The practice of dentistry in Colorado

Are there differences between urban and rural practicing dentists?

Colorado Health Institute
303 E. 17th Avenue, Suite 930
Denver, CO 80203
ww.ColoradoHealthInstitute.org

March 2010

Acknowledgments

The Colorado Health Institute wishes to acknowledge the contributions and support of the Colorado Department of Public Health and Environment's Oral Health Unit both in the development and analysis of the 2008 Colorado Rural Dentist and the 2009 Colorado Urban Dentist Workforce Surveys.

CHI staff supporting the project included Christine Demont-Heinrich, interim program manager for the Center for the Study of Colorado's Health Care Workforce, who oversaw the writing of this report, and Erik Nesse, research associate in the Center for the Study of Colorado's Health Care Workforce, who analyzed the survey data and was primary author of the report. Anna Furniss, manager of research and analytical services and Glenn Goodrich, SAS programmer and analyst, assisted Erik in the analysis of the survey variables of interest. Amy Downs, director of policy and research, Pamela Hanes, president and CEO, and Sherry Freeland Walker, director for communications, served as technical and style editors. Kindle Fahlenkamp-Morell, senior communications specialist, was responsible for graphic design.

CHI also would like to thank the Colorado Department of Public Health and Environment's Oral Health Unit for its support in funding the surveys and the hundreds of dentists who provided their valuable time and information by taking part in the surveys.

Pamela P. Hanes, PhD
President and CEO
Colorado Health Institute
March 2010

Table of Contents

Introduction

Oral health is an integral part of overall health and well-being, with the importance of oral health extending far beyond the health of teeth and gums. In addition to diseases such as dental caries, a growing body of research suggests that poor oral health is linked to conditions such as diabetes, heart disease and complications during pregnancy.[1] Although highly preventable, dental caries remain the most common chronic disease among children and the most common oral disease among all age groups.[2] Access to oral health care in Colorado, especially for low-income populations, is often problematic due to a number of factors such as lack of dental insurance, education about the importance of oral health or accessible providers.

The 2008-09 Colorado Household Survey* revealed that nearly two million Coloradans did not have dental insurance coverage at the time the survey was administered. [3] While dental insurance and utilization of dental services are not necessarily synonymous, people with dental insurance are more likely to receive oral health care than those lacking insurance. Seventy-nine percent of Coloradans who had dental insurance at the time of the Household Survey reported having been to the dentist or dental hygienist in the prior 12 months, while only 45 percent of those without dental insurance had been to either of these providers.[4]

Many Coloradans who reported having no dental insurance are otherwise covered by health insurance, including publicly financed health insurance programs such as Medicaid, Medicare and Child Health Plan Plus (CHP+). While Medicaid provides full dental benefits for children, CHP+ provides a limited dental benefit up to $600 per year for enrolled low-income children. Adults covered by Medicaid and Medicare do not have an oral health benefit but can be covered in the event of an emergency or if there is a concurrent medical condition that necessitates providing dental treatment.

At the same time, the aging of Colorado's population presents new challenges for dentistry. Increased life expectancy, aging of the baby boomers and decreasing rates of tooth loss among older adults will likely result in a greater demand for oral health care services as the population ages. Between 2010 and 2030, the number of Coloradans age 65 and older is projected to more than double—while the proportion of individuals age 65 and older relative to the population is expected to increase from 10 percent of the population to18 percent.[5] The rate at which dentists retire from the workforce may increase during this timeframe as well. Because dentists as a group are older than the rest of Colorado's workforce, they are expected to retire from the workforce at a faster rate than most other Colorado workers. Finally, the geographic maldistribution of dentists, particularly between rural and urban areas of the state, compounds the discrepancy between an increased demand for oral health care and a shrinking number of dentists in the workforce, particularly in areas that are already underserved.

Within this context, understanding the characteristics of Colorado's dentists, including their practice patterns and perspectives on access, is essential to determining whether the oral health needs of Coloradans currently are being met and likely to be met in the future. Further, this insight is instructive

* The Colorado Household Survey is a survey of 10,000 households in Colorado conducted in 2008-09. For more information, see http://www.colorado.gov/cs/Satellite/HCPF/HCPF/1242218508619.

for devising policy strategies to address access to dental care, the aging of both the dental workforce and the population, and to address issues related to the geographic maldistribution of the oral health workforce. To that end, in 2008 the Colorado Department of Public Health and Environment (CDPHE) contracted with the Colorado Health Institute (CHI) to survey dentists practicing in rural areas of the state. In 2009, as an extension of this work, CHI conducted a workforce survey of dentists practicing in urban areas of the state.†

In both cases, dentists were asked to provide their demographic and practice characteristics, educational background and opinions on various topics relevant to public policy such as the level of care provided to Colorado's underserved populations including low-income adults and children enrolled in Medicaid and CHP+. This report presents the findings from these surveys and provides comparison, where applicable, between urban and rural practicing dentists.

National Perspective

The U.S. Bureau of Labor Statistics estimates that 141,900 dentists were employed in the United States in 2008, or 4.7 dentists per 10,000 persons.[6] Although it is debatable whether this represents an adequate number of dentists to meet the population's needs, this benchmark conceals geographic and population-specific distribution issues that limit access to care for large numbers of people. The American Dental Association (ADA) describes the issue as follows: "People might think that if we just had more dentists, there wouldn't be an access-to-care problem. But the overall number of dentists is not the issue—it's where they're located, how many people they're able to treat and whether people can afford treatment or whether there's a way to pay for their care."[7]

To illustrate this point, geographic regions that have fewer than two dentists per 10,000 population have been designated by the federal Health Resources and Service Administration (HRSA) as Dental Health Provider Shortage areas (DHPSAs).‡ The Pew Center for the States estimates that more than 46 million Americans live in DHPSAs and that as many as 30 million of these individuals lack access to basic oral health care. Approximately 6,620 dentists would be required in shortage areas to remove shortage designations nationwide.[8]

These data suggest that the lack of oral health care access experienced by underserved populations may not be simply a result of a dentist shortage. Instead, lack of access may be the result of a maldistribution of oral health care providers. While in the near term, dentist maldistribution may be a more immediate concern than overall shortages, the American Association of Dental Schools predicts that the total

† "Rural" and "non-rural" are defined by Rural-Urban Commuting Area (RUCA) codes. For the purposes of this paper, "urban" is defined as any area whose RUCA code is not rural.

‡ A Dental Health Provider Shortage Area is a federal designation applied to geographic areas, population groups (such as low-income individuals) or specific facilities (such as correctional institutions) that have limited access to dental care. Geographic dental HPSAs are areas where the dentist-to-population ratio is fewer than two per 10,000, or, in case of demonstrable elevated need, 2.5 per 10,000. Population-based dental HPSAs are areas with vulnerable population groups (i.e., low income or high need) and a dentist-to-population ratio of 2.5 per 10,000 or fewer. For a more complete definition, see http://bhpr.hrsa.gov/shortage/dental.htm.

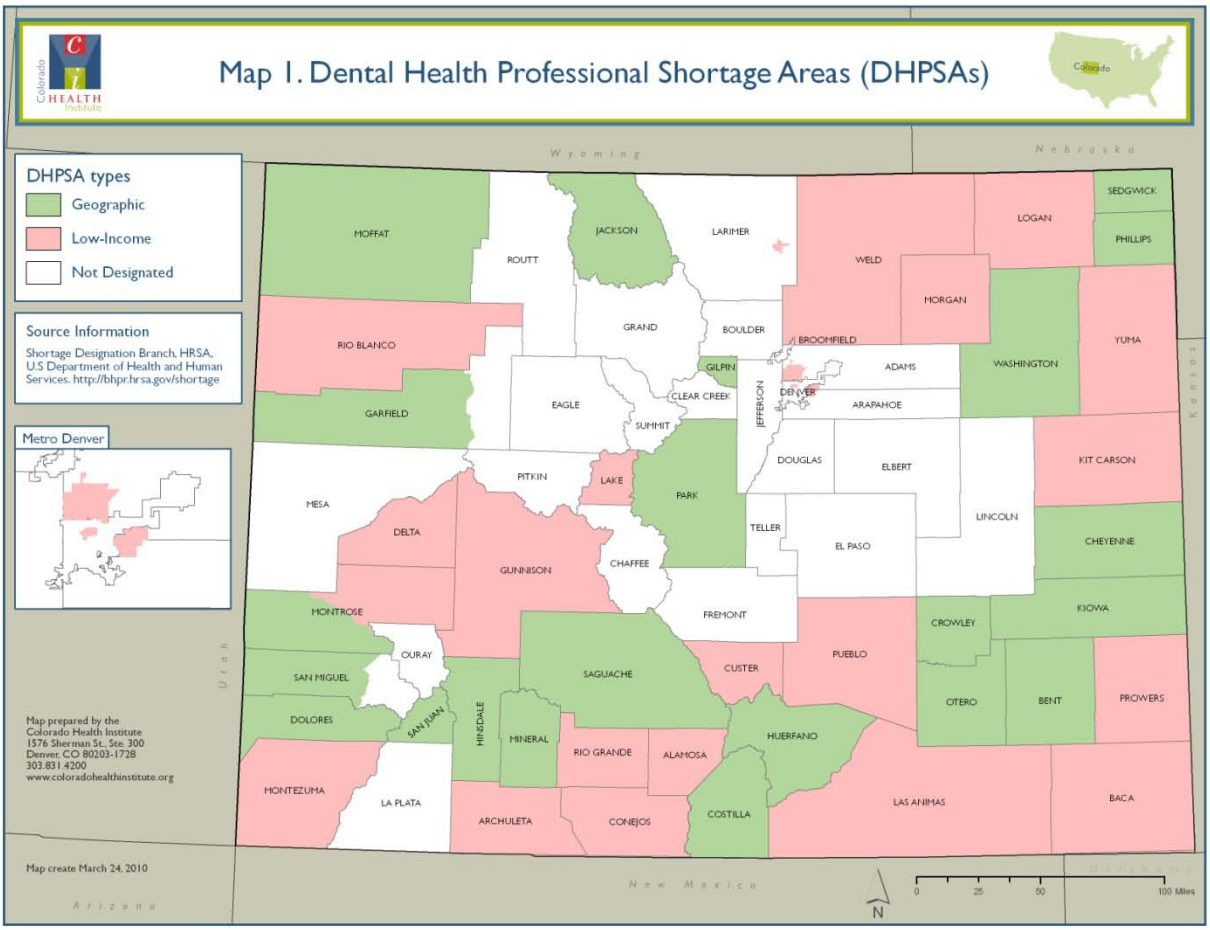
number of dentists practicing in the United States will begin to decline as early as 2014,[9] exacerbating access barriers for a growing number of Americans.

Colorado Perspective

COMPARISONS TO NATIONAL TRENDS

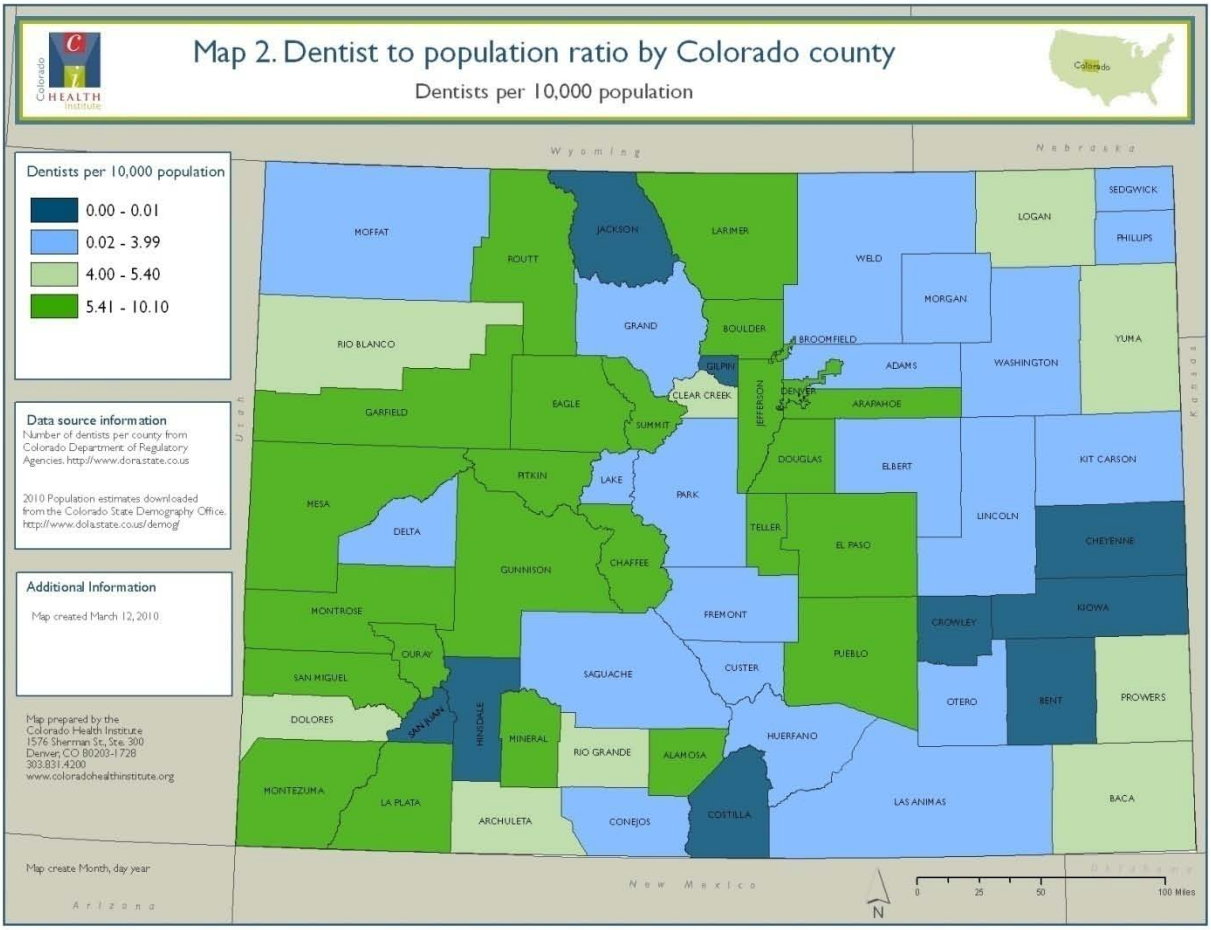
Colorado has more dentists per capita than the national average. In January 2010, approximately 3,554 dentists were actively licensed in Colorado or about 6.9 dentists per 10,000 Coloradans.[10] This number is 47 percent higher than the national average of 4.7 dentists per 10,000 persons.

Although Colorado has more dentists per capita than the national average, 43 counties or partial counties in Colorado have been designated as DHPSAs. Map 1 summarizes the locations and types of DHPSAs in Colorado.



Map 2 summarizes the dentist-to-population ratio in each of Colorado's 64 counties. Counties in light and dark green are those where the dentist-to-population ratio is at least 85 percent of the national average. Residents of these counties will likely face fewer access problems than counties colored light or

dark blue. Light blue counties have less than 85 percent of the national average dentist-to-population ratio. Dark blue counties had no actively licensed dentists in January 2010.



Two seemingly contradictory indicators—Colorado's relatively high overall dentist-to-population ratio and its large number of DHPSAs—suggest that dentists are not distributed around the state in proportion to the population, especially when comparing urban and rural areas. While some predominantly rural counties have a higher than average dentist-to-population ratio, a number of these counties nevertheless may be underserved because of geographic or economic barriers to access. For example, Mineral County has a high dentist-to-population ratio (10.1 per 10,000) but is nevertheless designated as a DHPSA. Mineral County has only one dentist who may or may not practice full-time, year-round or in close proximity to the county's approximate 1,000 residents.

Comparing the findings from the 2008 rural dentist and 2009 urban dental workforce surveys reveals factors that may be associated with this geographic maldistribution of dentists throughout the state and focuses the attention of policymakers on distribution issues they may wish to address in workforce policy development as well as local planning efforts.

Colorado Dentists: Survey Findings

METHODS

Both the 2008 and 2009 Colorado dentist workforce surveys were developed in partnership with the Oral Health Unit within CDPHE. The 2008 rural dentist survey was mailed to all 365 actively licensed dentists practicing in rural areas with lists obtained from the Department of Regulatory Agencies (DORA); 70 percent responded. The 2009 urban Colorado dentist workforce survey was mailed to a stratified random sample of 869 of the 2,995 actively licensed dentists known to DORA that were practicing in urban areas of the state; 54 percent responded. To match the rural sample to the total population of practicing dentists in rural areas, extra weight was given to responses based on respondents' gender, educational background and date when their first Colorado license was obtained. Urban dentist survey data were weighted by gender and age. Only responses from dentists who indicated they were seeing patients full-time, part-time or on a volunteer basis were included in the analyses that follow. Responses from dentists who indicated they were retired, active in other oral health activities or working outside the field of dentistry and not seeing patients were not included in this report of findings.

DEMOGRAPHIC CHARACTERISTICS

Contrary to common assumptions, the average age of Colorado's urban and rural dentists was nearly identical. Comparing urban and rural dentists by age cohorts revealed few differences (see Table 1). More of the urban dentist workforce was younger (34 years and younger) while more of the rural dentist workforce was older (55 years and older). Fifteen percent of urban dentists reported being 34 years of age or younger, compared to less than 11 percent of rural dentists. Approximately one-third (34%) of urban dentists reported being 55 or older, whereas 41 percent of rural dentists were 55 or older. Dentists in Colorado were notably older than Colorado's overall workforce.

Table 1. Colorado dentists' age by practice location compared to Colorado's overall workforce

Age	Urban	Rural	Colorado workforce
34 years or younger	15.4%	10.6%	35.8%
35-44 years	23.8%	22.1%	23.2%
45-54 years	27.0%	26.0%	23.7%
55-64 years	23.7%	29.8%	13.7%
65 years or older	10.0%	11.4%	3.5%
Mean of age (years)	48.6	50.7	-

SOURCE: Colorado Health Institute, 2009 Colorado (urban) Dentist Workforce Survey (Q26), 2008 Colorado Rural Dentist Workforce Survey (Q1), U.S. Census Bureau 2009 Longitudinal Employer-Household Dynamics data (see http://lehd.did.census.gov/led/datatools/qwiapp.html)

The Colorado dentist workforce was predominantly white, composed mostly of men, and less racially and ethnically diverse than the state's population. Although the urban dentist workforce appeared slightly more diverse and included a greater proportion of women than the rural workforce, there were

no notable diversity differences found between the two groups. Table 2 below illustrates racial, ethnic and gender differences between the two groups of dentists compared to Colorado's overall population.

Table 2. Colorado dentists' race, ethnicity and gender compared to Colorado's overall population

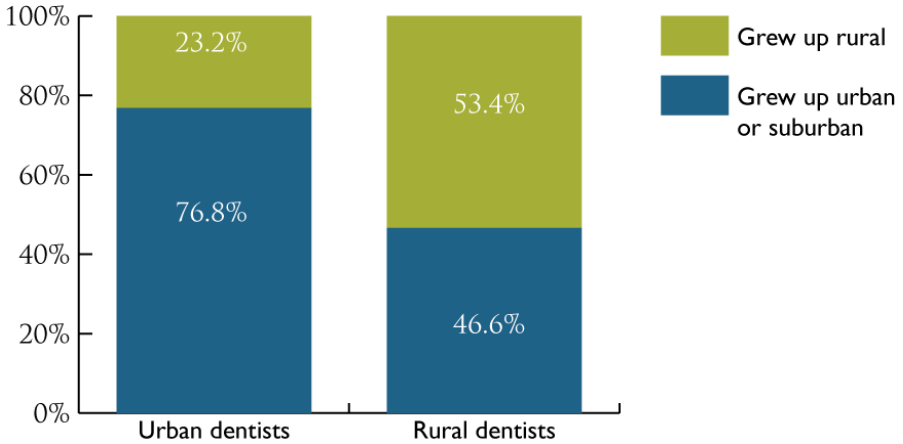
Race/ethnicity/gender	Urban	Rural	Colorado population*
African American	1.9%	0.0%	4.1%
Asian/Pacific Islander	5.9%	1.7%	2.8%
Mixed heritage	2.1%	2.0%	*
Native American	0.9%	0.0%	1.0%
Non-White Hispanic	1.0%	1.8%	19.2% (all Hispanic combined)
White Hispanic	3.3%	4.7%	
White	84.9%	89.8%	72.9%
Gender: Male	79.0%	87.6%	50.4%

SOURCE: Colorado Health Institute, 2009 Colorado (urban) Dentist Workforce Survey (Q28), 2008 Colorado Rural Dentist Workforce Survey (Q3), Colorado State Demography Office (http://www.dola.state.co.us/dlg/demog/population/forecasts/ethnicproj08.pdf)

*Figures based on 2010 projections from the Colorado State Demography Office. The State Demography Office does not include "mixed heritage" responses; therefore figures are not entirely comparable.

Published workforce literature suggests that dentists are more likely to practice in a location similar to the place where they grew up.[11] Data from the urban and rural dentist surveys support this association. As shown in Graph 1 below, few dentists practicing in urban locations (23%) grew up in a rural area, while most (77%) grew up in an urban or suburban area. Conversely, more than half (53%) of rural dentists grew up in a rural area, while fewer than half (47%) grew up in an urban or suburban area. These findings suggest that recruitment programs designed to address dentist shortages in particular geographic areas may be more successful when targeting dentists who grew up in a similar setting.

Graph 1. Area where Colorado dentists grew up by current practice location



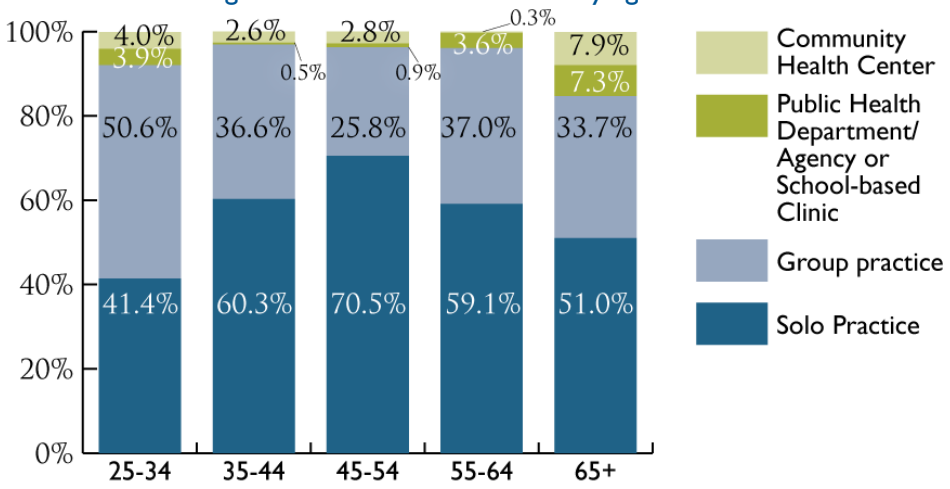
SOURCE: Colorado Health Institute, 2009 Colorado (urban) Dentist Workforce Survey (Q29), 2008 Colorado Rural Dentist Workforce Survey (Q4)

PRACTICE CHARACTERISTICS: URBAN DENTISTS

Almost all (95%) of Colorado urban dentists worked in private practice.[§] More than half (60%) worked in a solo private practice and slightly more than one-third (35%) worked in a private dental group. Few urban dentists worked in a public health department or school-based clinic (3%) and approximately the same proportion (3%) worked in a community health center. Comparable data on practice site were not collected for rural dentists.

As shown in the graph below, urban dentists' choice of work location varied by age. A greater proportion of younger urban dentists (34 years and younger) and older urban dentists (65 years and older) worked at a community health center, public health department/agency or school-based clinic—organizations that serve low-income populations—than urban dentists in other age groups. A trend also can be observed toward solo (private) practice and away from group practices during the middle of urban dentists' careers.

Graph 2. Practice setting of urban Colorado dentists by age



SOURCE: Colorado Health Institute, 2009 Colorado (urban) Dentist Workforce Survey (Q4, Q26)

EDUCATIONAL PREPARATION

There is one dental school in Colorado. The University of Colorado School of Dental Medicine graduated its first students in 1977 and currently graduates 60 or more dental students per year. Becoming a general dentist requires four years of graduate education. Post-doctoral specialty degrees in orthodontics and periodontics require 30 and 36 additional months of training, respectively.

Urban and rural practicing dentists were asked to rate certain areas of their educational preparation. No differences were observed between these two groups. The data were further analyzed to compare both urban and rural dentists who attended dental school in Colorado to those trained out of state (Table 3). For most areas of their educational preparation, no differences were observed between ratings given by Colorado-trained dentists and dentists trained out of state. More than three-fourths of all dentists rated

[§] Dentists were asked to choose either "solo, private practice," "dental group in private practice," "public health department/agency or school-based clinic" or "community health center." Private practice here refers to the sum of the first two responses.

most areas of instruction as having adequately prepared them for practice. Some differences, however, between those trained in-state versus out-state were observed in the areas of educational preparation that dentists rated poorly. Table 3 lists the five educational areas where the greatest proportion of dentists reported their preparation as being inadequate. Higher percentages in this case indicate poorer ratings.

Table 3. Colorado urban and rural dentists' perceptions of classroom and clinical areas of least adequate educational preparation by dental school location

Classroom or clinical preparation (areas most commonly rated inadequate) *	% indicating inadequate	
	Trained in Colorado	Trained out of state
Classroom instruction in management of a practice	54.7%	70.6%
Classroom instruction in setting up a practice	42.8%	57.3%
Classroom instruction in working with other health professionals	34.8%	33.2%
Classroom instruction in dental care for infants (0-3 yrs)	33.3%	36.5%
Clinical experiences in dental care for infants	42.6%	48.6%

SOURCE: Colorado Health Institute, 2009 Colorado (urban) Dentist Workforce Survey (Q22, Q23), 2008 Colorado Rural Dentist Workforce Survey (Q26, Q27)

*Dentists were asked to rate preparation on a scale of 1 (most adequate) to 5 (inadequate). Inadequate preparation is defined as a rating of 4 or 5.

All dentists trained in Colorado and out of state rated the same three areas of educational preparation least favorably (classroom instruction in managing and setting up a practice and clinical experience in dental care for infants). Colorado-trained dentists, however, rated each of these areas more positively than dentists trained elsewhere. Although 43 to 55 percent of Colorado-trained dentists rated their training in these areas as inadequate, the findings suggest that Colorado-trained dentists nevertheless rated Colorado's dental school more favorably than ratings of schools of dentists trained out of state.

Overall, these findings mirror those found in other surveys. For example, a 2006 American Dental Education Association survey found that only 43 percent of graduating seniors in dental schools nationwide reported being well-prepared for practice administration.[12]

WORKFORCE CONCERNS: USE OF DENTAL HYGIENISTS, RECRUITMENT, AGING AND MALDISTRIBUTION OF THE WORKFORCE

Use of dental hygienists

Dental hygienists work primarily with general dentists or, in the case of Colorado, are licensed to work independently. Research suggests that they provide effective and safe oral health care within the scope

of their practice[**] which includes preventive care and patient education. Dental hygienists earn considerably less than dentists making them a cost-effective alternative for the delivery of preventive oral health care. Employing dental hygienists can therefore increase the capacity of a dental practice without incurring the higher salary costs of an additional dentist. Recruitment and retention of dental hygienists could play an important role in improving oral health care access in Colorado, especially access to general dentistry. In light of this, both urban and rural dentists were asked to indicate how many dental hygienists they employed in their practice.

Table 4 summarizes the number of dental hygienists employed in urban and rural Colorado dentists' practices. Specialists were excluded from this analysis to more appropriately target those practices where dental hygienists play a more significant role.

Table 4. Number of dental hygienists in Colorado's general dental practices by practice location

Dental hygienists	Urban (general dentists)	Rural (general dentists)
None	21.8%	21.3%
One	24.3%	36.0%
Two	28.5%	27.3%
Three or more	25.5%	15.4%
Mean # of dental hygienists	1.8	1.4

SOURCE: 2009 Colorado Urban Dentist Workforce Survey (Q2, Q11), 2008 Colorado Rural Dentist Workforce Survey (Q8, Q17)

Urban dentists also were asked to describe their experiences in recruiting and retaining dental hygienists (rural dentists were not asked this question). Approximately half of urban dentists indicated they were not currently recruiting a hygienist, while one-quarter did not employ or contract with a dental hygienist. Relatively few (9%) urban dentists reported that it was difficult to recruit dental hygienists and fewer (6%) indicated it was difficult to retain them. Although a comparable question was not asked of rural dentists, experience with other health care providers such as physicians and nurses suggests that recruitment and retention of dental hygienists may be more difficult in rural areas of Colorado.

Recruitment of dentists

Efforts to recruit and retain dentists in underserved or rural areas may be aided by selectively targeting individuals who enjoy different aspects of the community where they work. Both urban and rural dentists were asked to indicate whether certain factors were important in their decision to practice in their current location. Overall, urban and rural dentists rated the importance of each factor similarly. Purchasing an established practice was the sole exception to this trend, which may be due to the greater number of established practices in urban areas.

[**] See *Colorado Collaborative Scopes of Care Study* for more on the efficacy of dental hygienists. http://www.coloradohealthinstitute.org/Global/Publications/2009/01/Collaborative-Scopes-of-Care-Study.aspx

Table 5. Factors important in Colorado dentists' decision to practice at their current practice site by practice location

Factor	Urban	Rural
Quality of life	92.4%	95.4%
Recreational/leisure activities	83.2%	87.6%
Salary potential	69.7%	N/A
Bought an established practice	54.0%	42.5%
Opportunity to join a large practice	20.5%	N/A
National Health Services Corps scholarship/loan commitment	4.4%	4.3%

SOURCE: Colorado Health Institute, 2009 Colorado (urban) Dentist Workforce Survey (Q8), 2008 Colorado Rural Dentist Workforce Survey (Q12)

One policy option often considered for expanding access to oral health care is to increase dental school enrollment. Research has shown an association between where dentists graduate from dental school and where they choose to practice. Both surveys included questions about where urban and rural dentists graduated from dental school. Because Colorado's dental school had no graduates before 1977, the dental school location of all Colorado dentists was analyzed for dentists who graduated in 1977 or later. Twenty-four percent of practicing urban dentists and 26 percent of practicing rural dentists that graduated in 1977 or later were trained in Colorado. Table 6 illustrates the proportion of all dentists trained in Colorado as well as the next three most common training locations for dentists graduating in 1977 or later.

Table 6. Top four states where Colorado dentists graduating in 1977 or later were trained by current practice location

State	**Urban** dentists graduating in 1977 or after		State	**Rural** dentists graduating in 1977 or after
Colorado	23.8%		Colorado	25.9%
Nebraska	10.8%		Nebraska	11.7%
Illinois	7.4%		Missouri	8.9%
Iowa	7.2%		Illinois	8.9%

SOURCE: Colorado Health Institute, 2009 Colorado (urban) Dentist Workforce Survey (Q20), 2008 Colorado Rural Dentist Workforce Survey (Q24)

While only one-quarter of dentists having been trained in Colorado may give the impression that relatively few Colorado-trained dentists remain in the state after graduation, a point-in-time analysis of dentist retention reveals that the opposite is true. The University of Colorado School of Dental Medicine has awarded approximately 1,116 dentistry degrees since its inception.[13] Although currently it is not possible to know exactly how many dentists trained in Colorado practice or ever practiced in the state after graduation, survey data indicate that approximately 50 percent of dentists trained in Colorado were practicing in the state in 2008 and 2009. While available literature on dental graduate

retention is limited, Colorado's retention rate appears to compare favorably with those of other states.[14]

Most of these Colorado-trained dentists were not recent graduates. Of all dentists still practicing in the state, 449 (81%) graduated more than five years before the surveys were administered. This finding suggests that most Colorado-trained dentists who remained in the state after graduation have practiced in Colorado for a number of years rather than leaving.

Aging of dentists

While Colorado has a relatively large number of dentists relative to its population, the retirement of older dentists may exacerbate access barriers in the future. As shown in Table 7, approximately the same proportion of the urban and rural dental workforce planned to leave practice during the year following survey administration. However, urban and rural dentists' reasons for leaving differed. Of rural dentists who planned to leave, retirement was the most important reason cited (65%). Among urban dentists, relocation was the most common reason (48%), with retirement next most common (35%).

Table 7. Colorado dentists' intention to leave practice within 12 months and reasons for leaving by current practice location

Intention to leave practice	Urban	Rural
% responding yes	7.2%	7.6%
Reasons for leaving practice among dentists intending to leave	**% important* urban**	**% important* rural**
Retirement	34.7%	64.9%
Relocation	47.8%	39.9%
Insufficient patient load	17.0%	22.1%
Administration and management too burdensome	26.2%	21.9%

SOURCE: Colorado Health Institute, 2009 Colorado (urban) Dentist Workforce Survey (Q31, Q31a), Colorado 2008 Rural Dentist Workforce Survey (Q30, Q31). Question was "mark all that apply"; thus, figures do not total 100%

*"Important" is defined as a response of 1 or 2 on a scale of 1 (very important) to 5 (not important)

It is difficult to know conclusively how many dentists intended to stop practicing dentistry in the year following each survey, although the overall percent of all dentists planning to leave their practice was relatively small. The results suggest, however, that a greater proportion of rural dentists planned to exit the workforce by retiring, whether partially or completely, soon after the survey date.

ACCESS TO DENTAL CARE FOR LOW-INCOME POPULATIONS

In Colorado, approximately one-fifth of dentists in both urban and rural areas reported accepting Medicaid patients in their practices (Table 8). Urban and rural dentists appeared more likely to accept CHP+ patients than Medicaid. Studies in the available literature[15] suggest that acceptance rates of

Medicaid reimbursement are relatively low nationwide as well. Additional analysis of Medicaid acceptance rates for general dentists compared to specialists revealed no appreciable differences.

Table 8. Colorado dentists' acceptance of sliding-fee payment, Medicaid and CHP+ by practice location

Access by payer source	Urban	Rural
Offers sliding-fee payment schedule	12.8%	13.3%
Accepts Medicaid patients	21.3%	21.1%
Accepts new Medicaid patients	17.9%	15.9%
Accepts CHP+ patients	31.3%	42.6%
Accepts new CHP+ patients	31.1%	40.6%

SOURCE: Colorado Health Institute, 2009 Colorado (urban) Dentist Workforce Survey (Q16), 2008 Colorado Rural Dentist Workforce Survey (Q20)

All dentists who reported that they did not accept Medicaid patients were asked to indicate their reasons for not doing so. As Table 9 shows, low reimbursement was the reason most commonly rated important by both urban and rural dentists. The relative importance of other reasons was comparable for both groups. These findings from Colorado dentists correspond with and validate those found in the published literature. The reasons many dentists cite for not accepting Medicaid enrollees are similar across the country and include low reimbursement rates, patient non-compliance and broken and no-show appointments.[16]

Table 9. Reasons cited by Colorado dentists for not accepting Medicaid payment by practice location

Reason	% important* urban	% important* rural
Reimbursement too low	90.4%	86.6%
Too many "no-shows"	88.2%	87.0%
Paperwork too difficult/time-consuming	87.7%	85.9%
Lack of patient compliance with oral hygiene practices	56.7%	N/A

SOURCE: Colorado Health Institute, 2009 Colorado (urban) Dentist Workforce Survey (Q16a), 2008 Colorado Rural Dentist Workforce Survey (Q21)

* "Important" indicates a response of 1 or 2 on a scale of 1 (very important) to 5 (not important)

Urban dentists also were asked to rate how important they thought certain policies would be in improving access to oral health care in Colorado (rural dentists were not asked a comparable question). Increasing Medicaid reimbursement was rated important by nearly 75 percent of urban dentists, followed by ensuring the availability of loan forgiveness programs for dentists willing to practice in underserved areas (62%). Urban dentists' responses to this question suggest that increasing Medicaid reimbursement rates or expanding loan forgiveness programs may be effective policy options to pursue in the long term to improve Medicaid acceptance rates.

Table 10. Urban Colorado dentists' views of policies to improve access for low-income populations

Urban dentists' opinions of policy options	% important*
Increase Medicaid reimbursement rates	74.3%
Ensure that loan forgiveness programs exist for dentists willing to practice in dental underserved area for a specified period of time	61.6%
Expand access to Medicaid coverage for low-income adults	51.0%
Provide low-cost liability insurance for dentists providing voluntary dental care to low-income children and adults	46.3%
Ensure every Coloradan has access to dental insurance	45.2%

SOURCE: Colorado Health Institute, 2009 Colorado (urban) Dentist Workforce Survey (Q34)

Although most urban and rural dentists neither accepted Medicaid nor provided a sliding-fee schedule for low-income patients, almost all urban dentists reported providing charity care (rural dentists were not asked a comparable question). Table 11 indicates the dollar amount of charity care generalist and specialist urban dentists estimated that they provided in 2008. Over one-quarter of urban general dentists provided no charity care or $2,500 or less compared to seven percent of urban dentists. On the other end of the spectrum, almost one-quarter of urban specialists provided over $25,000 in charity care compared to only eight percent of general dentists.

Table 11. Dollar amount of charity care provided by Colorado urban dentists in 2008, generalists and specialists

Dollar amount of charity care provided (2008)	Urban general dentists	Urban ADA-certified dental specialists*
None	6.4%	1.4%
$2,500 or less	19.3%	5.2%
$2,501 to $5,000	24.2%	20.8%
$5,001 to $10,000	24.5%	34.4%
$10,001 to $25,000	11.3%	14.2%
Over $25,000	7.7%	23.1%
Do not know	6.6%	0.9%

SOURCE: Colorado Health Institute, 2009 Colorado (urban) Dentist Workforce Survey (Q2, Q18)

SUMMARY OF FINDINGS

Comparing the 2009 Colorado urban dentist and the 2008 Colorado rural dentist workforce surveys reveals a number of similarities and differences between urban and rural practicing dentists. Although the average age of urban and rural dentists was similar, rural dentists were slightly older. Most urban dentists grew up in urban or suburban areas while most rural dentists grew up in a rural area.

Only 20 percent of both groups accepted Medicaid payment, but a greater proportion of rural than urban dentists accepted CHP+. Finally, while the same proportion of dentists from each setting reported planning to leave their practice in the 12 months following each survey, a greater proportion of departing rural dentists listed retirement as an important reason for leaving.

Within the social and demographic context described in the introduction to this paper, findings from the 2009 Colorado urban dentist and the 2008 Colorado rural dentist workforce surveys suggest that Colorado faces a number of challenges regarding the dentist workforce. While some data mitigate concerns about certain aspects of the workforce, challenges such as the geographic maldistribution of dentists, access barriers to oral health care for low-income populations, the aging of the dentist workforce and the aging of the population appear to remain policy issues that require focused attention.

Forty-three counties or sub-county regions are designated as geographic or population-based Dental Health Professional Shortage Areas, 34 counties fall below the national average ratio of 4.7 dentists per 10,000 persons, and nine counties have no practicing dentist. In some cases, the economics of establishing a dental practice and population density may work against improving access to care by simply recruiting a dentist.

The aging and eventual retirement of Colorado's dentists, coupled with the aging of Colorado's population, presents serious challenges to oral health access as well. Although a relatively small proportion of dentists indicated they would leave their practice in the year following each survey, dentists overall were older than the rest of Colorado's workforce. Additionally, advances in oral hygiene over the past decades may result in a greater need for oral health services at the same time that many dentists begin to retire.

Finally, most dentists in both urban and rural areas did not accept Medicaid or CHP+ patients. Low-income populations are especially vulnerable to oral health problems, partially as a result of lack of access to providers. This is especially true in more remote rural areas of the state. Studies have shown that children enrolled in Medicaid had almost twice the rate of untreated tooth decay as children with private dental insurance.[17] Untreated tooth decay can progress into more serious problems in the adult population.

Colorado data show that the number of individuals enrolled in Medicaid and CHP+ has increased 102 percent over the past 10 years,[18] further exacerbating the issue of access to oral health care given that most dentists reported that they did not accept Medicaid or CHP+ patients. While both urban and rural dentists cited low reimbursement as being a major impediment to accepting Medicaid, Medicaid rates have been cut even further since the surveys were administered. Establishing equity in the provision of oral health care represents a significant challenge for Colorado policymakers.

Endnotes

[1] Dubay, K, et al. (2005). "Assuring the Accessibility of Basic Dental Care Services: Issues of Workforce Supply, Organization of Care, and Education." *North Carolina Medical Journal* 66(6): 430-437.
[2] Ibid.
[3] 2008-09 Colorado Household Survey (QA7)
[4] 2008-09 Colorado Household Survey (QA7, QA7a)
[5] Colorado Department of Local Affairs State Demography Office
[6] U.S. Bureau of Labor Statistics. Retrieved March 11, 2009 from http://www.bls.gov/oco/ocos072.htm#emply and U.S. Census QuickFacts. Retrieved March 12, 2009 from http://quickfacts.census.gov/qfd/states/00000.html.
[7] Source: American Dental Association Website. "Oral Health Topics: Access to Dental Care." Retrieved March 15, 2009 from http://www.ada.org/public/topics/access.asp.
[8] The Pew Center for the States. "The Cost of Delay: State Dental Policies Fail One in Five Children." Retrieved February 18, 2010 from http://www.pewcenteronthestates.org/uploadedFiles/Cost_of_Delay_web.pdf.
[9] Collier, R (2009). "United States Faces Dentist Shortage." *Canadian Medical Association Journal* 181(11): E253-E254.
[10] Colorado Department of Regulatory Agencies, retrieved January 4, 2010 from https://www.doradls.state.co.us/lic_database_req.php and Colorado Department of Local Affairs State Demography Office, retrieved February 24, 2010 from http://www.dola.state.co.us/demog_webapps/population_age_gender.
[11] Osborne, P and Haubenreich, J (2003). "Underserved Region Recruitment and Return to Practice: A Thirty-Year Analysis." *Journal of Dental Education* 67(5): 505-508. Schwartz, M (2007). "The Pipeline from Dental Education to Practice: The Pennsylvania Experience." *Journal of Dental Education* 71(10): 1299-1313.
[12] American Dental Education Association (2006). "Annual ADEA Survey of Dental School Seniors, 2006 Graduating Class." *Journal of Dental Education* 71(9): 1228-1253. See also Houlberg, B (2008). "Dental Residents' Perceptions of Practice and Patient Management Training During Postgraduate Education." *Journal of Dental Education* 72(6): 643-652.
[13] 2008 Colorado Rural Dentist Workforce Survey (Q1), 2009 Colorado Dentist Workforce Survey (Q1), personal communication: Diane Brunson, Director of Public Health and Community Outreach, University of Colorado School of Dental Medicine, March 10, 2010.
[14] Osborne and Haubenreich (2007). Lin, H, et al. (2006). "In-State Graduate Retention for U.S. Dental Schools." *Journal of Dental Education* 70(12): 1320-3127.
[15] Morris, P, et al. (2004). "Pediatric Dentists' participation in the California Medicaid program." *Pediatric Dentistry* 26(1): 79-86. Al Agili, D, et al. (2007). "Medicaid Participation by Private Dentists in Alabama." *Pediatric Dentistry* 29(4): 293-302. Damiano, P, et al. (1990). "Factors affecting dentist participation in a state Medicaid program." *Journal of Dental Education* 54(11): 638-643. Venezie, R, and Vann, W Jr (1993). "Pediatric dentists' participation in the North Carolina Medicaid program." *Pediatric Dentistry* 15(3): 175-181. Shulman, J, et al. (2001). "Louisiana Dentists' attitudes toward the dental Medicaid program." *Pediatric Dentistry* 23(5): 395-400. Blackwelder, A, and Shulman J (2007). "Texas dentists' attitudes toward the Dental Medicaid program." *Pediatric Dentistry* 29(1): 40-46. Im, J, et al. (2007). "The North Carolina Medicaid program: Participation and perceptions among practicing orthodontists." *American Journal of Orthodontics and Dentofacial Orthopedics* 132(2): 144.e15-21. Hughes, R, et al. (2005). "Dentists' participation and children's use of services in the Indiana dental Medicaid program and SCHIP: Assessing the impact of increased fees and administrative changes." *Journal of the American Dental Association* (136): 517-523.
[16] Ibid.
[17] U.S. Government Accountability Office. "Extent of Dental Disease in Children Has Not Decreased, and Millions are Estimated to have Untreated Tooth Decay." Retrieved February 17, 2010 from http://www.gao.gov.new.items/d081121.pdf
[18] Colorado Department of Health Care Policy and Financing Medicaid caseload figures, FY 1999-2000 and projections FY2009-2010. Retrieved March 2, 2010 from http://www.colorado.gov/cs/Satellite/HCPF/HCPF/1209635766663.