The Distribution and Composition of Arizona's Dental Workforce and Practice Patterns: Implications for Access to Care

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Executive Summary

The problem of access to dental care services gained national attention following the publication of the first ever Surgeon General's report on Oral Health[1]. However, dental policies and programs implemented over the past several decades have done little to change the practice patterns of dental providers. In fact, disparities in oral health status have increased, partially due to inequities in access to care. This report summarizes the findings of a statewide survey of dentists in Arizona, particularly examining the patterns of practice in relation to access to care for underserved populations.

The data show a workforce and pattern of practice that closely mirrors national trends. The licensed dentist-to-population ratio is 1:1985, while the actual FTE dentist-to-population ratio is probably closer to 1:2200. Both ratios are higher than the national average of approximately 1:1700, but far below the federal shortage designation criteria of 1:5000[2, 3]. The distribution of these providers is uneven in relation to the population, and particularly uneven in relation to underserved populations.

Traditionally underserved communities, including rural communities, Dental Health Professional Shortage Areas (DHPSAs), and practices in communities with high numbers of "vulnerable populations" (populations who are below 200% of Federal Poverty Level, Hispanic or Native American) tend to have a smaller percentage of practices (of survey respondents) than they do of the state's population. This disparity is particularly large in high poverty and high Hispanic DCAs.

Practices in traditionally underserved communities reported accepting more Medicaid and uninsured patients, and generally offered a wide variety of services for their clients. However these practices were more likely to report a lower likelihood of accepting new patients, difficulty meeting translation needs, a tendency to hire few auxiliary staff, and fewer practitioner hours worked and patient visits scheduled. These findings raise serious questions about the distribution of dental providers and their ability to adequately address the oral health care needs of underserved population in the state.

The following recommendations for policy, program and data collection efforts are provided for state policy-makers and oral health program administrators.

1. Dental workforce planners in the state should examine the types of practices currently situated in underserved areas of the state and provide incentives for expansion of the types of practices that best meet the needs of these communities.

2. Auxiliary dental providers are a critical part of the dental team and have the potential to greatly increase access to care, particularly if their scope of practice was expanded and supervision requirements were reduced, as has happened in many other states, and is underway in Arizona. Policy-makers should examine the reasons for a low level of utilization of dental assistants and dental hygienists within dental practices delivering care to underserved populations. As the rules and regulations governing auxiliary providers change, the patterns of practice should be monitored, with particular attention to those providers delivering care to underserved populations.
3. Arizona is known as a retirement destination for American's older adults. However no information exists on the availability of oral health care for the seniors, many of which are uninsured, as Medicare does not provide dental benefits. More attention should be paid to this "vulnerable" population and the systems of care (financing, providers, ancillary services, institutional care) in place to meet the oral health care needs of this growing population.
4. Dental educators in the state should examine the availability of culturally competent care. Survey respondents reported over 28 languages spoken by their staff (80% Spanish) indicating a very diverse population needing oral health care in the state.
5. The average age of a dentist in Arizona is 48, meaning in 15 years or less many providers will start to retire. The new dental school in Arizona may mitigate some of this attrition, however planners should closely monitor the supply and distribution of new and active providers to ensure an adequate access to care for Arizona's population.
6. The Arizona Board of Dental Examiners should institute a mandatory licensure survey in order to ensure a 100% response rate to critical workforce questions. If the Office of Oral Health has to depend on survey data there is no ability to get 100% response rate and therefore no way to use the workforce data to address needy areas such as by designating DHPSAs. Consistently monitoring workforce trends is a necessary precursor to implementing systems of care and expanding access for vulnerable populations.
7. The 20-item questionnaire collected data on a number of descriptive items about dentists and the practices in which they work. Additional data points on provider, practice, and population characteristics, would help to address further workforce policy questions and concerns. Additional items should be added to any future surveys.

Background

The problem of access to dental care services gained national attention following the publication of the Surgeon General's report on Oral Health[1]. A primary component of access to care is the availability of a workforce that is able and willing to provide services to people in the communities in which they practice. Historically, workforce planners have measured overall supply to population ratios. Recently, a number of studies have examined not only the number of providers, but the geographic distribution and practice characteristics of those providers[4-9]. Findings from these and other studies have confirmed several trends:

- A lower dentist-to-population ratio exists in low-income and high minority urban communities, and rural communities
- There is a general lack of providers willing to care for Medicaid beneficiaries
- Programs designed to address the lack of providers in underserved areas are not comprehensive enough to meet the needs of all underserved populations
- Private solo practice remains the predominant model of care
- There are differences in practice patterns by age, gender and race/ethnicity of providers
- The racial/ethnic makeup of a community is often a stronger predictor than income of the supply of professionals practicing in the community

These trends have implications for policy development aimed at increasing the supply and distribution or altering regulation of the practice of dental providers. Policies implemented over the past several decades have done little to change the practice patterns of dental providers. In this time period the disparities in oral health have increased, partially due to inequities in access to care.

Purpose of Report

The purpose of this report is to summarize findings of a statewide survey of Arizona's dental practices relevant to access to care for underserved populations, and to provide recommendations for state policy, program and data collection efforts in Arizona. The Arizona Department of Health Services will publish a complete summary of the workforce data separately.

Survey Methodology

Arizona Department of Health Services, Office of Oral Health, (DHS) conducted a statewide telephone survey of dentists licensed and practicing in Arizona during the months of July 2000 through September 2001. DHS obtained a mailing list of dentists licensed and practicing in Arizona from the Arizona Board of Dental Examiners (BODEX). The Arizona BODEX mailing database consisted of dentists listed by location of practice. Each practice location was contacted to participate in the telephone survey. The

original mailing list consisted of 2397 licensed dentists practicing in Arizona. The address list was geocoded and dentists were grouped according to practice locations. During the course of the survey an additional 187 providers (new licensees) were added adjusting the original file to 2584 dentists.

Telephone interviews were conducted using a 20-item questionnaire designed to gather information on dentists' demographics, practice characteristics, office staffing patterns, patient profiles, and specialized services available. Questions were based on similar questions used by the American Dental Association in its surveys[10]. An initial attempt was made to speak with the dentist. If the dentist was not available, an office manager or the front desk receptionist responded to the survey. If no one was available at that time a second and third attempt were made.

The adjusted usable response rate (64%) consisted of 1648 unique providers located at 1317 practice sites. Non-response reasons included: a dentist or practice moving/closing; death; retirement; or simply choosing not to participate in the survey. Reasons for non-response were not available; therefore the response rate is likely higher than our estimate as non-eligible providers (eg. retirees) are still included in the denominator.

The survey information was then compared to Arizona's geographic and population characteristics. Arizona has 15 counties that have been subdivided into 94 Dental Care Areas (DCAs). DCAs are a geographic area defined by the State of Arizona based on aggregates of census tracts for better health workforce analysis. These DCAs are considered rational services areas for dental care by the State and are used for Federal Dental Health Professions Shortage Area (DHPSA) designations.

- 17 (18%) are Frontier[1]
- 14 (15%) are Indian Reservations
- 29 (31%) are Rural
- 34 (36%) are Urban

Thirty (32%) DCAs are also designated Dental Health Professional Shortage Areas (DHPSAs); of these,

- 3 (10%) are county DHPSAs
- 14 (47%) are Geographic DHPSAs
- 13 (43%) are low-income population DHPSAs

[1] Frontier = DCAs with <6 persons per square mile. Indian = Indian Reservation. Rural = DCAs in counties <400,000 population that are not FRONTIER or INDIAN are rural; also, DCAs with a population of < 50,000 in counties with a population of >400,000 are rural. Urban = DCAs in counties >400,000 with a DCA population of >=50,000.

The designation as a DHPSA is a federal designation for certain programs and is separate than classification of a DCA as rural or urban. There are fewer urban DCAs designated as DHPSAS than rural, frontier and Indian DCAs.

Table 1: DCA Characteristics

	Urban	Rural	Frontier	Indian Reservation	Total
DHPSA	6 (17.65%)	9 (31.03%)	12 (70.59%)	3 (21.43%)	30 (31.91%)
Not DHPSA	28 (82.35%)	20 (68.97%)	5 (29.41%)	11 (78.57%)	64 (68.09%)
Total	34 (100%)	29 (100%)	17 (100%)	14 (100%)	94 (100%)

Certain populations are considered vulnerable to having access to care problems. Minorities and children from low-income families have higher rates of dental disease[1]. If a DCA was in the top quartile of DCAs for percent of population under 200% of the Federal Poverty Level, percent of population Hispanic or percent of population Native American, we consider this a high "vulnerable population" DCA[4].

Table 2a: DCAs with Vulnerable Populations and their DHPSA Status

DCAs (n=94)	High Poverty DCAs*	Not High Poverty DCAs	High Hispanic DCAs**	Not High Hispanic DCAs	High Native American DCAs***	Not High Native American DCAs	Total
DHPSA	8 (33.3%)	22 (31.4%)	13 (54.2%)	17 (24.3%)	9 (37.5%)	21 (30.0%)	30 (31.9%)
Not DHPSA	16 (66.7%)	48 (68.6%)	11 (45.8%)	53 (75.7%)	15 (62.5%)	49 (70.0%)	64 (68.1%)
Total	24 (100%)	70 (100%)	24 (100%)	70 (100%)	24 (100%)	70 (100%)	94 (100%)

*High Poverty = in top quartile of DCAs for percent of DCA population <200% of poverty level
** High Hispanic = in top quartile of DCAs for percent of DCA population Hispanic
** High Native American = in top quartile of DCAs for percent of DCA population Native American

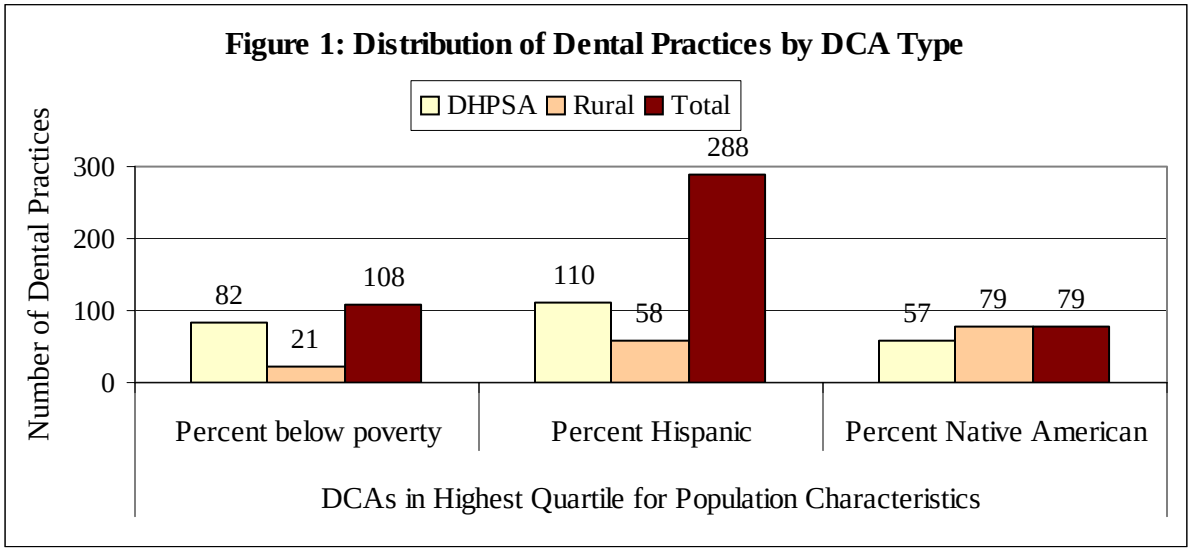
Table 2b: DCAs with Vulnerable Populations and their Geographic Characteristics

DCAs (n=94)	High Poverty DCAs*	Not High Poverty DCAs	High Hispanic DCAs**	Not High Hispanic DCAs	High Native American DCAs***	Not High Native American DCAs	Total
Rural	18 (75.0%)	42 (60%)	13 (54.2%)	47 (67.1%)	23 (95.8%)	37 (52.9%)	60 (63.8%)
Urban	6 (25.0%)	28 (40%)	11 (45.8%)	23 (32.9%)	1 (4.2%)	33 (47.1%)	34 (36.2%)
Total	24 (100 %)	70 (100%)	24 (100%)	70 (100%)	24 (100%)	70 (100%)	94 (100%)

*High Poverty = in top quartile of DCAs for percent of DCA population <200% of poverty level
** High Hispanic = in top quartile of DCAs for percent of DCA population Hispanic
** High Native American = in top quartile of DCAs for percent of DCA population Native American

Some DCAs were considered “vulnerable” in more than one category. In other states a high percent of African-American population would also be considered “vulnerable”, however in Arizona this population is so small we were unable to use it for these analyses.

There is substantial crossover between the three categories assigned to each DCA we examined: Urban/Rural, DHPSA/Not DHPSA, and Vulnerable Population/Not Vulnerable Population. Of the 1317 dental practices responding to the survey, 108 (8.2%) were in a high poverty DCA. Of these practices in a high poverty DCA, 82 (75.9%) were in a DCA also designated a DHPSA and 21 (19.4%) were in a rural DCA. Similarly, 288 (21.9%) responding practices were in a high Hispanic DCA. Of these 110 (38.2%) were in a DCA also designated a DHPSA and 58 (20.1%) were in a rural DCA. Finally, 79 (6.0%) responding practices were in a high Native American DCA. Of these 57 (72.2%) were in a DCA also designated a DHPSA and 79 (100%) were in a rural DCA.



The response rate was calculated for each type of community, or Dental Care Area (DCA). The response rate by individual DCA varied, therefore no DCA specific analyses were computed (i.e. calculating dentist-to-population ratios for individual DCAs). In order to further verify the validity of our geographic comparisons, the response rate by type of community was calculated. The response rate by type of community was consistent with the overall response rate, with just slightly more providers responding from rural DCAs and DCAs with a high number of Native Americans.

Table 3a: Number of Respondents per Type of Community

Type of DCA	Urban	Rural, Frontier or Indian	DHPSA	Not DHSPA	Total
Number of Dentists Surveyed	2791 (82.5)	594 (17.5%)	464 (13.7%)	2921 (86.3%)	3385 (100%)
Number of Dentist Respondents	1454 (78.7%)	394 (21.3%)	253 (13.7%)	1595 (86.3%)	1848 (100%)
Non-Unique Response Rate by Type of Community	52.1%	66.3%	54.5%	54.6%	54.6%

(non-unique respondent count, as some providers work in more than one office)

Table 3b: Number of Respondents per Type of Community

Type of DCA	High Poverty*	Not High Poverty	High Hispanic**	Not High Hispanic	High Native American ***	Not High Native American	Total
Number of Dentists Surveyed	350 (10.3%)	3035 (89.7%)	782 (23.1%)	2603 (76.9%)	162 (4.8%)	3223 (95.2%)	3385 (100%)
Number of Dentist Respondents	178 (9.6%)	1670 (90.4%)	418 (22.6%)	1430 (77.4%)	120 (6.5%)	1728 (93.5%)	1848 (100%)
Non-Unique Response Rate by Type of Community	50.9%	55.0%	53.5%	54.9%	74.1%	53.6%	54.6%

(non-unique respondent count, as some providers work in more than one office)
*High Poverty = in top quartile of DCAs for percent of DCA population <200% of poverty level
** High Hispanic = in top quartile of DCAs for percent of DCA population Hispanic
** High Native American = in top quartile of DCAs for percent of DCA population Native American

The average age of respondents (48.3) is slightly lower than of the sample as a whole (50.5), however the sample of "active" providers included 234 providers over the age of 65, which may mean that the sample actually included providers who were actually retired.

The survey was structured so that some of the data were collected for each individual provider in a practice, and other data were collected for the practice as a whole. Throughout this report we distinguish "provider-level" analyses from "practice-level" analyses.

Data Limitations

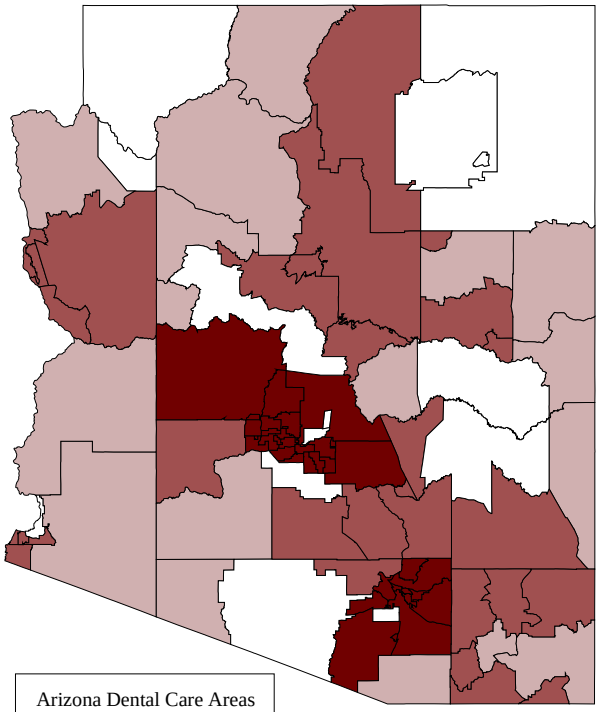
Data limitations include a low response rate in some geographic areas and the general limitations of accuracy of self-reported data. The sample was representative by age and geographic location, however

response rate bias by type of practitioner is possible but not measurable due to reasons for non-response not being recorded. Another limitation is that the data do not identify if a dental practice is a community or rural health center.

Geographic Overview of Arizona

Arizona is a large southwestern state on the Mexican border with a 2000 census population of 5.1 million. Many of the people living in Arizona are considered to be vulnerable populations in relation to access to dental care. Twenty-five percent of the state's population is Hispanic, 13% of the population is foreign born, and 25% of the population speaks a primary language other than English. As well, there are a large number of Indian Reservations in the state with 5% of the state's population being Native American [11].

Figure 2: Arizona Dental Care Areas, 2000

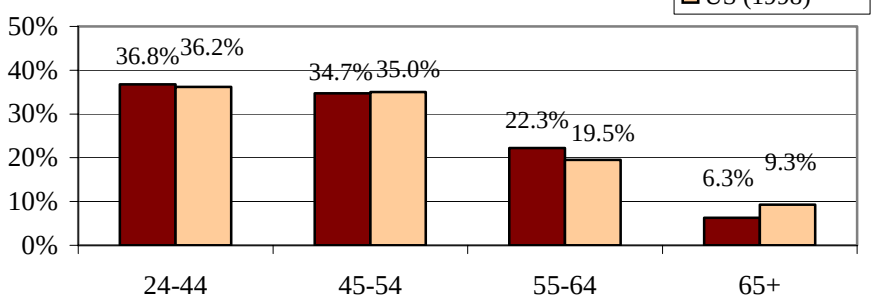


Arizona is both a young state, with almost 30% of the population under age 20 (7.5% under age 5), as well as an old state, with 13% of the population over age 65 (all percents are slightly higher than national averages). Similar to the nation, there is also an increasing segment of the population over age 85 [11]. Arizona also has a growing number of people enrolled in Medicaid, known as the Arizona Health Care Cost Containment System (AHCCCS). In 1997, only 9% of the population was enrolled in AHCCCS, while by 2001, 17% of the population was enrolled in AHCCCS. This is due to partially to changes in the eligibility for the program as well as a downturn in the economy and in-migration of eligible residents.

Characteristics of Dentists in Arizona

The basic characteristics of the dental workforce in Arizona mirror national trends. Survey respondents report similar numbers of females (10.1% vs 9.4% nationally), a similar age (mean age 48.3 years vs. 49.0 nationally), and a similar number of general practice providers (80.3% vs. 79.5% nationally)[12].

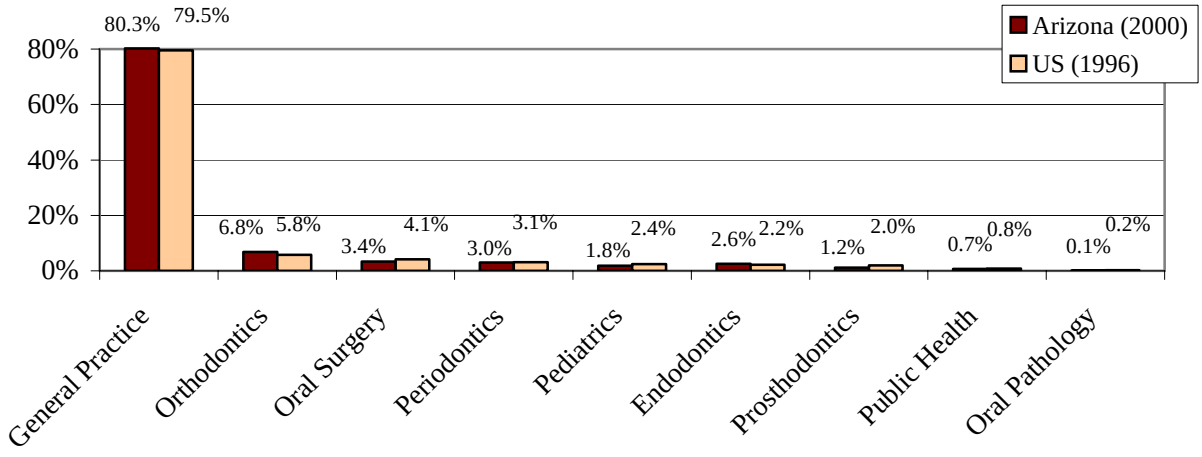
Figure 3: Age Distribution of Dentists, Arizona and the US



Source for US Data: ADA, The 1999 Survey of Dental Practice: Characteristics of Dentists in Private Practice and Their Patients. 2001, ADA, Survey Center: Chicago.

In Arizona, female dentists are younger (42 years) on average than male dentists (49 years), and are more likely than men to be general practitioners rather than specialists. 10.2% of general practitioners are female while only 6.8% of specialists are female.

Figure 4: Specialty Distribution of Dentists, Arizona and US



Source for US Data: ADA, Distribution of Dentists in the United States by Region and State, 1996. 1998, American Dental Association: Chicago, IL.

*Percents to not add up to 100 due to missing data

The number of hours worked and patient visits provided by dentists in Arizona also mirror national trends[12]. The number of hours worked varied significantly by gender, with women working fewer overall hours than men, but seeing a similar number of patients per hour worked. The patient visits scheduled per

week varied significantly by specialty, with specialist dentists scheduling more patient visits per week and seeing more patients per hour than generalist dentists. However, generalists and specialists work a similar number of overall hours per week[2]. Only 16.0% of dentists reported working in more than one office, and one third of those said the second office location was in the same community.

Table 4: Mean Hours and Mean Patient Visits Per Week Per Dentist

	General Practice		Specialists		All Dentists	
	AZ	US	AZ	US	AZ	US
Hours Per Week	36.10	36.50	35.82	36.50	36.07	36.50
Patient Visits per Week	54.25	54.60	103.21	90.30	64.06	60.40
n=1648; AZ = 2000 survey data; US = 1998 survey data [12]						

A small proportion (18.6%) of responding dentists reported that they accepted AHCCCS patients. Almost all providers accepting AHCCCS (98.0%) were accepting new AHCCCS patients. On average, providers accepting AHCCCS patients had 32.9% of their patients on AHCCCS.

Dental Practice Characteristics in Arizona

The majority of dental practices in Arizona are solo practices (74%) and employ dental assistants (98%) and dental hygienists (66%), again, closely mirroring national trends[13]. On average, practices employ 2.5 assistants and 1.2 hygienists. Of practices employing allied staff, these averages increase to 2.6 and 1.8 respectively.

Table 5: Size of Dental Practices in Arizona and the US

AZ Dental Practices	Generalists		Specialists		All Dentists	
	AZ	US	AZ	US	AZ	US
One Dentist	72.6%	68.0%	65.6%	61.5%	74.0%	66.9%
Two Dentists	19.4%	20.6%	20.9%	19.8%	18.5%	20.5%
Three or More Dentists	8.0%	11.4%	13.5%	18.7%	7.6%	12.7%
	n=1046		n=326		n=1317	
AZ = 2000 survey data; US = 1998 survey data [12]						

Dental practices employing assistants employ them an average 33.6 hours a week, while those employing hygienists do so an average 26.4 hours per week. This translates into practices employing, on average 2.6 FTE assistants and 1.5 FTE hygienists (assuming an FTE = 4 days a week, or a 32 hour work week[14]).

[2] Differences may be due to appointments with dental hygienists being counted or not. In the US data the scheduled visits does not include dental hygienists appointments, however in the AZ data it is unclear, and those reporting on the visits may have included or not.

The size of a dental practice is related to the number of auxiliary staff employed, the more dentists employed in a practice, the more dental assistants and hygienist are employed as well.

Table 6: Number of Dental Auxiliary Staff Employed in Dental Practices in Arizona and the US

	General Practice		Specialists		All Dentists	
	AZ	US	AZ	US	AZ	US
No Dental Assistant	1.4%	6.9%	2.5%	0.0%	1.6%	6.2%
One Dental Assistant	33.5%	36.1%	18.5%	19.4%	29.8%	33.3%
Two Dental Assistant	36.5%	33.7%	26.8%	25.3%	34.1%	32.3%
Three or More Assistants	28.5%	23.3%	52.3%	53.0%	34.5%	28.2%
No Dental Hygienist	23.7%	27.7%	64.3%	73.1%	33.7%	35.1%
One Dental Hygienist	35.9%	29.5%	14.8%	0.0%	30.7%	26.1%
Two Dental Hygienists	25.3%	24.0%	12.3%	0.0%	22.1%	21.3%
Three or More Hygienists	15.2%	18.8%	8.6%	10.3%	13.6%	17.4%
AZ = 2000 survey data; US = 1998 survey data [12]						

Almost all dental practices accept new patients (95.7%). On average, patients must wait 2 weeks for an appointment with a general practitioner, even less for a specialist. Almost all offices (94.7%) accept private dental insurance. Of these, 92.9% accept indemnity plans, 73.1% accept PPO plans, and 28.0% accept HMO or prepaid plans. Nationally, 56% of the population is enrolled in a private benefit plan, with 43% in indemnity, 31% in a PPO and 18% in an HMO[15]. The ADA reports that only 63% of patients use a benefit plan, 31% pay out of pocket and 5% use public assistance[10]. At the practice level, 15.3% of practices have at least one provider taking AHCCCS patients. Only 2.1% of practices have a sliding fee scale (charging fees based on patient income) for their patients.

Very few practices see migrant farm workers (4.8%), however, 91.0% of practices see special needs patients (physical disability (85%), mental retardation (84%), behavioral problems (83%), serious mental illness (80%), or cleft lip or palate(75%)).

The survey asked if there were any staff in the office who could translate for patients (not a professional medical translator), and 58% of responding offices responded they had at least one staff that could translate for non-English speaking patients. While 28 different languages were reported spoken by office staff, the most common (80%) was Spanish. One third (36.6%) of practices reported that none of their patients needed translation services, with 3.3% of practices reporting over half of their patients need translation services. Translation needs were reported “always” met by 85.0 % of practices, while 4.7% of practices reported their staff was ”rarely” or “never” able to meet translation needs.

Geographic Patterns of Practice and Access

The descriptive statistics provided show that the characteristics and practice patterns of dentists in Arizona are similar to those documented nationally. To further explore the practice patterns of dentists in Arizona, we compared the reported practice characteristics across the different geographic areas of Arizona. We examined differences between practices in urban and rural DCAs and differences between practices in DCAs that were designated DHPSAs vs. non-DHPSAs. Rural DCAs are more likely to be designated DHPSAs, so the patterns of practice among rural DCAs and DHPSAs tends to be similar. Unless otherwise specified, the term "rural" encompasses DCAs that are considered rural, frontier and Indian reservations.

Dentists

Practitioners working in a rural DCA or DHPSA were slightly older on average than their counterparts. There is no significant difference by gender in propensity to practice in a rural DCA or DHPSA but female dentists were significantly more likely to practice in DCAs with Indian Reservations.

Table 7: Average Age of Dentist by DCA Type

	Avg. Age	P value
Rural DCA	49.0	
Urban DCA	47.2	p<0.0002
DCA Designated DHPSA	48.4	
DCA not designated DHPSA	47.5	p<0.02

Specialists were equally likely to practice in rural DCAs and DHPSAs in comparison to general dentists. Geographic variation existed for the number of patient visits and hours worked, with dentists working in rural DCAs and DHPSAs scheduling fewer patient visits and working fewer hours than those in urban DCAs or non-DHPSAs. The difference in patients scheduled per patient care hour was significant between dentists working in urban and rural DCAs, but not between dentists working in DHPSA and non-DHPSA designated DCAs.

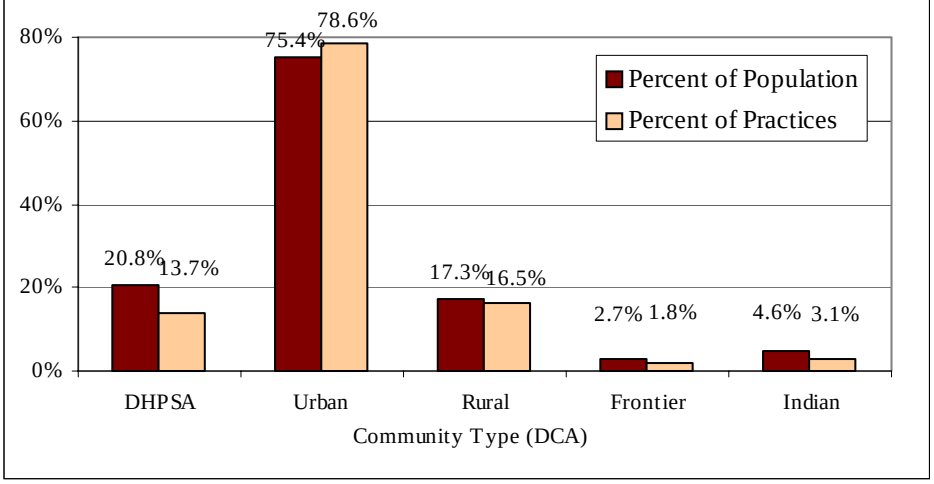
Table 8: Mean Hours, Mean Patient Visits, and Mean Patient Visits per Patient Care Hour by DCA type

	Mean Patient Care Hours per Week	Mean Patient Visits per Week	Mean Patient Visits per Patient Care Hour
Rural/Frontier/Indian DCA	29.3	47.4	1.7
Urban DCA	32.2	56.6	1.9
	P=0.0003	p<0.0001	p=0.0101
DHPSA	28.9	47.8	1.7
Non-DHPSA	32.0	55.7	1.8
	P=0.01	p=0.01	p=0.2663

Dental Practices

Dental practices were more likely to be found in urban DCAs relative to the population distribution than in rural DCAs. As well, dental practices were less likely to be found in DHPSAs relative to the population distribution. The number of dentists working in a practice is not associated with propensity to practice in a rural DCA or DHPSA. Dental assistant practice patterns tracked closely with that of dentists, with no significant difference in employment of assistants between urban and rural DCAs, or between DHPSAs and non-DHPSAs. Dental hygienists, however, are significantly less likely to be employed in general practices in rural DCAs or in any practice in a DHPSA.

Figure 5: Comparison of Location of Dental Practices and Population by DCA Type in Arizona (2000)



To further explore differences in practice models across regions we examined the mix of providers. We compared the ratio of FTE dental auxiliaries to FTE dentists by the geographic characteristics of the DCA in which they practice. A ratio greater than 1 would indicate a practice that uses more auxiliaries than dentists, for example, a practice with two FTE dentists, two FTE dental assistants, and one FTE dental hygienist would have a ratio of 1.5. The ratio was significant when compared to DCAs status; practices with a <=1 ratio (those practices employing equal or fewer assistants than dentists) more likely to be found in DHPSAs and rural DCAs. The pattern held for the ratio of dental assistants to dentists (p=0.05), however when examining the ratio of dental hygienists to dentists the ratio was more likely to be 0 (no dental hygienists employed per dentist) in DHPSAs and rural DCAs (sig. p<0.0001).

Table 8: Ratio of FTE Auxiliaries to Dentists in Dental Practices

Number of Practices	Rural	Urban	DHPSA	Not DHPSA
No Auxiliaries	5 (1.8%)	26 (2.5%)	4 (2.22%)	27 (2.4%)
Ratio <=1	62 (22.0%)	109 (10.5%)	43 (23.9%)	128 (11.3%)
Ratio >1	215 (76.2%)	900 (87.0%)	133 (73.9%)	982 (86.4%)
Total	282 (100%)	1035 (100%)	180 (100%)	1137 (100%)
	P<0.0001 (chi sq)		P<0.0001 (chi sq)	

Practices that do not accept new patients are significantly more likely to be located in a DHPSA or in a rural DCA than those practices accepting new patients; however there are very few sites (n=56, 4.25%) not accepting new patients.

Table 9: Number of Sites Accepting New Patients by Practice Location

	Rural	Urban	DHPSA	Not DHPSA
Accept New Patients	260 (92.2%)	1001 (96.7%)	166 (92.2%)	1095 (96.3%)
No New Patients	22 (7.8%)	34 (3.3%)	14 (7.8%)	42 (3.7%)
Total	282 (100%)	1035 (100%)	180 (100%)	1137 (100%)
	p=0.0009 (chi sq)		p=0.0116 (chi sq)	

Acceptance of private insurance by a practice differed significantly between urban and rural DCAs, with rural practices less likely to accept private insurance. As well, practices located in a DHPSA were less likely to accept private insurance.

Table 10a: Number of Sites Accepting Private Insurance by Practice Location

	Rural	Urban	DHPSA	Not DHPSA
Accept Insurance	257 (91.8%)	980 (95.5%)	159 (89.3%)	1078 (95.5%)
Does Not Accept Insurance	23 (8.2%)	46 (4.5%)	19 (10.7%)	50 (4.5%)
Total	280 (100%)	1026 (100%)	178 (100%)	1128 (100%)
	p=0.0134 (chi sq)		p=0.0005 (chi sq)	

Table 10b: Number of Sites Accepting AHCCCS by Practice Location

Accept AHCCCS	56 (19.9%)	145 (14.0%)	51 (28.3%)	150 (13.2%)
Does Not Accept AHCCCS	226 (80.1%)	890 (86.0%)	129 (71.7%)	987 (86.8%)
Total	282 (100%)	1035 (100%)	180 (100%)	1137 (100%)
	p<0.0001 (chi sq)		p=0.0155 (chi sq)	

As mentioned previously, the data do not identify which dental offices were community or rural health centers. These findings may reflect the propensity for those types of practices to locate in rural DCAs or DHPSAs and accept only AHCCCS or indigent patients, not privately insured patients.

Practices located in rural DCAs are more likely to accept migrant farmworkers, special needs patients, and AHCCCS patients than practices in urban DCAs. Likewise, practices located in DHPSAs are more likely to accept sliding fee scale, migrant farmworkers, AHCCCS patients and provide translation services than non-DHPSA practices. There was no difference between urban and rural practices in the acceptance of sliding fee or provision of translation services. There was no difference between DHPSA and non-DHPSA located practices in acceptance of special needs patients.

Sixty-three percent of practices reported their patients needing interpretation services. This varied by geography, with practices located in DHPSAs needing more translation services, and having a greater percent of their practice's patients needing translation.

Patterns of Dental Practice in Relation to Vulnerable Populations

The geographic patterns of care demonstrated in Arizona are very similar to those documented in other states[5, 6, 8]. To further explore the distribution of dental practices in relation to the impact they have on access to care, we compared the reported dentist characteristics and practice patterns with the location of vulnerable populations. Specifically, we considered vulnerable population DCAs those in the top quartile for percent of the population below 200% of the Federal Poverty Level, percent Hispanic population or percent Native American population.

Dentists

There was no difference in propensity for dentist to work in vulnerable population areas by gender. Dentists nearing retirement age (61-65 years) and dentists past retirement age (66+ years) were significantly more likely to work in vulnerable populations areas (p=0.0001).

Table 11: Number of Dentist and Percent per Age Category Working in Vulnerable Population DCAs

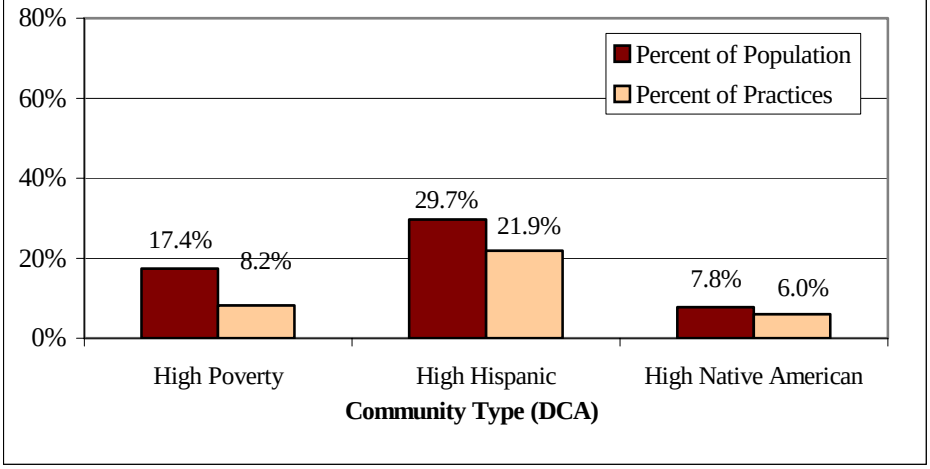
	Age 24-60	Age 61+
Practitioners in Any Vulnerable Population DCA	411 (26.2%)	80 (38.8%)
Practitioners not in a Vulnerable Population DCA	1161 (73.8%)	126 (61.2%)
Total	1572 (100%)	206 (100%)
	p=0.0001 (chi sq)	

There was no difference in propensity for dentist to work in vulnerable population areas between generalist and specialist dentists. However, there was a difference in the number of hours and patient visits scheduled by specialty in vulnerable population areas. Significantly, general practitioners working in high poverty and high Hispanic areas are likely to schedule more patient visits per week. General practitioners working in high poverty areas are also more likely to work either part-time (under 20 hrs) or over time (over 40 hours) per week in those practices. Specialists in high poverty areas and general practitioners in high Hispanic areas were more likely to work part-time in those practices (under 20 hrs). There was no difference in patient visits scheduled per patient care hour between dentists in any of the vulnerable population DCAs and those not in vulnerable population DCAs.

Dental Practices

Dental practices were less likely to be found in high Poverty, high Hispanic and high Native American DCAs relative to the population distribution than in non-vulnerable population DCAs.

Figure 6: Comparison of Location of Dental Practices and DCA Populations in Arizona (2000)



The number of dentists employed in a practice is not an indicator of propensity to work in a vulnerable population community, however the total number of staff (including dentists, dental assistants and dental hygienist) is significant, with practices in high poverty and high Hispanic DCAs having 2 or fewer staff members, compared to non-vulnerable areas which tend to have 3 or more staff members.

The ratio of FTE dental auxiliary staff to FTE dentist is significantly lower for practices located in high Native American DCAs, with those practices in these DCAs likely to have assistants but only part time (fewer FTE dental auxiliaries than dentists: ratio <=1). For the ratio of FTE dental assistants to FTE

dentists, this pattern holds. The ratio of FTE dental hygienists to FTE dentists is significant for all vulnerable population areas, with practices in these areas most likely to not employ dental hygienists.

Table 12: Number of Sites in each Vulnerable Population DCAs by Ratio of FTE Dental Hygienists to FTE Dentists

	High Poverty*	Not High Poverty	High Hispanic**	Not High Hispanic	High Native American***	Not High Native American
No Hygienists	54 (50.0%)	418 (34.6%)	133 (46.2%)	339 (32.9%)	53 (67.1%)	419 (33.8%)
Ratio <=1	29 (26.9%)	381 (31.5%)	71 (24.7%)	339 (32.9%)	16 (20.3%)	394 (31.8%)
Ratio >1	25 (23.2%)	410 (33.9%)	84 (29.2%)	351 (34.11)	10 (12.7%)	425 (34.3%)
Total	108 (100%)	1209 (100%)	288 (100%)	1029 (100%)	79 (100%)	1238 (100%)
n=1317	p<0.0001		P=0.001		p<0.0001	

*High Poverty = in top quartile of DCAs for percent of DCA population <200% of poverty level
** High Hispanic = in top quartile of DCAs for percent of DCA population Hispanic
** High Native American = in top quartile of DCAs for percent of DCA population Native American

Almost all practices accept new patients, however, practices in high poverty (p=0.007) and high Hispanic (p=0.026) DCAs were slightly less likely to accept new patients.

Almost all practices accept private insurance, however, practices in high poverty (p=0.004) and high Hispanic (p=0.001) DCAs were less likely to accept private insurance. Among types of insurance, indemnity plans (the most common type of insurance) were significantly less likely to be accepted by practices in high poverty DCAs (p=0.0005) while PPO plans were less likely to be accepted in practices in high Hispanic DCAs (p=0.03).

Table 13: Number of Practices Accepting AHCCCS in Vulnerable Population DCAs

	High Poverty	Not High Poverty	High Hispanic	Not High Hispanic	High Native American	Not High Native American
Accept AHCCCS	38 (35.2%)	163 (13.5%)	73 (25.3%)	128 (12.4%)	22 (27.8%)	179 (14.5%)
Does Not Accept AHCCCS	70 (64.8%)	1046 (86.5%)	215 (74.7%)	901 (87.6%)	57 (72.2%)	1059 (85.5%)
Total	108 (100%)	1209 (100%)	288 (100%)	1029 (100%)	79 (100%)	1238 (100%)
	p<0.0001		P<0.0001		P=0.001	

Dental practices in all three vulnerable population areas were more likely to accept AHCCCS (Medicaid) than practices in non-vulnerable population areas. Dental practices in high poverty ($p<0.0001$) and high Hispanic ($p<0.0001$) DCAs were more likely to accept sliding fee; however very few practices had sliding fee scales (n=28).

Dental practices in high poverty ($p=0.006$) and high Hispanic ($p<0.0001$) DCAs were more likely to see migrant farm workers, although overall very few practices saw migrant farmworkers (n=63). Conversely, most dental practices accept special needs patients (n=1185), yet dental practices in high poverty ($p=0.0003$) and high Hispanic ($p<0.0001$) DCAs were less likely to see special needs patients. This pattern held across different types of special needs. As well, the percent of special needs patients in a practice (mean=4.1%) was positively associated with the percent of the population in poverty and the percent of the Hispanic population in a community.

Dental practices in high poverty ($p<.0001$) and high Hispanic ($p=0.0002$) DCAs were more likely to have a staff person who spoke Spanish or another language and could translate for patients. They were also more likely to have over 25% of their patients needing translation services ($p<.0001$). Dental practices in high Hispanic DCAs were more likely ($p<.0001$) to say they rarely or never could meet the translation needs of their patients (11.8%).

Conclusions

While comparative measures of overall supply across the state were not available due to the varied response rates across DCAs, general patterns across geography and population emerge. Rural DCAs, DHPSAs, and practices in DCAs with high numbers of "vulnerable populations" (top quartile of population below 200% of FPL, Hispanic or Native American) tend to have a smaller percentage of practices (of survey respondents) than they do of the state's population. This disparity is particularly large in high poverty and high Hispanic DCAs.

Interestingly, there was not a significant geographic difference in the location of general practice dentists and specialist dentists. However, there were far fewer specialists dentists than general dentists. We also found only small differences in practice locations by provider age and gender. Race data on dentists was not available.

Providers in rural DCAs tend to practice fewer hours, provide fewer patient visits, and see fewer patients per hour on average than their urban counterparts. Practices in rural DCAs are less likely to hire dental hygienists, and have on average a ratio of FTE dental auxiliaries to FTE dentists that is below 1, meaning if they do employ assistants or hygienists, they employ fewer FTE of these than dentists. Practices in rural DCAs are more likely to see migrant farm workers and AHCCCS patients, although relatively few providers see either. Finally, practices in rural DCAs are also more likely to see special needs patients and are less likely to take new patients or private insurance plans, although the vast majority of practices accept all three of these.

Providers in DHPSAs tend to practice fewer hours and provider fewer patient visits on average than their non-DHPSA counterparts, but see the same number of patients per hour. Practices in DHPSAs are less likely to employ dental hygienists, and have a lower average ratio of FTE dental auxiliaries to FTE dentists. Practices in DHPSAs are more likely to see sliding fee scale patients, migrant farm workers and AHCCCS patients, although relatively few providers see any of these types of patients. They are also more likely to provide translation services for their clients, and report that a higher percent of their patients need translation services. Finally, practices in DHPSAs are less likely to accept private insurance plans, although the vast majority of practices accept insurance.

There were some similar patterns across providers working in all three types of vulnerable population DCAs. These dentists are more likely to be nearing retirement age and are more likely to accept AHCCCS patients. Practices in all vulnerable population DCAs hired few dental hygienists, with the majority of practices employing no hygienists in these areas.

Different patterns emerged for practices in High Native American DCAs compared to non-vulnerable DCAs than for practices in High Poverty and High Hispanic DCAs, which seemed to show the same patterns. The only significant difference of practices in High Native American DCAs is that they tend to hire fewer FTE assistants than dentists.

General practice dentists in High Poverty and High Hispanic DCAs tended to schedule more patient visits per week and are more likely to work part time. Specialists in high Poverty DCAs were more likely to work part time in those practices. Practices in High Poverty and High Hispanic DCAs were more likely to accept sliding fee scale, see migrant farmworkers, and have a staff that can translate for patients. They also report a higher percentage of their patients needing translation services, and are more likely to report that they “never” or “rarely” can meet all their translation needs.

Discussion

The data from Arizona show a pattern that is much like what has been seen in other states, with some unique characteristics due to the high numbers of Native American residents and geographic areas of the state designated Indian Reservations. In terms of overall supply, the licensed dentists per population ratio is 1:1985 while the actual FTE dentist-to-population ratio is probably closer to 1:2200. Both ratios are above the national average of 1:1700 but far below the federal shortage designation criteria of 1:5000[2]. The distribution of responding providers has been shown to be uneven in relation to the population of the State. Services are clearly less plentiful in communities considered more vulnerable, rural communities, DHPSAs, and communities with high numbers of people in poverty, Hispanic populations and Native American populations.

Data on high levels of acceptance of new patients (96%) and short wait times (under 2 weeks) for appointments may indicate that there is unused capacity in the dental care system. Most practices accept private insurance, however national estimates indicate that only 56% of the population has dental insurance, so while the availability of services for the insured would seem to be adequate, the availability of services for the uninsured is unclear[15]. Few practices accept AHCCCS or other low-income payments scales, and the few practices not accepting new patients tend to be in the more vulnerable areas signifying that while overall capacity may be adequate, the safety net may be at capacity in some communities.

Only 19% of providers and 15 % of practices accept AHCCCS patients indicating the providers who are willing to see these patients are concentrated in a few practices. On average AHCCCS patients make up about 32% of the patient populations of those practice that accept AHCCCS patients (a very high average percent) indicating that these practices are focused on this particular market. And 11% of providers accepting AHCCCS report between 75-100% of their practice is made up of AHCCCS patients.

The pattern of use of dental auxiliaries, particularly dental hygienists, is somewhat vexing. Dentists will usually expand the use of these providers to increase the productivity and profitability of their practice. Arizona has had community college dental hygiene programs for years, but only had a dental school since 2003. However, practices in rural DCAs, DHPSAs and DCAs with vulnerable populations are much less likely to employ a high number of dental assistants or any dental hygienists at all. The reasons for this are unclear, but the trend further calls into question the capacity of these practices to serve the populations in their communities.

The propensity for practices in rural, DHPSA and vulnerable population DCAs to not accept private insurance and to accept sliding fee scale, migrant farmworkers and AHCCCS patients points to the probability these are more likely to be community health centers than private dental offices. In general, providers in these DCAs seem to offer services that would appear to meet the needs of vulnerable populations, however the fact that there are so few providers in vulnerable areas suggests that while existing providers are responsive, their capacity to meet the needs of vulnerable populations is limited. In addition, these providers tend to be close to retirement, which could cause a decrease in services in the near future if no new providers replace them.

Reported data on translation needs and availability of staff to help translate indicates that this is a need, particularly in the high Hispanic communities. Race data were not available for dentists, but if the racial composition of the Arizona dental workforce tracks with US trends as closely as the rest of the demographic data, we can estimate that only 3-4% of dentists are of Hispanic origin[16]. With a large (25%) and growing Hispanic proportion of the state's population, the need for culturally competent dental care for this population in particular is likely very high.

Finally, the disparate patterns for Native American communities may be explained by the fact that there are so many reservations that are served by the federal government through the Indian Health Service (IHS). Dentists working for the IHS are not required to have an Arizona dental license, therefore would not have been surveyed. This means that some of the communities of interest may have a higher supply of services than we were able to measure.

In summary, the dental workforce survey conducted by the Arizona Office of Oral Health has provided some very useful information on the composition and distribution of dental services in Arizona. The overall supply of providers does not seem to be inadequate, but questions remain about the distribution of those providers and their ability to adequately address the oral health care needs of underserved population in the state.

Recommendations

The following policy recommendations are offered to Arizona's policy-makers, workforce planners, dental educators, and public health providers based on the conclusions from the data presented in this report.

Policy Recommendations

1. Dental workforce planners in the state should examine the types of practices currently situated in underserved areas of the state and provide incentives for expansion of the types of practices that best meet the needs of these communities.
2. Auxiliary dental providers are a critical part of the dental team and have the potential to greatly increase access to care, particularly if their scope of practice was expanded and supervision requirements were reduced, as has happened in many other states, and is underway in Arizona. Policy-makers should examine the reasons for a low level of utilization of dental assistants and dental hygienists within dental practices delivering care to underserved populations. As the rules and regulations governing auxiliary providers change, the patterns of practice should be monitored, with particular attention to those providers delivering care to underserved populations.
3. Arizona is known as a retirement destination for American's older adults. However no information exists on the availability of oral health care for the seniors, many of which are uninsured, as Medicare does not provide dental benefits. More attention should be paid to this "vulnerable" population and the systems of care (financing, providers, ancillary services, institutional care) in place to meet the oral health care needs of this growing population.
4. Dental educators in the state should examine the availability of culturally competent care. Survey respondents reported over 28 languages spoken by their staff (80% Spanish) indicating a very diverse population needing oral health care in the state.
5. The average age of a dentist in Arizona is 48, meaning in 15 years or less many providers will start to retire. The new dental school in Arizona may mitigate some of this attrition, however planners should closely monitor the supply and distribution of new and active providers to ensure an adequate access to care for Arizona's population.

Data Collection Recommendations

6. The Arizona Board of Dental Examiners should institute a mandatory licensure survey in order to ensure a 100% response rate to critical workforce questions. If the Office of Oral Health has to depend on survey data there is no ability to get 100% response rate and therefore no way to use the workforce data to address needy areas such as by designating DHPSAs. Consistently monitoring workforce trends is a necessary precursor to implementing systems of care and expanding access for vulnerable populations.
7. The 20-item questionnaire collected data on a number of descriptive items about dentists and the practices in which they work. The following additional data points would help to address further workforce policy questions and concerns. These items should be added to any future surveys.

Oral Health Care Provider Demographics:

- Race/ethnicity of dentist
- Survey hygienists and assistants separately for this information to avoid double & triple counting
- Dental school attended (in-state or out-of state)
- Retirement plans
- Dental residency (yes/no and type)

Practice Characteristics

- Volunteer or charity care provided
- Practice type (private, community clinic, rural clinic etc)
- Special services for seniors

Population Characteristics

- Dental care needs (estimates by DCA based on population)
- Number of AHCCCS patients by DCA

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