more conventional practices. The Northwest Dental Residency accepts Medicaid-insured patients and offers a sliding fee scale that approximately 40% of its patients utilize across its 4 practice sites. The University of Washington pediatric residency in Seattle and at the Yakima Valley Farmworkers Clinic accepts Medicaid-insured patients, and low-income patients can make use of a sliding-fee scale to pay for services.

The University of Washington and Swedish residencies receive federal general medical education (GME) funding to support their activities. The Washington legislature has allocated funding to support the Northwest Dental Residency, which also receives, along with the UW Pediatric dental residency in Yakima, federal support through Title VII Congressional appropriation.

In 2009 there were at least 40 dental residents in AEGD, GPR and pediatric residencies delivering oral health services in Washington. These residencies are located in Seattle, Yakima and other eastern Washington communities. The general dental and pediatric dental residencies in eastern Washington have been effective pipeline programs through which dentists continue work in the same geographic areas after completing their residencies.

Mobile Dental Clinics: There were 24 independent mobile dental clinics operating in Washington in 2009. These clinics on wheels strive to increase access to dental care for underserved populations. Each clinic sets its own eligibility criteria to receive their services. Some clinics have more than 1 mobile vehicle, and altogether there are more than 40 mobile facilities, providing services in most of the state's counties, that are operated by the clinics.

According to data from the Washington Department of Health, most of the mobile clinics report that they focus on serving low-income and uninsured patients, and many target school children, seniors, and/or farm workers and migrant populations. All provide topical fluorides, and a large majority report that they provide referrals, oral hygiene instructions, prophylaxis, and sealants.

Most (86%) of Washington's mobile dental clinics accept Medicaid payment for their services, and 29% operate with sliding fee scales. Washington's mobile clinics reported in 2009 that on average, each provided more than 2,300 patient visits annually. Nearly half (47%) of clinics treat undocumented patients. Much of the staff time used by mobile clinics is volunteer. Clinics reported in 2009 that on average, for each clinic, the number of volunteer days per year were 20 for dentists, 6 for dental hygienists, 14 for dental assistants, 2 for dental students and 5 for dental hygiene students.

Tribal Dental Clinics: Among the 29 officially recognized tribes in Washington State, 23 have dental clinics that in 2009 were staffed by approximately 31 dentists, 8 dental hygienists, and 66 dental assistants. Some tribes have reported the need for more oral health providers to meet the needs of their populations.

University of Washington School of Dentistry:
In addition to educational programs described previously, the UW School of Dentistry operates dental clinical facilities that deliver $2.3 million in uncompensated care and 60,000 visits a year. Other activities that expand access to oral health care include:

The Early Childhood Oral Health (ECOH) program includes clinical care, research and training focused on the oral health needs of infants and young children. A partnership between the UW School of Dentistry and Seattle Children's Hospital, ECOH will be centered at the new Washington Dental Service Building for Early Childhood Oral Health at Magnuson Park (opening fall 2010). ECOH is especially attentive to the needs of underserved children, including those with special needs.

The Dental Education in Care of Persons with Disabilities (DECOD) at the UW School of Dentistry treats persons with severe disabilities, and prepares dental professionals to meet their special oral health needs. DECOD provides more than 5,200 dental visits per year.

The Oral Health Collaborative, composed of dental hygienists, students and dental hygiene advocates, works with rural and underserved communities upon request to improve sustainable access to preventive dentistry and services.

The Access to Baby, Child and Dentistry (ABCD) program trains general dentists to provide oral health care for young Medicaid-eligible children, and provides supportive services so families can access dental care. Originally a partnership involving the University of Washington, the Washington State Dental Association, the Medical Assistance Administration, local health departments and the Washington Dental Service Foundation, program coordination now occurs at the community level.

Volunteer/Retired Program (VRP): Out of the 390 total health professionals participating in Washington's Volunteer/Retired Providers Malpractice Insurance Program in 2009, 56 were dentists and 14 were dental hygienists. The state pays for these providers' malpractice insurance so that they may volunteer to provide non-invasive dental care in charitable, free or mobile dental clinics around the state. Non-invasive dental care includes diagnosis, oral hygiene, restoration and extraction. The VRP participants who only use their Washington State professional license for volunteer work are additionally eligible for free license renewal.

Washington Dental Service Foundation Oral Health Connections: The Oral Health Connections program, launched in September 2009 in 2 Washington communities, will link patients age 55 and older with participating dental providers, provide patient education, and help overcome barriers to care, such as transportation limitations. The program plans to elevate the quality of oral health care for older adults by increasing collaboration and communication among dentists, physicians and pharmacists.

Washington State Dental Association Outreach: The Outreach program coordinates access to participating dentists and dental labs that offer reduced fees for qualifying patients to receive dental care. Eligible patient groups are those without insurance and who are age 65 and older, have Alzheimer's disease, or are disabled adults age 18 and older.

Washington State Health Care Authority—Community Health Services Program: This program supports clinics that serve people without health insurance. Contracting with 33 clinics in 2005, the Community Health Services Program helps to provide medical, dental, and migrant services for low-income and special populations throughout Washington.

Other Charitable/Low-Cost Care: In addition to the programs described above, there are 6 public health dental clinics in King County and 5 in other parts of the state that provide free and/or reduced-fee dental services. There are also dental providers who provide free and reduced-fee services in their offices or at community clinics. Information about access to dental services, including free and reduced-cost care, is available from the Washington State Department of Health at http://www.doh.wa.gov/cfh/oral_health/findcare.htm.

DISCUSSION AND POLICY OPTIONS

DISCUSSION

Washington's oral health workforce is comprised of dental and medical health care professionals and supporting caregivers. All have important and complementary roles to play in providing oral health care to Washington's residents. Together they represent the state's oral health workforce supply. Information about workforce supply is only useful for health planning when it can be examined in relation to the population it serves in order to determine if the health needs of that population are being adequately served by its health workforce.

The number of dentists in Washington has grown in actual numbers and relative to the state's population over the past decade. There were an estimated 71 actively practicing dentists per 100,000 population in Washington in 2009. The American Dental Association estimates there were 59 professionally active dentists per 100,000 U.S. population in 2005, and that number will decrease to approximately 55 by 2020 (Valachovic, 2009). Washington's dental hygienist workforce also has been growing steadily, and the state had an estimated 59 actively practicing dental hygienists per 100,000 population in 2009. National comparisons are not available for dental hygienists. These ratios need to be viewed with caution, however, and in relation to any unmet need for dental services occurring among segments of the population and across geographic regions.

Oral Health Needs in Washington: Provider-to-population ratios are only one measure of the size of a workforce. The adequacy of the workforce must take into account current unmet needs as well as future trends in the population and its oral health needs. Studies in Washington have found that caries rates have been increasing over time, with significant disease levels apparent in some populations by ages 2 to 4. Oral health disparities persist among some racial and ethnic groups, low-income populations, and those with low educational achievement. Maldistribution of the dental workforce persists: only 5 of the state's 39 counties did not submit a request or receive federal designation as a whole or partial county dental HPSA in 2009. Clearly, there remain unmet needs for oral health care services in the state.

The need for oral health care in Washington will continue to increase as the population grows and ages and if mass preventive measures (such as community water fluoridation, school-based sealant delivery, widespread application of topical fluoride, and oral health education) do not become widespread. From 2000 to 2008, Washington's population expanded at a rate approximately 40% higher than the national average (11% vs. 8%), and between 2009 and 2025, it is estimated that the state's population will increase by over 1.5 million and the state will have nearly 1 million more persons aged 65 years or older (U.S. Census Bureau, 2009). Because of the projected population growth, greater emphasis on prevention is needed to control the caries epidemic, especially to prevent it from becoming widespread in young children. Older members of the population are living longer, and most are retaining their own teeth. These individuals will require more dental services later in life than was the case for previous generations.

The Future of Washington's Oral Health Workforce: Expanded oral health needs among younger and older members of the population, combined with projected overall growth in the size of the state's population, mean the state will need more providers over the next several decades who can help maintain good oral health, prevent oral diseases, and deliver treatment when necessary. If Washington mirrors the rest of the nation, the population will also become increasingly diverse, which may translate into a higher risk for oral disease and problems with access to care.

Successful implementation of the mass prevention measures needed to prevent caries and reduce the need for future oral health care services is dependent on having an adequate dental public health workforce. Less than 2% of the state's dentists, however, reported being public health specialists.

Because the average age of Washington's dentists is relatively high (48 years), an increasing number of dentists will be retiring from the state's workforce over the coming 10-20 years. Less than half (42%) of the current dentist workforce reported they obtained their initial dentist education in Washington, indicating that the state depends upon substantial in-migration of dentists from other states to maintain its dentist supply. To maintain or increase the dentist supply in the future will require increases in the number of dental graduates from the state's dental school (about 80% of whom are estimated to stay in Washington to practice) and/or higher rates of in-migration of dentists from other states. Because of the length of dental education, efforts to modify dentist supply through changes in dental school capacity require significant lead time. Attracting dentists into the state is heavily dependent on the wages, practice conditions and incentives, and quality-of-life factors in Washington compared with other states.

As the number of dentists providing care has increased, so has the number of jobs available for dental hygienists. Because of their somewhat younger average age, retirement may not deplete dental hygienist supply as rapidly as for other professions, but demand for dental hygienists is projected to increase by 29% between 2007 and 2017 (Washington State

Employment Security Department, 2009). Most of the state's supply of dental hygienists obtained their professional education in-state. Keeping up with projected increases in demand will require increasing the capacity of the state's dental hygiene schools, increased migration of dental hygienists into the state, or both.

Access to and utilization of oral health care by communities of color could be improved if the oral health care workforce were more representative of these populations (U.S. Department of Health and Human Services, 2000b). In 2008, 10% of the state's overall population was Hispanic and 16% was of non-white race (U.S. Census Bureau, 2009). Washington's dentists were less representative of the state's Hispanic population, with only 3% reporting Hispanic ethnicity in 2007. Twenty percent of dentists in the state reported being non-white, more than the state average, although that percentage included a higher percentage of Asians than occurred in the state population (14% among dentists compared with 7% in the state population). Just 9% of dental hygienists reported being non-white, much less than in the overall population. Similarly, only 2% reported being Hispanic, less than a quarter of the percentage in the state population. Strategies will also be needed to attract a more diverse dental hygiene workforce.

If the oral health needs of the population continue to grow, more oral health services, provided by highly efficient teams, will be required. Growth in oral health care demand will increase demand for professions that increase the size and efficiency of the dental team, such as dental assistants, EFDAs and, potentially, new models of dental professionals. Because EFDAs are a new profession in Washington, the next couple of years will be important to watch to see how that workforce is deployed. Dental assistants have been part of dental teams in Washington for many years, but little is known about trends in their supply. Because they recently became a registered profession in the state, the size of the supply of Washington's dental assistants now can be more easily tracked.

There will also be growing attention to the use of primary care medical providers to provide preventive oral health services in the state, especially for children. Policy measures and reimbursements are aligned to support this strategy, but the supply of primary care providers is not keeping pace with demand for primary care services, especially in rural areas (U.S. General Accounting Office, 2008; WWAMI Rural Health Research Center, 2009). The extent to which primary care providers can fill oral health workforce gaps will depend on the extent of growth of the primary care medical workforce, as well as its engagement in oral health.

POLICY OPTIONS

As this report makes evident, the overall oral health workforce has been growing, but upcoming retirements from "baby boomer" providers and the projected growth in the state's population are likely to slow that growth or even cause a relative decline in the size of the oral health workforce. Uneven distribution of many health professions contributes to gaps in access to care in parts of the state. These trends, and the state's current and future oral health needs, call for a strategic approach to workforce planning that will ensure an adequate pipeline of professionals who can respond to the population's oral health needs.

To meet these goals, health planners, policymakers and educators have an array of options to affect the size, characteristics and distribution of the oral health workforce. No single organization or agency has the ability to bring about the numerous changes that are needed to substantially improve the oral health of the population. Successful efforts will require substantial collaboration among many diverse private and public partners. The following are strategies to emphasize prevention, educate efficient teams, and better distribute the workforce of the future.

- ***Promote Interest in Oral Health Professions Among Young People:*** To increase the pool of candidates for oral health professions education, it is critical to introduce young students to health care careers at formative ages (as early as elementary school) and instill the importance of math and science skills for educational success. K-12 health careers pathway programs that provide exposure and mentorship to students from populations underrepresented in the professions, such as rural students and students of color, will help to increase their representation in these careers.
- ***Support Education Programs that Improve the Capacity of the Workforce to Care for Underserved and Special Populations:*** To provide the necessary preventive measures and meet the growing oral health needs of Washington residents, training is needed that produces more professionals in general dentistry, pediatric dentistry and dental public health. In addition, service learning programs, clinical rotations in rural and underserved communities, and other similar experiences for health professions students can increase the likelihood that students will eventually serve those populations (Robert Graham Center, 2009). The capacity of Washington's oral health workforce to serve populations most in need could be increased through support and expansion of the ABCD program, RIDE, and other opportunities for students to learn from working with underserved populations.

- ***Support Early Prevention:*** Programs are needed that support the current workforce's capacity for prevention of caries and treatment of young children with tooth decay. Early preventive efforts and identification of children with, or at risk for, oral disease are critical. This strategy will require training general dentists in the care of young children, since most children are cared for by general dentists. It is important to implement policies and programs that maximize medical professionals' ability to provide preventive services, such as through adequate reimbursement for these services. In addition, programs are needed that promote further public health training among dental and dental hygiene students to enhance their community leadership roles and increase the professionals' knowledge about the population's needs and prevention strategies.
- ***Continue and Expand Programs that Promote Practice in Primary Care Shortage Areas:*** Because student debt can influence choice of specialty and location of practice, expansion of loan repayment and scholarship programs that require service to underserved populations could increase the number of oral health providers who choose general practice careers. Such programs not only help students overcome the financial burdens of health professions education, a particular draw for rural students and students from communities of color, but also allow more providers to enhance their professional experiences through the reward of public service. Similarly, programs that reduce barriers for volunteers and retired professionals to donate services in underserved areas and with underserved populations can increase access.
- ***Support Collaborative and Inter-professional Education and Practice:*** Dentistry has historically been isolated from the rest of the health care system. The efficiency and effectiveness of the workforce could be enhanced by promoting programs that train inter-professional teams to work together to deliver oral health care (Mouradian & Maier, 2009). Models such as the UW RIDE program (where dental, medical and dental hygiene students train together) show promise. Effective models of inter-professional training should be supported and encouraged to be replicated in other settings.
- ***Explore New Ways to Use Allied Health Dental Providers and Alternative Dental Providers to Increase Dental Treatment Capacity and Efficiency:*** The traditional dental team (dentists, dental hygienists and dental assistants) lacks a provider similar to the medical profession's nurse practitioner or physician assistant (Pew Center on the States and National Academy of State Health Policy, 2009). Exploring the benefits and drawbacks of increasing dental hygienists' ability to provide certain services for underserved populations, and/or the feasibility of introducing new types of providers such as dental therapists, community dental health coordinators and/or other new practitioners, would be useful for workforce planning.
- ***Monitor Trends in the Oral Health Workforce:*** Most of the data and analyses presented in this report were supported by one-time federal grants and single-application analyses by state and professional organizations. Commitment of resources for ongoing data collection and analysis is required if the state is to be able to evaluate the impact of changes in the oral health workforce and the factors that influence workforce trends. Quantifying the effective size of the workforce and tracking trends would be greatly improved if basic information about whether or not a licensed provider was actively practicing, their practice specialty, and race/ethnicity were collected along with the address and age information required for professional licensing and renewal.

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APPENDIX A. WASHINGTON DEPARTMENT OF HEALTH SURVEY QUESTIONNAIRES: DENTISTS AND DENTAL HYGIENISTS

Included in this appendix are the questionnaires used by the Department of Health to survey all licensed dentists and dental hygienists in Washington State in 2007. The Department of Health contracted with 2 of the state's universities to develop these questionnaires and conduct the surveys. The questionnaires were developed by the University of Washington Center for Health Workforce Studies (UW CHWS). The administration of the survey was done by the Social and Economic Sciences Research Center at Washington State University, with technical assistance from the UW CHWS. A detailed report of the survey methods and response rates is in Appendix D.

Survey of Washington State Licensed Health Care Providers: License type: DENTISTS

Please answer all questions as instructed. If you hold more than one type of license to practice, please complete the questionnaire as it applies to the license type listed above. PLEASE DO NOT DOUBLE COUNT YOUR ACTIVITIES across license types. Instructions on how to complete the questions are listed at the right side of the page.

SPECIALTY

Q1. Select ONE category below that best describes your primary area of practice. *(If you are not clinically active, please select the type of work with which you are most associated.)*

- ○ General practice
- ○ Pediatrics
- ○ Orthodontics
- ○ Endontics
- ○ Periodontics
- ○ Prosthodontics
- ○ Oral/maxillofacial surgery
- ○ Oral/maxillofacial radiology
- ○ Oral pathology
- ○ Public health
- ○ Other

PRACTICE ACTIVITIES

Q2. Are you currently practicing (employed or volunteer) as a dentist in Washington State?

- ○ Yes
- ○ No **==> Skip to Q9**

Q3. During a typical week, approximately how many hours do you spend in the following professional dental activities? *(Do not include on-call time.)*

- ☐☐ Direct patient care (including patient education)
- ☐☐ Administration of clinical practice
- ☐☐ Teaching (dental education)
- ☐☐ Research
- ☐☐ Other professional dental activities

☐☐ **TOTAL** hours (add above items -- This should represent your typical weekly hours of work.)

Q4. In the past 12 months, how many weeks did you work? *(For example, if you work all year and take two weeks vacation, you would work 50 weeks.)*

☐☐ Weeks

Q5. Do you provide direct patient care?

- ○ Yes
- ○ No **==> Skip to Q8**

Q6. What are the ZIP codes of your work location(s) where you provide direct patient care?

☐☐☐☐☐ Principal work location ZIP code

☐☐☐☐☐ Secondary work location ZIP code (if applicable)

Q7. Do you provide direct patient care in more than two locations?

- ○ Yes
- ○ No

MARKING INSTRUCTIONS

- Use a No. 2 pencil or a blue or black ink pen only.
- Do not use pens with ink that soaks through the paper.
- Make solid marks that fill the response completely
- Make no stray marks on this form

CORRECT: ● INCORRECT: ✓ ✗ ○ ◎

{RespID1}

{RespID}

Please turn the page over and answer the questions on the other side.

FACILITY TYPE

Q8. Which ONE of the following best describes the work setting of your principal position?

- ○ Independent/solo practice dental clinic
- ○ Group dental clinic
- ○ Government facility such as VA/IHS/Public Health
- ○ Insurance claims/benefits
- ○ Education/research
- ○ Other

PRACTICE HISTORY

Q9. How many total years have you practiced as a dentist? *(Include both time in Washington and elsewhere.)*

☐☐ Total years of practice (including in Washington) *(Use 0 if none.)*

Q10. How many total years have you practiced as a dentist in Washington?

☐☐ Total years of practice in Washington *(Use 0 if none)*

Q11. When do you plan to retire?

- ○ Already retired
- ○ Within the next 5 years
- ○ Within the next 6 - 10 years
- ○ More than 10 years from now
- ○ Don't know/Uncertain

EDUCATION

Q12. Which of the following programs have you completed? *(Mark all that apply.)*

Type of Degree/Program	Q12a. Did you complete this program / obtain this degree? Yes	Q12a. No	Q12b. If yes, in what year did you complete the program? ☐☐☐☐	Q12c. If yes, did you complete this program at an institution in Washington state? Yes	Q12c. No
a. Doctor of Dental Surgery (DDS)	○	○		○	○
b. Doctor of Dental Medicine (DMD)	○	○		○	○
c. Acredited post-doctoral dental education	○	○		○	○

Q13. Did you complete your education to become a dentist outside of the United States?

- ○ Yes, outside the U.S.
- ○ No

ETHNICITY and RACE

Q14. Are you of Spanish / Hispanic / Latino origin?

- ○ Yes
- ○ No

Q15. The Spanish/Hispanic/Latino question is about ethnicity, not race. Please continue to answer the following question by marking one or more boxes to indicate what you consider your race(s) to be.

- ○ White
- ○ Black or African American
- ○ American Indian or Alaska native
- ○ Asian
- ○ Native Hawaiian/Pacific Islander
- ○ Other

Thank you for participating in this important survey! **Please return your questionnaire in the envelope provided, or to SESRC, Washington State University, PO Box 641801, Pullman, WA 99164-1801**

Survey of Washington State Licensed Health Care Providers:
License type: DENTAL HYGIENISTS

Please answer all questions as instructed. If you hold more than one type of license to practice, please complete the questionnaire as it applies to the license type listed above. PLEASE DO NOT DOUBLE COUNT YOUR ACTIVITIES across license types.

Specialty

Q1. Select ONE category below that best describes your primary area of practice.

1. Supervised clinical practice
2. Unsupervised practice (as defined by RCW 18.29.056)
3. Public health
4. School sealants/fluoride varnish programs
5. Education
6. Other

Q2. Considering the direct patient care you provide, which of the following best describes your main practice activities? (Check only ONE.)

1. Primary/Generalist care
2. Specialized care (for example, periodontal)
3. Not applicable - I do not provide direct patient care

Practice Activities

Q3. Are you currently practicing (employed or volunteer) as a dental hygienist in Washington state?

1. Yes
2. No **==> Skip to Q10**

Q4. During a typical week, approximately how many hours do you spend in the following activities? *(Do not include on-call time.)*

☐☐ Direct patient care (including patient education)

☐☐ Administration of clinical practice

☐☐ Teaching (dental hygienist education)

☐☐ Research

☐☐ Other professional activities

☐☐ **TOTAL** hours (add above items -- This should represent your typical weekly hours of work.)

{ 000000000 }

Q5. In the past 12 months, how many weeks did you work? *(For example, if you work all year and take two weeks vacation, you would work 50 weeks.)*

☐☐ Weeks

Q6. Do you provide direct patient care?

1. Yes
2. No **==> Skip to Q9**

Please turn the page over and answer the questions on the other side.

- Use a No. 2 pencil or a blue or black ink pen only.
- Do not use pens with ink that soaks through the paper.
- Make solid marks that fill the response completely.
- Make no stray marks on this form.

CORRECT: ● **INCORRECT:** ⊘ ⊗ ⊖ ◔

Q7. What are the ZIP codes of your work location(s) where you provide direct patient care?

☐☐☐☐☐ Principal work location ZIP code

☐☐☐☐☐ Secondary work location ZIP code (if applicable)

Q8. Do you provide direct patient care in more than two locations?

1 Yes
2 No

Facility Type

Q9. Which ONE of the following best describes the work setting of your principal position?

1 Private office or clinic
2 Public clinic
3 Public health
4 Nursing home/Extended care/long term care facility
5 Hospital
6 Home health agency
7 Education/Research
8 Other

Practice History

Q10. How many total years have you practiced as a dental hygienist? *(Include both time in Washington and elsewhere.)*

☐☐ Total years of practice (including in Washington) *(Use 0 if none.)*

Q11. How many total years have you practiced as a dental hygienist in Washington?

☐☐ Total years of practice in Washington *(Use 0 if none)*

Education

Q12. Which of the following programs have you completed? *(Mark all that apply.)*

Type of Degree/Program	Q12a. Did you complete this program / obtain this degree? Yes	No	Q12b. If yes, in what year did you complete the program?	Q12c. If yes, did you complete this program at an institution in Washington state? Yes	No
a. Certificate in dental hygiene	1	2	☐☐☐☐	1	2
b. Associate degree in dental hygiene	1	2	☐☐☐☐	1	2
c. Bachelor's degree in dental hygiene	1	2	☐☐☐☐	1	2
d. Master's degree in dental hygiene	1	2	☐☐☐☐	1	2

Q13. Did you complete your initial education to become a dental hygienist outside of the United States?

1 Yes, outside the U.S.
2 No

Ethnicity and Race

Q14. Are you of Spanish / Hispanic / Latino origin?

1 Yes
2 No

Q15. The Spanish/Hispanic/Latino question is about ethnicity, not race. Please continue to answer the following question by marking one or more boxes to indicate what you consider your race(s) to be.

1 White
2 Black or African American
3 American Indian or Alaska native
4 Asian
5 Native Hawaiian/Pacific Islander
6 Other

Thank you for participating in this important survey! **Please return your questionnaire in the envelope provided, or to SESRC, Washington State University, PO Box 641801, Pullman, WA 99164-1801**

APPENDIX B. SURVEY FINDINGS: DENTISTS

Following are the results of the analyses of the data collected in a 2007 Department of Health survey of Washington State's licensed dentists. The Department of Health contracted with 2 of the state's largest universities to develop and conduct the survey. The data analysis was completed by the University of Washington Center for Health Workforce Studies (UW CHWS). Data collection was done by the Social and Economic Sciences Research Center at Washington State University, with technical assistance from the UW CHWS. In addition to the survey data, Department of Health licensing data were used in these analyses. A detailed report of the survey methods and response rates is in Appendix D.

Table B-1. Number and Residence of Dentists with Washington State Licenses (2007)

	n	Percent*
Dentists—total	5,830	100.0%
Residing† in Washington	4,654	79.8%
Residing† in Idaho	47	0.8%
Residing† in Oregon	299	5.1%
Residing† outside Washington, Idaho and Oregon	771	13.2%
Missing data	59	1.0%

* The percentages do not total 100% due to rounding.
† Residence was attributed to the state associated with the ZIP code on the dentist's Washington State license.

Table B-2. Residence of Dentists Who Practice in Washington State (2007)

	n*	Percent
Residing† in Washington	4,443	93.8%
Residing† in Idaho	5	0.1%
Residing† in Oregon	192	4.1%
Residing† outside Washington, Idaho and Oregon	94	2.0%

* Weighted number.
† Residence was attributed to the state associated with the ZIP code on the dentist's Washington State license.

Table B-3. Number of Dentists and Percent Practicing in Washington by Washington Workforce Development Area (WDA) (2007)

		Estimated Total Dentists in Washington†		
WDA*	Unweighted n	Weighted n	Percent	Percent Practicing in Washington‡
1	76	273	5.9%	93.2%
2	86	308	6.6%	92.3%
3	87	314	6.8%	90.8%
4	95	342	7.3%	94.5%
5	499	1,833	39.4%	91.5%
6	101	343	7.4%	86.9%
7	79	267	5.7%	89.0%
8	45	148	3.2%	98.2%
9	40	155	3.3%	89.4%
10	37	123	2.6%	94.5%
11	42	155	3.3%	90.4%
12	113	393	8.4%	92.3%
Total	1,300	4,654		91.6%

* Counties by Workforce Development Area (WDA)—WDA 1: Clallam, Jefferson, Kitsap; WDA 2: Grays Harbor, Lewis, Mason, Pacific, Thurston; WDA 3: Island, Skagit, San Juan, Whatcom; WDA 4: Snohomish; WDA 5: King; WDA 6: Pierce; WDA 7: Clark, Cowlitz, Wahkiakum; WDA 8: Adams, Chelan, Douglas, Grant, Okanogan; WDA 9: Kittitas, Klickitat, Yakima, Skamania; WDA 10: Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Oreille, Stevens, Walla Walla, Whitman; WDA 11: Benton, Franklin; WDA 12: Spokane.
† "In Washington" was determined from the ZIP code of the license mailing address.
‡ There were 88 (1.9%) Washington dentists for whom practicing status was missing.

Table B-4. Demographic Characteristics of Dentists in Washington (2007): Overall and by Practice Status

			Dentists in Washington*		
	Unweighted n	Weighted n	Overall	Practicing (in Washington)	Not Practicing (in Washington)
Total (n)	1,300	4,654		4,185	383
Age					
Mean			49.3	48.1	60.7
Median			50	48	63
Age categories					
<25	0	0	0.0%	0.0%	0.0%
25-29	38	177	3.8%	3.8%	3.2%
30-34	100	514	11.0%	12.0%	2.4%
35-39	138	647	13.9%	15.1%	0.0%
40-44	101	471	10.1%	10.8%	4.9%
45-49	146	504	10.8%	11.6%	5.3%
50-54	184	575	12.4%	12.9%	6.7%
55-59	227	675	14.5%	14.1%	16.7%
60-64	204	557	12.0%	11.1%	19.3%
65-69	87	275	5.9%	4.6%	18.8%
70-74	44	152	3.3%	2.4%	12.1%
75+	31	107	2.3%	1.6%	10.6%
Sex					
Female	198	828	17.8%	18.4%	12.0%
Race					
White only	1,032	3,589	80.7%	80.0%	88.7%
Black/African-American only	6	21	0.5%	0.5%	0.0%
American Indian/Alaska Native only	2	9	0.2%	0.2%	0.0%
Asian only	141	603	13.6%	14.1%	6.0%
Native Hawaiian/Pacific Islander only	2	10	0.2%	0.3%	0.0%
Other	29	117	2.6%	2.8%	0.8%
Multiple races	27	98	2.2%	2.0%	4.5%
Total	1,239	4,447	100%	100%	100%
Missing data†	61	207	4.4%	3.9%	6.3%
Ethnicity					
Hispanic	26	112	2.5%	2.6%	0.7%
Missing data	42	143	3.1%	2.8%	1.4%

* "In Washington" was determined from the ZIP code of the license mailing address.
† The percent calculations above do not include these missing data responses.

Table B-5. Demographic Characteristics of Dentists Practicing in Washington (2007) by WDA*

	Dentists Practicing in Washington											
	WDA 1	**WDA 2**	**WDA 3**	**WDA 4**	**WDA 5**	**WDA 6**	**WDA 7**	**WDA 8**	**WDA 9**	**WDA 10**	**WDA 11**	**WDA 12**
Age												
Mean	47.5	48.5	47.3	48.5	47.5	49.7	50.5	49.6	46.4	51.3	43.7	49.5
Median	46	51	46	49	47	53	51	54	40	53	39	49
Age categories												
<25	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
25-29	5.1%	3.1%	3.2%	1.1%	5.0%	2.7%	0.0%	5.0%	6.3%	0.0%	12.2%	1.2%
30-34	12.0%	11.1%	10.0%	9.7%	12.7%	12.4%	16.3%	8.3%	22.4%	8.1%	18.3%	5.8%
35-39	10.8%	10.7%	25.9%	15.8%	15.4%	13.0%	5.5%	11.7%	16.4%	7.6%	20.8%	20.2%
40-44	18.1%	15.6%	8.9%	14.2%	9.8%	10.0%	11.3%	8.5%	5.6%	4.8%	5.1%	12.0%
45-49	12.0%	7.4%	10.9%	10.5%	13.8%	7.0%	12.7%	7.2%	8.8%	21.3%	4.0%	11.2%
50-54	11.3%	16.0%	6.8%	16.3%	13.2%	13.3%	15.3%	13.5%	6.4%	15.1%	11.0%	12.8%
55-59	12.9%	17.7%	13.5%	13.7%	11.8%	13.3%	13.7%	26.0%	17.4%	28.4%	14.8%	13.8%
60-64	8.9%	13.6%	12.6%	12.6%	8.9%	18.3%	15.1%	15.1%	3.4%	7.0%	7.6%	13.7%
65-69	5.1%	3.5%	5.2%	3.4%	4.4%	6.8%	4.1%	4.7%	5.8%	2.4%	4.8%	5.3%
70-74	3.8%	1.3%	1.4%	1.2%	3.0%	3.1%	3.9%	0.0%	0.0%	3.1%	0.0%	2.5%
75+	0.0%	0.0%	1.6%	1.6%	2.0%	0.0%	2.1%	0.0%	7.4%	2.1%	1.2%	1.5%
Sex												
Female	12.9%	12.9%	17.4%	22.9%	25.4%	12.9%	9.6%	11.7%	6.4%	13.4%	11.6%	13.3%
Race												
White only	84.8%	83.5%	93.8%	75.6%	68.0%	86.5%	86.9%	91.0%	85.4%	93.4%	94.2%	97.6%
All other races	15.2%	16.6%	6.1%	24.4%	32.0%	13.5%	13.1%	9.0%	14.7%	6.6%	5.8%	2.4%
Ethnicity												
Hispanic	6.3%	3.3%	1.4%	2.5%	3.2%	0.0%	1.6%	2.5%	1.9%	7.2%	0.0%	0.0%

* Counties by Workforce Development Area (WDA)—WDA 1: Clallam, Jefferson, Kitsap; WDA 2: Grays Harbor, Lewis, Mason, Pacific, Thurston; WDA 3: Island, Skagit, San Juan, Whatcom; WDA 4: Snohomish; WDA 5: King; WDA 6: Pierce; WDA 7: Clark, Cowlitz, Wahkiakum; WDA: Adams, Chelan, Douglas, Grant, Okanogan; WDA 9: Kittitas, Klickitat, Yakima, Skamania; WDA 10: Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Oreille, Stevens, Walla Walla, Whitman; WDA 11: Benton, Franklin; WDA 12: Spokane.

Table B-6. Specialties/Areas of Practice of Dentists in Washington (2007)

Specialty/Area of Practice	Dentists in Washington*				
		Total		Practicing in Washington	
	Unweighted n	Weighted n	Percent	Weighted n	Percent†
General practice	971	3,465	75.9%	3,180	76.6%
Pediatrics	53	197	4.3%	182	4.4%
Orthodontics	77	301	6.6%	273	6.6%
Endodontics	32	114	2.5%	112	2.7%
Periodontics	32	110	2.4%	91	2.2%
Prosthodontics	23	69	1.5%	52	1.3%
Oral/maxillofacial surgery	36	124	2.7%	109	2.6%
Public health	20	77	1.7%	77	1.9%
Other	30	110	2.4%	75	1.8%
Total	1,274	4,568	100.0%	4,151	100.0%
Missing data‡	26	86	1.8%	32	0.8%

* "In Washington" was determined from the ZIP code of the license mailing address.
† The percentages do not total 100% due to rounding.
‡ The percent calculations above do not include these missing data.

Table B-7. Age, Years of Practice, Education, and Sex by Specialties/Areas of Practice of Dentists Practicing in Washington (2007)

Specialty/Area of Practice	Dentists Practicing in Washington				
	Average Age	Average Number of Years Practicing as a Dentist	Average Years Dental Practice in Washington	Percent of Dentists Who Completed Postdoctorate	Percent Female
General practice	47.7	19.8	17.0	38.3%	17.8%
Pediatrics	45.4	16.9	12.7	95.4%	36.7%
Orthodontics	48.9	20.3	17.4	100.0%	12.5%
Endodontics	47.5	18.5	12.9	97.3%	21.0%
Periodontics	54.1	26.5	17.7	100.0%	10.1%
Prosthodontics	52.6	25.1	17.6	94.4%	5.7%
Oral/maxillofacial surgery	49.1	19.8	14.4	97.0%	20.4%
Public health	44.8	17.0	10.1	32.7%	47.9%
Other	54.7	24.2	17.9	89.2%	14.7%

Table B-8. Work Setting of Dentists Practicing in Washington (2007)

Work Setting	Dentists Practicing in Washington		
	Unweighted n	Weighted n	Percent
Independent/solo practice dental clinic	732	2,609	73.7%
Group dental clinic	152	541	15.3%
Government facility	50	209	5.9%
Education/research	20	77	2.2%
Other	26	102	2.9%
Missing*	171	646	15.4%

* The percent calculations above do not include these missing data responses.

Table B-9. Years of Practice of Dentists Practicing in Washington (2007)

	Dentists Practicing in Washington
Average number of years practicing as a dentist	20.1
Average number of years practicing as a dentist in Washington	16.7

Table B-10. Work Setting of Dentists Practicing in Washington (2007) by Specialty/Area of Practice

	Dentists Practicing in Washington			
Specialty/Area of Practice	Independent/Solo Practice Dental Clinic	Group Dental Clinic	Government Facility	Other
General practice*	76.7%	15.2%	5.0%	3.0%
Pediatrics	50.3%	27.2%	11.8%	10.7%
Orthodontics	85.9%	9.4%	0.0%	4.7%
Endodontics*	63.7%	25.8%	0.0%	10.6%
Periodontics*	88.8%	7.5%	0.0%	3.8%
Prosthodontics	75.7%	12.9%	6.3%	5.1%
Oral/maxillofacial surgery*	57.2%	22.5%	10.2%	10.2%
Public health	0.0%	8.0%	68.9%	23.1%
Other	24.5%	0.0%	0.0%	75.5%

* The percentages do not total 100% due to rounding.

Table B-11. Number of Locations for Dentists Practicing in Washington (2007) Providing Direct Patient Care

	Dentists Practicing in Washington		
Provide Direct Patient Care	Unweighted n	Weighted n	Percent
Overall	1,121	4,080	100.0%
In one location	889	3,197	84.9%
In two locations	86	323	8.6%
In more than two locations	61	244	6.5%
Missing data*	85	316	7.8%

* The percent calculations above do not include these missing data responses.

Table B-12. Age of Dentists Practicing in Washington (2007) by Full-/Part-Time Status

	Dentists Practicing in Washington	
	Full Time*	Part Time
Total, n† (%)	3,339 (80.6%)	806 (19.4%)
Mean age	47.0	52.7
Age ≤55 years (n = 2,893†)	86.1%	13.9%
Age >55 years (n = 1,291†)	68.1%	31.9%

* Full-time status was assigned if work hours totaled ≥32 hours/week and part time was <32 hours/week. There were 40 weighted cases for which full-time status was missing.
† Weighted number. Unweighted numbers were 915 for full time and 224 for part time.

Table B-13. Average Weekly Hours by Work Setting of Professional Activity Among Dentists Practicing in Washington (2007)

Average Weekly Hours in Professional Activity	Work Setting of Dentists Practicing in Washington			
	Overall	Independent/ Solo Practice Dental Clinic	Group Dental Clinic	All Other Work Settings
Direct patient care (including patient education)	30.0	31.2	29.5	26.0
Administration of clinical practice	5.1	5.5	4.7	3.4
Teaching (dental education)	0.9	0.4	0.4	3.4
Research	0.4	0.1	0.5	1.6
Other professional hours	1.3	1.1	1.2	1.4
Total*	37.5	38.4	35.8	34.2

* Total hours do not equal the sum of professional activity component hours because total hours were reported independently.

Table B-14. Education of Dentists in Washington (2007)

	Dentists in Washington*	
	Overall	Practicing (in Washington)
Total (n)	4,654	4,185
Dental education		
DDS	84.8%	84.5%
DMD	15.2%	15.5%
Postdoctoral	60.2%	30.7%
Missing data†, n‡ (%)	53 (1.1%)	39 (0.9%)

* "In Washington" was determined from the ZIP code of the license mailing address.
† The percent calculations above do not include these missing data.
‡ Weighted number.

Table B-15. Location of Initial Dentist Education Among Dentists in Washington* (2007)

	Type of Program/Degree		
	DDS	DMD†	Total
Total number‡	3,904	699	4,603
Obtained initial dental education from an institution in Washington State	51.7%	NA	41.6%
Missing data§, n‡ (%)	203 (5.2%)		203 (4.4%)

* "In Washington" was determined from the ZIP code of the license mailing address.
† DMD degree program not offered in Washington State.
‡ Weighted number.
§ The percent calculations above do not include these missing data.

Table B-16. Percent of Dentists Who Obtained their Initial Dentist Education in Washington by Age Group (2007)

Age Categories	Dentists in Washington*	
	Weighted n	Initial Dentist Education Obtained in Washington
<25	0	0.0%
25-29	177	52.1%
30-34	514	39.6%
35-39	647	34.9%
40-44	471	51.0%
45-49	504	48.2%
50-54	575	64.5%
55-59	675	52.5%
60-64	557	54.1%
65-69	275	60.6%
70-74	152	68.1%
75+	107	62.7%
Total	4,654	

* "In Washington" was determined from the ZIP code of the license mailing address.

Table B-17. Geographic Location of Principal Practice of Dentists Practicing in Washington (2007)

Principal Practice Location	Dentists Practicing in Washington		
	Unweighted n	Weighted n	Percent
Western Washington	838	3,051	78.4%
Eastern Washington	238	842	21.6%
Missing	75	291	7.0%
Urban	945	3,433	88.2%
Rural*	131	459	11.8%
Missing	75	291	7.0%

* Rural was defined using the Rural-Urban Commuting Area (RUCA) taxonomy as a combination of large rural, small rural, and isolated small rural groupings of RUCA codes. More information is available at http://depts.washington.edu/uwruca/.

Table B-18. Retirement Plans of Dentists Practicing in Washington (2007)

	Dentists Practicing in Washington			
	Weighted n	Total Percent	Dentists Age 55 or Younger	Dentists Over Age 55
Already retired	115	2.8%	0.1%	8.6%
Plan to retire				
Within 5 years	645	15.5%	2.9%	43.8%
Within 6 to 10 years	788	19.0%	15.1%	27.7%
In more than 10 years	2,163	52.1%	71.2%	9.5%
Don't know/uncertain	440	10.6%	10.7%	10.4%
Missing*	33	0.8%	0.9%	0.6%

* The percent calculations above do not include these missing data.

Table B-19. Characteristics of Dentists in Washington (2007) Who Obtained their Initial Education to Become a Dentist Outside of the United States

	Dentists in Washington*
Total Washington dentists with initial education from outside the United States† (n)	218
Practicing in Washington	91.8%
Mean age (years)	45.5
Female	32.9%
Race and ethnicity	
White non-Hispanic	54.9%
Black/African-American only	0.0%
American Indian/Alaska Native only	0.0%
Asian only	37.1%
Native Hawaiian/Pacific Islander only	0.0%
Other	8.0%
Multiple races	0.0%
Ethnicity: Hispanic	11.8%
Highest program completed	
DDS/DMD	42.9%
Postdoctoral	57.1%
Average number of years practicing as a dentist	17.3
Average number of years practiced in Washington	11.1
Provide direct patient care	96.8%

* "In Washington" was determined from the ZIP code of the license mailing address.
† Weighted number (56 unweighted).

APPENDIX C. SURVEY FINDINGS: DENTAL HYGIENISTS

Following are the results of the analyses of the data collected in a 2007 Department of Health survey of Washington State's licensed dental hygienists. The Department of Health contracted with 2 of the state's largest universities to develop and conduct the survey. The data analysis was completed by the University of Washington Center for Health Workforce Studies (UW CHWS). Data collection was done by the Social and Economic Sciences Research Center at Washington State University, with technical assistance from the UW CHWS. In addition to the survey data, Department of Health licensing data were used in these analyses. A detailed report of the survey methods and response rates is in Appendix D.

Table C-1. Number and Residence of Dental Hygienists with Washington State Licenses (2007)

	n	Percent*
Dental hygienists—total	4,796	100.0%
Residing† in Washington	4,184	87.2%
Residing† in Idaho	84	1.8%
Residing† in Oregon	142	3.0%
Residing† outside Oregon, Idaho, or Washington	373	7.8%
Missing data	13	0.3%

* The percentages do not total 100% due to rounding.
† Residence was attributed to the state associated with the ZIP code on the dental hygienist's Washington State license.

Table C-2. Residence of Dental Hygienists Who Practice in Washington State (2007)

	n*	Percent
Residing† in Washington	3,739	98.7%
Residing† in Idaho	23	0.6%
Residing† in Oregon	13	0.3%
Residing† outside WA, ID, and OR	14	0.4%

* Weighted number.
† Residence was attributed to the state associated with the ZIP code on the dental hygienist's Washington State license.

Table C-3. Number of Dental Hygienists and Percent Practicing in Washington by Washington Workforce Development Area (WDA) (2007)

		Estimated Total Dental Hygienists in Washington†		
WDA*	Unweighted n	Weighted n	Percent	Percent Practicing in Washington
1	68	198	4.7%	91.0%
2	110	319	7.6%	95.4%
3	76	214	5.1%	89.3%
4	133	388	9.3%	92.0%
5	454	1,296	31.0%	90.8%
6	159	468	11.2%	90.2%
7	126	369	8.8%	88.3%
8	47	135	3.2%	90.4%
9	70	210	5.0%	86.1%
10	33	95	2.3%	85.7%
11	49	146	3.5%	86.3%
12	118	342	8.2%	84.4%
Missing data‡	2	5	0.1%	

* Counties by Workforce Development Area (WDA)—WDA 1: Clallam, Jefferson, Kitsap; WDA 2: Grays Harbor, Lewis, Mason, Pacific, Thurston; WDA 3: Island, Skagit, San Juan, Whatcom; WDA 4: Snohomish; WDA 5: King; WDA 6: Pierce; WDA 7: Clark, Cowlitz, Wahkiakum; WDA 8: Adams, Chelan, Douglas, Grant, Okanogan; WDA 9: Kittitas, Klickitat, Yakima, Skamania; WDA 10: Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Oreille, Stevens, Walla Walla, Whitman; WDA 11: Benton, Franklin; WDA 12: Spokane.
† "In Washington" was determined from the ZIP code of the license mailing address.
‡ The percent calculations above do not include these missing data.

Table C-4. Demographic Characteristics of Dental Hygienists in Washington (2007): Overall and by Practice Status

	Unweighted n	Weighted n	Dental Hygienists in Washington*		
			Overall	Practicing (in Washington)	Not Practicing (in Washington)
Total (n)	1,445	4,184		3,743	423
Age					
Mean			44.5	43.9	49.1
Median			45	44	51
Age categories					
<25	18	60	1.4%	1.6%	0.0%
25-29	107	337	8.2%	8.6%	3.9%
30-34	151	430	10.3%	10.6%	8.4%
35-39	177	559	13.4%	14.0%	8.4%
40-44	208	645	15.4%	15.7%	13.7%
45-49	226	682	16.3%	16.5%	13.9%
50-54	283	720	17.2%	17.5%	15.4%
55-59	166	467	11.2%	10.2%	18.7%
60-64	78	195	4.7%	3.9%	11.0%
65-69	20	60	1.4%	1.0%	4.5%
70-74	9	20	0.5%	0.3%	1.9%
75+	1	1	0.0%	0.0%	0.2%
Missing data†	1	8	0.2%		
Sex					
Male	37	109	2.6%	2.6%	2.5%
Race					
White only	1,300	3,763	92.0%	91.5%	96.5%
Black/African-American only	4	11	0.3%	0.3%	0.0%
American Indian/Alaska Native only	2	5	0.1%	0.1%	0.0%
Asian only	50	151	3.7%	4.0%	1.4%
Native Hawaiian/Pacific Islander only	3	9	0.2%	0.2%	0.0%
Other	21	61	1.5%	1.6%	0.0%
Multiple races	31	90	2.2%	2.2%	2.1%
Total	1,411	4,089	100.0%	100.0%	100.0%
Missing data†	34	95	2.3%	1.9%	2.7%
Ethnicity					
Hispanic	11	33	2.2%	2.3%	1.4%
Missing data†	156	453	1.8%	1.6%	1.4%

* "In Washington" was determined from the ZIP code of the license mailing address.
† The percent calculations above do not include these missing data.

Table C-5. Demographic Characteristics of Dental Hygienists Practicing in Washington (2007) by WDA*

	Dental Hygienists Practicing in Washington											
	WDA 1	WDA 2	WDA 3	WDA 4	WDA 5	WDA 6	WDA 7	WDA 8	WDA 9	WDA 10	WDA 11	WDA 12
Age												
Mean	45.1	42.5	44.3	43.8	45.2	43.1	43.6	44.2	41.2	41.0	39.7	45.2
Median	45	43	45	43	46	43	44	47	42	41	37	44
Age categories												
<25	2.4%	0.8%	0.0%	1.2%	1.3%	2.4%	2.6%	7.1%	2.4%	0.0%	0.0%	0.9%
25-29	5.1%	12.2%	11.2%	5.5%	6.6%	10.7%	7.0%	4.6%	9.0%	28.5%	20.1%	6.8%
30-34	4.4%	13.2%	10.6%	12.2%	11.1%	10.1%	10.1%	9.4%	15.3%	5.1%	20.6%	3.7%
35-39	18.2%	14.2%	14.8%	16.2%	12.9%	12.3%	15.0%	14.9%	14.4%	12.5%	15.9%	13.4%
40-44	19.6%	11.5%	12.8%	17.8%	12.5%	18.5%	17.0%	8.1%	24.8%	14.1%	7.6%	25.8%
45-49	17.2%	20.0%	11.1%	15.0%	18.3%	15.1%	16.5%	15.6%	12.8%	8.3%	19.0%	17.3%
50-54	12.4%	19.0%	23.1%	19.6%	17.7%	18.1%	17.7%	20.2%	14.1%	12.5%	10.2%	16.6%
55-59	18.2%	7.7%	12.0%	8.3%	10.4%	8.2%	9.1%	18.2%	6.0%	16.4%	5.0%	11.7%
60-64	0.0%	0.9%	3.6%	3.7%	6.6%	3.7%	4.1%	1.7%	1.2%	2.6%	0.0%	3.8%
65-69	2.6%	0.0%	0.8%	0.0%	2.1%	1.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%
70-74	0.0%	0.6%	0.0%	0.5%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%
75+	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sex												
Male	4.8%	2.8%	3.3%	4.3%	1.7%	1.9%	1.9%	7.8%	0.0%	6.3%	0.0%	3.7%
Race												
White only	92.1%	95.6%	91.1%	87.6%	87.6%	93.0%	96.3%	90.0%	88.8%	100.0%	97.4%	97.0%
All other races	7.9%	4.5%	8.9%	12.4%	12.3%	6.9%	3.6%	10.0%	11.2%	0.0%	2.6%	3.0%
Ethnicity												
Hispanic	7.3%	2.3%	2.7%	0.8%	1.7%	1.5%	1.0%	0.0%	10.8%	0.0%	0.0%	3.1%

* Counties by Workforce Development Area (WDA)—WDA 1: Clallam, Jefferson, Kitsap; WDA 2: Grays Harbor, Lewis, Mason, Pacific, Thurston; WDA 3: Island, Skagit, San Juan, Whatcom; WDA 4: Snohomish; WDA 5: King; WDA 6: Pierce; WDA 7: Clark, Cowlitz, Wahkiakum; WDA: Adams, Chelan, Douglas, Grant, Okanogan; WDA 9: Kittitas, Klickitat, Yakima, Skamania; WDA 10: Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Oreille, Stevens, Walla Walla, Whitman; WDA 11: Benton, Franklin; WDA 12: Spokane.

Table C-6. Main Practice Area (Primary vs. Specialty Care) of Dental Hygienists in Washington (2007)

	Dental Hygienists in Washington*				
		Total		Practicing in Washington	
Main Practice Area	Unweighted n	Weighted n	Percent	Weighted n	Percent
Primary/generalist care	1,207	3,516	85.4%	3,252	87.9%
Specialized care	150	427	10.4%	390	10.5%
No primary area of practice	64	176	4.3%	59	1.6%
Missing data†	24	65	1.5%	42	1.1%

* "In Washington" was determined from the ZIP code of the license mailing address.
† The percent calculations above do not include these missing data.

Table C-7. Specialties/Areas of Practice of Dental Hygienists in Washington (2007)

	Dental Hygienists in Washington*				
		Total		Practicing in Washington	
Specialty/Area of Practice	Unweighted n	Weighted n	Percent	Weighted n	Percent
Supervised clinical practice	1,304	3,789	91.4%	3,498	93.8%
Unsupervised practice	11	30	0.7%	26	0.7%
Public health	33	95	2.3%	92	2.5%
Education	34	95	2.3%	83	2.2%
Other	48	135	3.2%	30	0.8%
Missing data†	15	40	1.0%	14	0.4%

* "In Washington" was determined from the ZIP code of the license mailing address.
† The percent calculations above do not include these missing data.

Table C-8. Years of Practice of Dental Hygienists Practicing in Washington (2007)

	Dental Hygienists Practicing in Washington
Average number of years practicing as dental hygienist	17.2
Average number of years practicing as dental hygienist in Washington	15.6

Table C-9. Work Setting of Dental Hygienists Practicing in Washington (2007)

Work Setting*	Dental Hygienists Practicing in Washington		
	Unweighted n	Weighted n	Percent
Private office or clinic	992	2,886	96.2%
Public clinic	9	25	0.8%
Public health	9	28	0.9%
Education/research	12	34	1.1%
Other	10	27	0.9%
Missing†	259	743	19.9%

* Two additional work settings do not appear above because no one selected them (nursing home/extended care/long-term care facility and home health agency).
† The percent calculations above do not include these missing data.

Table C-10. Number of Locations for Dental Hygienists Practicing in Washington (2007) Providing Direct Patient Care

Provide Direct Patient Care	Dental Hygienists Practicing in Washington		
	Unweighted n	Weighted n	Percent
Overall	1,291	3,743	100.0%
In one location	880	2,551	75.0%
In two locations	143	423	12.4%
In more than two locations	147	427	12.6%
Missing data*	121	342	9.1%

* The percent calculations above do not include these missing data.

Table C-11. Age of Dental Hygienists Practicing in Washington (2007) by Full-/Part-Time Status

	Dental Hygienists Practicing in Washington	
	Full Time*	Part Time
Total, n† (%)	1,896 (50.9%)	1,826 (49.1%)
Mean age	43.0	44.8
Age ≤55 years (n = 3,270†)	51.9%	48.1%
Age >55 years (n = 465†)	45.1%	54.9%

* Full-time status was assigned if work hours totaled ≥32 hours/week and part time was <32 hours/week.
† Weighted number. Unweighted numbers were 653 for full time and 630 for part time.

Table C-12. Average Weekly Hours by Work Setting of Professional Activity Among Dental Hygienists Practicing in Washington (2007)

Type of Professional Activity	Practice Location of Dental Hygienists Practicing in Washington		
	Overall	Private Office or Clinic	All Other Settings
Direct patient care (including patient education)	25.5	25.8	23.8
Administration of clinical practice	1.9	1.6	2.0
Teaching (dental hygienist education)	0.8	0.3	5.3
Research	0.3	0.1	3.0
Other professional activities	0.8	0.5	3.3
Total*	29.3	28.2	37.3

* Total hours do not equal the sum of professional activity component hours because total hours were reported independently.

Table C-13. Initial and Highest Dental Hygienist Education of Dental Hygienists in Washington (2007)

	Dental Hygienists in Washington*	
	Overall	Practicing in Washington
Total (n)	4,184	3,743
Initial dental hygienist education		
Certificate program	28.0%	28.5%
Associates degree	45.8%	46.5%
Bachelors degree	26.2%	25.0%
Missing data†	15 (0.4%)	7 (0.2%)
Highest dental hygienist education		
Certificate program	5.9%	5.5%
Associates degree	57.9%	59.7%
Bachelors degree	35.0%	33.6%
Masters degree	1.1%	1.1%
Missing data†, n‡ (%)	15 (0.4%)	7 (0.2%)

* "In Washington" was determined from the ZIP code of the license mailing address.
† The percent calculations above do not include these missing data.
‡ Weighted number.

Table C-14. Initial and Highest Dental Hygienist Education of Dental Hygienists Practicing in Washington (2007) by WDA*

	Dental Hygienists Practicing in Washington											
	WDA 1†	WDA 2†	WDA 3†	WDA 4†	WDA 5	WDA 6†	WDA 7	WDA 8†	WDA 9	WDA 10	WDA 11†	WDA 12†
Initial dental hygienist education												
Certificate program	27.4%	29.1%	21.1%	28.6%	28.6%	29.5%	47.5%	16.9%	41.5%	22.4%	29.1%	8.0%
Associates degree	49.7%	54.0%	57.2%	48.9%	49.2%	56.5%	42.1%	44.0%	53.0%	32.1%	35.5%	12.5%
Bachelors degree	22.9%	16.9%	21.7%	22.5%	22.2%	14.0%	10.4%	39.1%	5.5%	45.5%	35.4%	79.5%
Highest dental hygienist education												
Certificate program	4.2%	7.8%	4.1%	3.0%	5.0%	3.5%	11.7%	2.5%	11.4%	11.4%	7.4%	1.6%
Associates degree	69.9%	70.0%	64.3%	64.6%	60.7%	72.7%	63.2%	53.8%	69.2%	31.9%	51.4%	14.5%
Bachelors degree	25.8%	22.1%	27.5%	31.7%	32.8%	23.4%	24.2%	43.8%	19.4%	56.7%	39.3%	81.6%
Masters degree	0.0%	0.0%	4.2%	0.8%	1.5%	0.5%	0.9%	0.0%	0.0%	0.0%	2.0%	2.2%

* Counties by Workforce Development Area (WDA)—WDA 1: Clallam, Jefferson, Kitsap; WDA 2: Grays Harbor, Lewis, Mason, Pacific, Thurston; WDA 3: Island, Skagit, San Juan, Whatcom; WDA 4: Snohomish; WDA 5: King; WDA 6: Pierce; WDA 7: Clark, Cowlitz, Wahkiakum; WDA 8: Adams, Chelan, Douglas, Grant, Okanogan; WDA 9: Kittitas, Klickitat, Yakima, Skamania; WDA 10: Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Oreille, Stevens, Walla Walla, Whitman; WDA 11: Benton, Franklin; WDA 12: Spokane.
† Percentages do not total to 100% due to rounding.

Table C-15. Dental Hygienist Education Obtained from an Institution in Washington, Among Dental Hygienists in Washington* (2007)

	Overall†	Type of Program/Degree			
		Certificate	Associates	Bachelors	Masters
Total number‡	4,184	1,168	2,741	1,503	46
Obtained dental hygienist degree/completed program from an institution in Washington State	79.2%	80.6%	81.4%	76.3%	69.0%
Missing data§, n‡ (%)	146 (3.5%)	72 (6.2%)	114 (4.2%)	46 (3.1%)	9 (19.6%)

* "In Washington" was determined from the ZIP code of the license mailing address.
† The overall number does not equal the sum of the degree types because it is possible for hygienists to have earned more than one type of degree or certificate.
‡ Weighted number.
§ The percent calculations above do not include these missing data.

Table C-16. Initial Education Program of Dental Hygienists in Washington by Age Group (2007)

	Dental Hygienists in Washington*				
		Initial Dental Hygienist Degree/Program Completed			Dental Hygienists Who Obtained Initial Degree/Completed Initial Program in Washington
Age Categories	Weighted n	Certificate	Associates Degree	Bachelors Degree	
<25	60	25.3%	40.6%	34.2%	95.8%
25-29	337	36.5%	38.9%	24.6%	85.7%
30-34	430	30.9%	46.5%	22.5%	81.6%
35-39	559	30.5%	53.3%	16.2%	81.8%
40-44	645	23.5%	45.7%	30.8%	80.2%
45-49	682	23.9%	47.1%	29.1%	78.8%
50-54	720	29.4%	44.6%	25.9%	79.4%
55-59	467	26.3%	53.0%	20.5%	70.3%
60-64	195	29.3%	25.5%	45.2%	54.9%
65-69	60	34.3%	23.5%	42.2%	52.8%
70-74	20	10.9%	29.1%	60.0%	78.2%
75+	1	0.0%	100.0%	0.0%	100.0%

* "In Washington" was determined from the ZIP code of the license mailing address.

Table C-17. Geographic Location of Principal Practice of Dental Hygienists Practicing in Washington (2007)

	Dental Hygienists Practicing in Washington		
Principal Practice Location	Unweighted n	Weighted n	Percent
Western Washington	977	2,824	79.1%
Eastern Washington	252	746	20.9%
Missing	62	172	4.6%
Urban	1,120	3,258	91.2%
Rural*	109	313	8.8%
Missing	62	172	4.6%

* Rural was defined using the Rural-Urban Commuting Area (RUCA) taxonomy as a combination of large rural, small rural, and isolated small rural groupings of RUCA codes. More information is available at http://depts.washington.edu/uwruca/.

Table C-18. Characteristics of Dental Hygienists in Washington (2007) Who Obtained their Initial Education to Become a Dental Hygienist Outside of the United States

	Dental Hygienists in Washington*
Total Washington dental hygienists with initial education from outside the U.S.† (n)	61
Percent of all dental hygienists in Washington	1.5%
Percent of dental hygienists in Washington with initial education from outside the U.S. who are practicing in Washington	100.0%
Mean age (years)	42.5
Male	4.8%
Race	
White only	74.3%
All other races	25.6%
Ethnicity: Hispanic	5.0%
Initial dental hygienist degree/program completed	
Certificate program	29.5%
Associates degree	50.2%
Bachelors degree	20.2%
Highest dental hygienist degree/program completed	
Certificate program	19.1%
Associates degree	55.0%
Bachelors degree	25.9%
Average number of years practicing as a dental hygienist	13.5
Average number of years practiced in Washington	11.5
Provide direct patient care	96.1%

* "In Washington" was determined from the ZIP code of the license mailing address.
† Weighted number (19 unweighted).

APPENDIX D. DENTIST AND DENTAL HYGIENIST SURVEY ANALYSIS METHODS

The methods used in the design, administration and analysis of data from the 2007 Department of Health survey of Washington State's licensed dentists and dental hygienists are described below. The Department of Health contracted with 2 of the state's largest universities to develop and conduct the survey. The data analysis was completed by the University of Washington Center for Health Workforce Studies (UW CHWS). Data collection was done by the Social and Economic Sciences Research Center at Washington State University, with technical assistance from the UW CHWS. The questionnaires can be found in Appendix A.

DATA SOURCE

The data for this report are from the 2007 surveys of licensed dentists and dental hygienists conducted by the Washington State Department of Health and the Washington Workforce Training and Education Coordinating Board. The surveys were initiated in 2007 through a directive from the Washington State Legislature to collect race/ethnicity, specialty, practice and education information on the licensed health professionals in the state. Under this legislation, each type of licensed professional would be surveyed once every 2 years. The survey procedures involved contacting all licensees for a given profession with a letter offering Web access to the questionnaire. The 2-page questionnaire (see Appendix A) was tailored to reflect the practice and education characteristics of each profession. In order to increase response rates in a cost-effective manner, a 33% random sample of each profession was selected to receive a paper copy of the questionnaire and one additional follow-up mailing, in addition to the initial letter if necessary. These procedures were used by the Washington Department of Health (through its survey contractor at Washington State University) for both the dentist and dental hygienist surveys. Of the 5,830 licensed dentists in 2007, 1,534 (26.3%) total responses were received. The response rate for the single contact group was 12.4%, which represented 480 responses. The randomly selected 33% sample yielded 1,054 responses (54.2%). From the 4,796 active dental hygienist licenses in 2007, 1,655 (34.5%) survey responses were received: 597 were received (18.7%) from the single-contact group and 1,058 were received (66.2%) from the randomly selected 33% sample (see Tables D-1 and D-5).

DETERMINING RESIDENCE AND PRACTICE LOCATION

In this report, most findings are presented for dentists and dental hygienists who resided in Washington and/or practiced in Washington. Determination of whether or not a provider resided in Washington was made using the state and ZIP code fields of the provider's license record: the provider's license address was presumed to be the residence location of the provider. The ZIP codes of primary and secondary practice locations from the survey responses were used to determine practice location. Available lists of ZIP codes by state were used to assign ZIP codes to Washington or other states. For sub-state analyses these ZIP codes were used to assign providers to counties, and counties were subsequently assigned to a workforce development area (WDA). WDAs are sub-state regions composed of one or more counties that receive state and federal assistance for workforce planning and development programs. The residence and practice ZIP codes also were used to determine rural-urban status (see Regional and Sub-State Analyses section below). It should be noted that the analyses populations initially were limited to dentists and dental hygienists residing in Washington in order to calculate and assign response weights (see Data Weighting section below). Among those respondents residing in Washington, dentists and dental hygienists who practiced in Washington were identified. As a result, those providers who live outside of Washington but practice in Washington are not represented in the "practicing in Washington" results.

REGIONAL AND SUB-STATE ANALYSES

Survey response rates were calculated for the 12 WDAs of the state. WDA was assigned by identifying the county in which the dentist's or dental hygienist's license mailing address was located. Survey results by WDA for dentists are limited to demographics, distribution and percent practicing. Survey results for dental hygienists by WDA include demographics, distribution, percent practicing, and education background. Response rates for both dentists and dental hygienists by WDA are shown in Tables D-1 and D-5.

Selected survey results are presented separately for eastern and western Washington. Eastern Washington is comprised of the following counties occurring east of the north-south Cascade Mountain range: Adams, Asotin, Benton. Chelan, Columbia, Douglas, Ferry, Franklin, Garfield, Grant, Kittitas, Klickitat, Lincoln, Okanogan, Pend Oreille, Skamania, Spokane, Stevens, Walla Walla, Whitman, and Yakima. Western Washington counties (west of the Cascades) included Clallam, Clark, Cowlitz, Grays Harbor, Island, Jefferson, King, Kitsap, Lewis, Mason, Pacific, Pierce, Skagit, San Juan, Snohomish, Thurston, Wahkiakum, and Whatcom.

Selected results are presented for rural and urban oral health providers. Rural/urban status was determined by the ZIP code of the provider's primary practice location. The ZIP code version of the Rural-Urban

Commuting Area (RUCA) taxonomy, version 2.0, was used to classify practice ZIP codes into 1 of 33 RUCA categories and the associated 2 groupings of those RUCA categories that classify a location as either rural or urban.[1] RUCAs take into account not only an area's population and location, but also account for the ZIP code population's work-commuting patterns in relationship to surrounding cities and towns.

DATA REPORTING CRITERIA

Due to the small numbers of respondents for some survey options (e.g., oral/maxillofacial radiology) and the resulting imprecision of these estimates, these data were not reported individually. When the total number of weighted responses for a particular survey response category was fewer than 25, those cases were reported in the "other" category for all survey responses except demographic information (e.g., age and race).

DATA WEIGHTING

To address possible response bias, we compared dentist and dental hygienist survey respondents to the total licensed dentist and dental hygienist populations respectively on several factors for which data were available for all licensed dentists and dental hygienists from state licensing records: age, sex, in-Washington residence, and WDA of residence. Additionally, respondents from the random sample who received a follow-up contact when necessary were compared with those respondents who were in the group with only a single contact. The age, sex and residence characteristics of these 2 respondent groups were compared, and they were not statistically different for either the dentists or for the dental hygienists. The age distribution of the survey respondents, however, was significantly different than the total licensed population: a larger proportion of older dentists and older dental hygienists responded to the survey (see Tables D-3 and D-7). Without adjustments to account for this age bias among respondents, survey results would reflect the views and practice patterns of older dentists and dental hygienists disproportionately and provider characteristics associated with age (e.g., work hours) would be less likely to accurately reflect the licensed oral health provider populations. As a result, response weights (the number of dentists and dental hygienists each response represented) were calculated for both dentists and dental hygienists for each year of age as represented by the total licensed dentist and dental hygienist populations living in Washington State. The weight calculated for each dentist and dental hygienist age year was then applied to the survey responses. The average weight across all dentists living in Washington was 3.58, and the average weight across all dental hygienists in Washington was 2.89 (causing the response to be counted as 2.89 responses). Tables D-3 and D-7 show the characteristics of survey respondents compared with the overall licensed dentist and dental hygienist populations.

ASSIGNMENT OF MISSING VALUES

When survey respondents answered part of a question and the response to the remainder of the question could be inferred, the missing value was assigned. For example, if a respondent responded with a "yes" indicating they held a bachelor's degree in dental hygiene , but did not answer "no" to other dental hygiene degree options, the blank responses were assumed to be "no." Similarly, if a respondent reported direct patient hours or clinical administration hours but did not report hours for other activities such as teaching or research, these missing values were considered to be zero. This was also true if a respondent did not report his or her total weekly hours but provided hours spent in each individual activity, in which case the sum of the individually reported hours was used as the weekly total hours. As a result of these assumptions and the fact that respondents were allowed to answer only parts of questions, the number of respondents (the "n") varies across survey questions.

1. WWAMI Rural Health Research Center, University of Washington. (2009). *Rural-Urban Commuting Area Codes (Version 2.0)*. Retrieved April 6, 2009, from http://depts.washington.edu/uwruca.

Table D-1. Response Rates for Washington Dentists by Workforce Development Area (WDA)

	Response Rates Overall	Response Rates for Random Sample of 33% of Licensed Dentists
Total number	5,830	1,944
Overall responses (n)	1,534	1,054
Overall responses (%)	26.3%	54.2%
Responses (% of WDA) by WDA*		
1	33.6%	63.2%
2	35.0%	66.7%
3	33.2%	64.8%
4	24.6%	61.1%
5	25.4%	50.0%
6	22.1%	49.0%
7	26.3%	53.9%
8	35.7%	68.9%
9	28.4%	71.1%
10	40.2%	76.3%
11	33.9%	69.8%
12	34.2%	61.2%

* Counties by Workforce Development Area (WDA)—WDA 1: Clallam, Jefferson, Kitsap; WDA 2: Grays Harbor, Lewis, Mason, Pacific, Thurston; WDA 3: Island, Skagit, San Juan, Whatcom; WDA 4: Snohomish; WDA 5: King; WDA 6: Pierce; WDA 7: Clark, Cowlitz, Wahkiakum; WDA 8: Adams, Chelan, Douglas, Grant, Okanogan; WDA 9: Kittitas, Klickitat, Yakima, Skamania; WDA 10: Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Oreille, Stevens, Walla Walla, Whitman; WDA 11: Benton, Franklin; WDA 12: Spokane.

Table D-2. Response Rates for Washington Dentists by Age Group

	Response Rates Overall	Response Rates for Random Sample of 33% of Licensed Dentists
Total number	5,830	1,944
Overall responses (n)	1,534	1,054
Overall responses (%)	26.3%	54.2%
Responses (% of age group) by age categories		
<25	0.0%	0.0%
25-29	20.3%	33.3%
30-34	17.2%	36.3%
35-39	19.7%	44.4%
40-44	20.5%	44.2%
45-49	28.1%	57.0%
50-54	30.5%	60.8%
55-59	33.0%	66.1%
60-64	34.1%	67.3%
65-69	31.3%	68.9%
70-74	28.0%	57.9%
≥75	30.1%	61.0%

Table D-3. Age and Sex Characteristics of All Licensed Dentists in Washington (2007) Compared with Survey Respondents

	Total Licensed Population	Survey Respondents	
		From 33% Random Sample	From Dentists NOT in Random Sample
Total number	5,830	1,944	3,882
Age			
Mean	48.6	48.8	48.5
Median	49.0	49.0	49.0
Age categories (% of category)			
<25	0.0%	0.0%	0.0%
25-29	4.1%	2.8%	4.0%
30-34	12.2%	8.2%	7.5%
35-39	14.6%	11.3%	10.0%
40-44	10.2%	8.0%	7.9%
45-49	10.5%	11.6%	10.4%
50-54	12.3%	12.8%	17.5%
55-59	13.7%	17.2%	17.3%
60-64	11.8%	15.8%	14.0%
65-69	5.8%	6.9%	6.7%
70-74	2.9%	3.1%	2.9%
75+	1.9%	2.4%	1.9%
Missing	0.1%		0.1%
Sex			
Females (%)	20.7%	16.7%	15.2%

Table D-4. Geographic Distribution of All Licensed Dentists in Washington (2007) Compared with Survey Respondents

	Total Licensed Population	Survey Respondents	
		From 33% Random Sample	From Dentists NOT in Random Sample
Total number	5,830	1,944	3,886
Geography			
Out of state (%)	20.2%	18.4%	21.0%
In-state, overall (%)	79.8%	81.6%	79.0%
WDA* (%)			
1	4.9%	4.8%	4.9%
2	5.3%	4.7%	5.6%
3	5.6%	5.5%	5.7%
4	8.3%	7.1%	8.9%
5	42.2%	43.9%	41.4%
6	9.8%	9.4%	10.0%
7	6.4%	6.4%	6.5%
8	2.7%	2.8%	2.6%
9	3.0%	2.8%	3.1%
10	2.0%	2.4%	1.8%
11	2.7%	2.7%	2.6%
12	7.1%	7.3%	7.0%

* Counties by Workforce Development Area (WDA)—WDA 1: Clallam, Jefferson, Kitsap; WDA 2: Grays Harbor, Lewis, Mason, Pacific, Thurston; WDA 3: Island, Skagit, San Juan, Whatcom; WDA 4: Snohomish; WDA 5: King; WDA 6: Pierce; WDA 7: Clark, Cowlitz, Wahkiakum; WDA 8: Adams, Chelan, Douglas, Grant, Okanogan; WDA 9: Kittitas, Klickitat, Yakima, Skamania; WDA 10: Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Oreille, Stevens, Walla Walla, Whitman; WDA 11: Benton, Franklin; WDA 12: Spokane.

Table D-5. Response Rates for Washington Dental Hygienists by Workforce Development Area (WDA)

	Response Rates Overall	Response Rates for Random Sample of 33% of Licensed Dental Hygienists
Total number	4,796	1,598
Overall responses (n)	1,655	1,058
Overall responses (%)	34.5%	66.2%
Responses (% of WDA) by WDA*		
1	36.8%	65.7%
2	41.0%	68.8%
3	34.9%	70.8%
4	33.5%	65.1%
5	33.8%	63.2%
6	32.2%	61.5%
7	34.6%	64.2%
8	36.2%	65.1%
9	43.8%	88.9%
10	33.0%	64.0%
11	32.7%	63.4%
12	31.9%	64.9%

* Counties by Workforce Development Area (WDA)—WDA 1: Clallam, Jefferson, Kitsap; WDA 2: Grays Harbor, Lewis, Mason, Pacific, Thurston; WDA 3: Island, Skagit, San Juan, Whatcom; WDA 4: Snohomish; WDA 5: King; WDA 6: Pierce; WDA 7: Clark, Cowlitz, Wahkiakum; WDA 8: Adams, Chelan, Douglas, Grant, Okanogan; WDA 9: Kittitas, Klickitat, Yakima, Skamania; WDA 10: Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Oreille, Stevens, Walla Walla, Whitman; WDA 11: Benton, Franklin; WDA 12: Spokane.

Table D-6. Response Rates for Washington Dental Hygienists by Age Group

	Response Rates Overall	Response Rates for Random Sample of 33% of Licensed Dental Hygienists
Total number	4,796	1,598
Overall responses (n)	1,655	1,058
Overall responses (%)	34.5%	66.2%
Responses (% of age group) by age categories		
<25	29.7%	56.3%
25-29	33.6%	58.7%
30-34	33.7%	65.9%
35-39	30.9%	59.7%
40-44	32.2%	62.4%
45-49	34.0%	68.0%
50-54	39.2%	74.3%
55-59	35.0%	68.6%
60-64	39.6%	70.1%
65-69	31.8%	80.0%
70-74	43.5%	57.1%
≥75	33.3%	100.0%
Missing	1	

Table D-7. Age and Sex Characteristics of All Licensed Dental Hygienists in Washington Compared with Survey Respondents

	Total Licensed Population	Survey Respondents	
		From 33% Random Sample	From Dental Hygienists NOT in Random Sample
Total number	4,796	1,598	3,198
Age			
Mean	44.7	44.3	44.8
Median	45	45	45
Age categories (% of category)			
<25	1.1%	0.9%	1.7%
25-29	7.6%	7.7%	7.5%
30-34	10.0%	10.8%	8.7%
35-39	11.8%	11.9%	11.6%
40-44	14.3%	14.3%	14.2%
45-49	16.0%	17.3%	13.7%
50-54	20.1%	19.1%	21.8%
55-59	11.7%	11.4%	12.2%
60-64	5.4%	5.1%	6.0%
65-69	1.3%	1.1%	1.5%
70-74	0.6%	0.4%	1.0%
75+	0.1%	0.1%	0.0%
Missing	1		1
Sex			
Male (%)	3.0%	2.6%	3.2%
Missing	1		1

Table D-8. Geographic Distribution of All Licensed Dental Hygienists in Washington Compared with Survey Respondents

	Total Licensed Population	Survey Respondents	
		From 33% Random Sample	From Dental Hygienists NOT in Random Sample
Total number	4,796	1,598	3,198
Geography			
Out of state (%)	12.8%	12.5%	12.9%
In-state, overall (%)	87.2%	87.5%	87.1%
WDA* (%)			
1	4.4%	4.8%	4.2%
2	6.4%	8.0%	5.6%
3	5.2%	4.7%	5.5%
4	9.5%	9.2%	9.6%
5	32.1%	33.1%	31.6%
6	11.8%	11.5%	12.0%
7	8.7%	8.8%	8.7%
8	3.1%	3.1%	3.1%
9	3.8%	3.9%	3.8%
10	2.4%	1.8%	2.7%
11	3.6%	2.9%	3.9%
12	8.9%	8.2%	9.2%
Missing	618 (12.9%)	202 (12.6%)	416 (13.0%)

* Counties by Workforce Development Area (WDA)—WDA 1: Clallam, Jefferson, Kitsap; WDA 2: Grays Harbor, Lewis, Mason, Pacific, Thurston; WDA 3: Island, Skagit, San Juan, Whatcom; WDA 4: Snohomish; WDA 5: King; WDA 6: Pierce; WDA 7: Clark, Cowlitz, Wahkiakum; WDA 8: Adams, Chelan, Douglas, Grant, Okanogan; WDA 9: Kittitas, Klickitat, Yakima, Skamania; WDA 10: Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Oreille, Stevens, Walla Walla, Whitman; WDA 11: Benton, Franklin; WDA 12: Spokane.

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Benedetti TJ, Baldwin LM, Skillman SM, et al. Professional liability issues and practice patterns of obstetric providers in Washington State. *Obstet Gynecol.* 2006 Jun;107(6):1238-46.

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The WWAMI Center for Health Workforce Studies is located at the University of Washington Department of Family Medicine. The Center brings together researchers from medicine, nursing, dentistry, public health, the allied health professions, pharmacy, and social work to perform applied research on the distribution, supply, and requirements of health care providers, with emphasis on state workforce issues in underserved rural and urban areas of the WWAMI region. Workforce issues related to provider and patient diversity, provider clinical care and competence, and the cost and effectiveness of practice are emphasized.

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