

The Dentist Workforce in North Carolina 2005: A Commentary

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This commentary, delivered at the North Carolina Oral Health Summit 2005, presents a basic assessment of the currently active dentist workforce situation in North Carolina. The assessment suggests that North Carolina's dentist workforce supply, while qualitatively excellent, is quantitatively insufficient, ranking North Carolina 47th out of 50 states. In addition, like many states, North Carolina is experiencing significant maldistribution in its supply of dentists. Moreover, the massive projected population growth, changing demographics, disease trends, alterations in demand for care, and potentially significant changes in dental practice styles all further reinforce the view that North Carolina urgently needs to develop substantially increased capacity for enrolling and graduating high quality dentists.

Within acknowledged limitations, the present analysis offers a number of conclusions: *One*, there is an urgent need for dentist workforce expansion in North Carolina based upon the existing dentist shortage, the current maldistribution of dentists, and the very strong North Carolina population growth projected out to 2030 by the United States Census Bureau. *Two*, North Carolina's goal should be to position its dentist-to-population ratio to rank somewhere near the national median of 6.0 dentists per 10,000 population. *Three*, to achieve its need for more dentists, North Carolina should rapidly pursue significant dental student enrollment expansion. *Four*, dental student enrollment growth should be linked with North Carolina Area Health Education Center programs to encourage training in appropriate rural and underserved community settings. *Five*, expansion in dental and dental hygiene enrollment should provide admission priority to academically qualified candidates from rural North Carolina. *Six*, expansion should be considered for General Dental Practice Residency programs and Pediatric Dentistry Specialty programs.

Introduction

The opportunity to examine the status of North Carolina's dental workforce comes at a critical time. On one hand, caries rates among school children and adolescents continue to decline, relatively fewer extractions are being performed, fewer

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adults are becoming edentulous, and a majority of North Carolina citizens are receiving excellent oral healthcare services. Nevertheless, as one looks forward, the state faces increasingly serious dental, oral, and craniofacial healthcare challenges. For North Carolina's oral healthcare system, whether in the private or public sectors, the current and growing challenge is to provide the population with adequate access to professional dental care in all counties of the state, but especially for rural and economically disadvantaged populations, regardless of where they live. The dental care access problem in North Carolina is acute and getting worse.

Contrast this with the situation nearly 30 years ago, when data from the 1976 North Carolina Dental Disease Prevalence Survey, and the National Health and Nutrition Examination Survey (NHANES), permitted Schonfeld and Warren-Hicks to write, "The dental care system in North Carolina is considerably underutilized in each of the six Health Service Areas due to the low level of demand for dental care. It is expected that this underutilization will result in a drop in productivity in future years due to the four percent annual net increase in dental manpower. The

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North Carolina population has been increasing at an annual rate of one percent.”¹ Surveying the North Carolina dental manpower growth between 1972 and 1979, Konrad and DeFries wrote, “These data show a steady growth in the number of licensed dentists over the period 1972 to 1979. Since the year 1972, the average annual net growth in the supply of dentists in the state has varied between 3.1 and 4.9% per year, with an average net growth rate of about four percent.”² In contrast, and from the perspective of 2005, it is very clear that North Carolina has changed dramatically since the mid-1970s, and for many persons in the state, gaining access to needed and adequate dental, oral, and craniofacial healthcare has become a more difficult and/or unaffordable proposition.

While acknowledging some over-simplification, the current and likely future access to dental care challenge faced in North Carolina appears to arise from a confluence of four distinct elements or trends:

- *Deterioration of Dental Medicaid.* North Carolina’s Medicaid dental reimbursement rates deteriorated during the 1980s and 1990s. Not only that, significant coverage restrictions were also imposed in the early 2000s.
- *Shortage of Dentists.* A severe shortage of dentists has emerged in North Carolina. In the United States, North Carolina currently ranks 47th of the 50 states in terms of the dentist-to-population ratio.
- *Mal-distribution of Dentists.* In North Carolina, as in most other states, and as is true for many other service professions, the distribution of dentists has continued to evolve to the disadvantage of the state’s rural populations.
- *Massive Population Growth.* The United States Census Bureau projects that among the states, North Carolina will jump from being the tenth to the seventh largest in population in 25 years. The Census Bureau estimates the 2000-2030 relative population growth will be 29.2% for the United States, but 51.9% for North Carolina.

In consideration of these factors, in 1998, the North Carolina General Assembly charged the North Carolina Department of Health and Human Services (DHHS) with exploring the dental care access issue and recommending strategies for improving the situation. Specifically, the legislature asked the North Carolina DHHS to develop strategies for:

- Assisting dentists in increasing the number of Medicaid patients they treat;
- Increasing Medicaid patients’ access to quality dental services;
- Teaching dental professionals how to better integrate Medicaid and other low-income patients into their practices; and
- Expanding the capacity of local health departments and community health centers to provide properly diagnosed and supervised preventive services, such as sealants, fluoride, and basic dental hygiene treatments to low-income patients.

The legislature’s charge to the North Carolina DHHS deserves closer attention. Three of the four concerns to be studied,

and strategies to be developed, focused on North Carolina Medicaid issues as they related to dentistry. The fourth area of focus was on local health departments and community health centers and their capacity to offer preventive dental services. In the legislature’s charge itself, no direct reference was made to the supply of the privately practicing dental workforce in North Carolina. Yet, privately practicing dentists constitute over 95% of the dentist workforce in the state.

On receiving its charge, the North Carolina DHHS contracted out the task of evaluating the four issues identified and recommending appropriate corrective strategies to the North Carolina Institute of Medicine (IOM). The North Carolina IOM formed a high-level, blue-ribbon Task Force on Dental Care Access that undertook the study and released its report in May 1999.³ The report included 23 recommendations.

Since that time, a good deal has been accomplished in implementing most of these recommendations, or parts thereof. Implementation efforts have included: (1) significant new legislation, (2) changes to dentist licensing procedures by the North Carolina State Board of Dental Examiners, (3) generous funding from the Kate B. Reynolds Charitable Trust for new and expanded community dental clinics, (4) changes in legally permitted duties for dental hygienists in public health clinics, (5) refinement in contract terms for dentists qualifying for support through the state’s Office of Research, Demonstrations and Rural Health Program Development, and (6) some additional funds for children’s dental care through North Carolina Medicaid. The North Carolina IOM has provided a particularly useful service by issuing follow-up reports in 2001, 2003, and 2005, which tracks the progress made on the original 1999 recommendations.^{4,5}

The North Carolina IOM Recommendations on Dental Workforce

In spite of the fact that no direct reference to North Carolina’s dental workforce supply appeared in the legislature’s original charge to North Carolina DHHS, the North Carolina IOM study recognized that dental workforce supply concerns existed and needed attention. In its 1999 Report, the North Carolina IOM Task Force on Dental Care Access offered nine recommendations for “increasing the supply of dentists and dental hygienists in the state with particular focus on recruiting dental professionals to practice in underserved areas and to treat underserved populations.”³ These appeared as recommendations 4-12 in the report and will not be reproduced here.

Importantly, however, the nine dental workforce recommendations emphasized issues related to, or for the most part restricted themselves to, the Medicaid and the local/community health centers’ components of the legislature’s original charge to the North Carolina DHHS. Two important exceptions were the recommendation that the North Carolina State Board of Dental Examiners (SBDE) establish a licensure-by-credentials pathway, and that the SBDE also consider whether existing regional (i.e., multi-state) dental examining boards could form yet another

pathway to dental licensure in North Carolina. The first of those two pathways has been implemented.⁶ The second of these two pathways appears on track for future implementation. But, the North Carolina IOM was not charged to undertake a comprehensive dental workforce study, and it did not do so. As a result, several large-scale dental workforce issues, with important public policy implications for North Carolina, were not addressed in the North Carolina IOM Report.

The North Carolina Legislature Begins to Address Concerns over Dental Workforce Supply

The legislature's major response to the 1999 North Carolina IOM Report was the 2001 introduction and passage of Senate Bill 861, which, among other achievements, set into motion a study to evaluate the feasibility of increasing North Carolina's capacity to train dentists.⁶ Specifically, the legislature charged the University of North Carolina Board of Governors to evaluate alternative approaches for enrolling, training, and graduating more dental students in North Carolina. The Board recruited a team of external consultants to conduct the study and generate a report with recommendations for the Board.⁷ The Board of Governors received, whetted, and formally approved the report and delivered it to the legislature in July 2002.

The consultants' recommendations contained in the Board of Governors report called for a significant and rapid enrollment increase, from 80 to 105 dental students, at the University of North Carolina at Chapel Hill (UNC-Chapel Hill). There has been concrete follow-up on this recommendation, and UNC-Chapel Hill has submitted an enrollment expansion plan, through the Board of Trustees and the Board of Governors, to the North Carolina legislature. The legislature has, in turn, authorized planning funds for this initiative, which has now been expanded to increase enrollment by 50 students per class, specifically by going from 80 to 130 admitted dental students per year.

The Board of Governors' study for the legislature also recommended that the General Dentistry Residency Program at East Carolina University (ECU) be significantly expanded, and that ECU consider the establishment of a pediatric dental residency program. The Board's report further recommended that ECU evaluate the feasibility of establishing a dental hygiene program. Subsequently, ECU submitted a request for planning funds to expand their General Dental Practice Residency Program, but the legislature did not appropriate funds for their request. To date, it appears that ECU has not acted to implement the other recommendations related to training programs in pediatric dentistry and dental hygiene.

Dental Workforce in North Carolina 2005: A Brief Overview

On January 1, 2004, North Carolina had 3,483 active in-state dentists and 4,052 in-state licensed dental hygienists.¹⁰ In that same year, North Carolina's dentists practiced in 96 of the state's 100 counties. Still referencing the start of 2004, North Carolina's dentist-to-population ratio stood at 4.1 dentists per 10,000 people, compared to the national figure of 6.0 dentists per 10,000 people. An examination of dentist-to-population ratios in all 50 states in 2004 revealed that North Carolina's dentist-to-population ratio ranked 47th out of 50 states.¹¹ Table 1 provides some basic information for placing the state's dental workforce concerns into a relevant context.

Table 1.
Dental Workforce Context, North Carolina, 2004

North Carolina population in 2003—8.4 million
Population Growth 1990-2000:
North Carolina—21.4%
United States—13.1%
Annual North Carolina dental expenditures \$1.65 billion
3,483 active in-state dentists (81% generalists)
Distribution (96 counties have one or more dentists)
North Carolina has 4.1 dentists per 10,000 population (<i>National figure is 6.0 per 10,000</i>)
North Carolina's dentist-to-population ratio ranks 47th among 50 states
4,052 in-state licensed dental hygienists

Table 2 provides more detailed information about the rate of growth in the dentist workforce in both North Carolina and the United States between 1976 and 2003. These data indicate North Carolina's dentist-to-population ratio has been virtually flat since 1987. Moreover, the national dentist-to-population ratio has been consistently 40-50% higher than North Carolina's.

Turning to the stock of dental hygienists in North Carolina, Table 3 shows that the number of active dental hygienists has grown from 1,368 dental hygienists in 1979 to 4,052 in January

Table 2.
Dentist Workforce, United States and North Carolina, 1976-2003

Year	United States			North Carolina		
	Population (millions)	Active Dentists	Dentist-to- Population Ratio (per 10,000 population)	Population (millions)	Active Dentists	Dentist-to- Population Ratio (per 10,000 population)
1976	217.6	110,300	5.1	5.6	1,900	3.4
1987	242.3	137,800	5.7	6.4	2,600	4.1
1992	254.9	152,900	6.0	6.6	2,700	4.1
1995	264.6	158,600	6.0	7.2	2,900	4.0
2000	281.5	166,000	5.9	7.8	3,100	4.0
2003	290.3	173,600	6.0	8.5	3,500	4.1

Table 3.
Active Dental Hygienists per 10,000 Persons in North Carolina, 1979-2003

Year	Licensed Dentists per 10,000 Population	Active Dental Hygienists per 10,000 Population	Active Hygienists	Dental Hygienists-Dentist Ratio
1979	3.8	2.4	1,368	0.62
1989	4.1	3.3	2,190	0.82
1998	4.0	4.5	3,395	1.12
2003	4.1	4.8	4,052	1.18
Change Percentage (1979-2003)	7.9%	100%	199.3%	

2004, a 199.3% increase. In terms of the ratio of dental hygienists per 10,000 population, this too has grown from 2.4 in 1979 to 4.8 in 2004, a 100% increase in the ratio. In contrast, the dentist-to-population ratio grew by only 7.9% over the same period. These two disparate growth rates account for the improvement in the ratio of dental hygienists-to-dentists. In 1979, there were 0.62 dental hygienists for every licensed in-state dentist. By January 2004, the ratio had changed, indicating 1.17 dental hygienists for every North Carolina active, in-state dentist.

The Distribution of Dentists in North Carolina

Beyond concerns about the adequacy in the overall supply of dentists in North Carolina, the dental care access problem is significantly compounded by the uneven distribution (hence, the availability) of dentists across the state's 100 counties. Figure 1 indicates the number of dentists per 10,000 people in each of the state's counties, as reported for 2003.¹² Most revealing is that only eight North Carolina counties have a dentist-to-population ratio that approaches or exceeds the United States average of 6.0 dentists per 10,000 people. This explains, in large measure, why 79 North Carolina counties are federally designated dental shortage areas.¹³ In North Carolina, 28 counties are served by two dentists or fewer per 10,000 population. These workforce distribution concerns need to be evaluated against the continuing high population growth in North Carolina, and the expected impact of that population growth in terms of the future availability of professional dental services in both urban and rural counties.

Productivity and Quality Increases by Dentists and the Dental Team

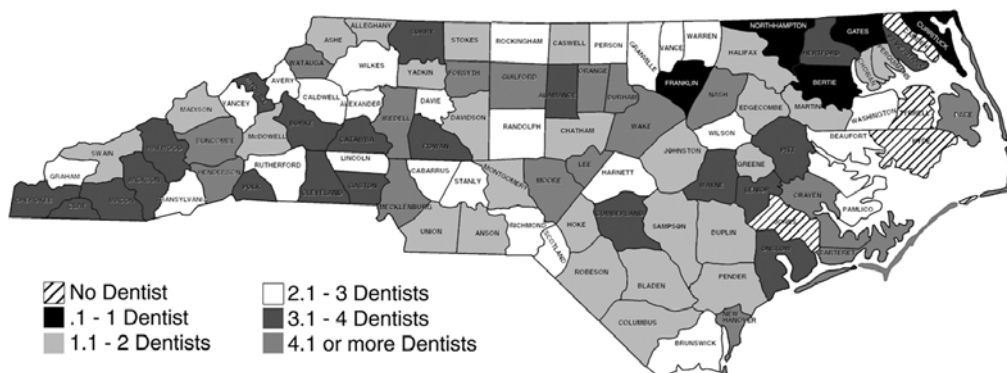
Almost all good economic analyses of dental workforce supply recognize that it is the supply of dental services, not simply the supply of dentists, dental hygienists, dental assistants, and dental technicians, that is critical to the population. This is a valid and important

distinction. In recent decades, the dental team has demonstrated continuing increases in service productivity (and quality) per unit of time. In acknowledging the significance of productivity and quality increases, these have their weakest impact where the stock of dentists is low and/or where the available dentists are aging and may be past their most productive years. While it is only speculation, it does appear that older dentists close to retirement constitute a substantial proportion of the supply of dentists in rural North Carolina counties.

Access to Dental Care in the Face of North Carolina's Population Growth

Beyond the dentist workforce shortage and dental care access concerns in 2005, the projected population growth in the state will greatly magnify the problems that currently exist. The challenge of providing future dental care services for North Carolina's population will, therefore, become more formidable with each passing year. North Carolina is currently the tenth largest state, on top of which it is also one of the fastest growing states.⁸ Already during the 1990-2000 decade, United States Census Bureau data show that North Carolina's population grew by 21.4%, compared to the United States population that grew by only 13.1% for the same period.⁹

Figure 1.
Number of North Carolina Dentists per 10,000 Population, by County, 2003



Data Source: North Carolina Health Professions Data System.¹²

Looking ahead, the continuing population changes for North Carolina are even more dramatic. Figure 2, adapted from recent United States Census Bureau estimates, illustrates that in terms of absolute population growth during 2000-2030, North Carolina will experience the 5th largest population increase among the 50 states.¹⁵ Based on these estimates, North Carolina's population is projected to be 4.2 million larger in 2030 than in 2000. It is remarkable that, for the period 2000-2030, the total United States population is expected to grow by 29.2%, while over the same period North Carolina's population is projected to grow by 51.9%.¹⁵

Assuming that the United States Census Bureau provides the most reliable population projections available, the preliminary implications for the dental workforce needed by North Carolinians in 2030 are staggering. Two scenarios may be considered. Under the first scenario, North Carolina will continue to rank 47th out of 50 states and maintain its dentist-to-population ratio of 4.1 per 10,000 population. Just 25 years from now, to maintain the current ratio, North Carolina will require approximately 5,500 active dentists, in contrast to the 3,606 active as of January 1, 2005.¹⁶ Under the second scenario, in which the national dentist-to-population ratio norm is adopted for North Carolina, the state will need 6,320 active dentists in 2030.

The impact of dentists retiring from active practice deserves more explicit consideration when considering future dentist workforce needs. Assuming a typical 35-year career span for dentists and a rectangular age distribution, it becomes apparent that approximately 3.0% of active dentists retire or otherwise leave dental practice each year. In North Carolina, this suggests that approximately 95-105 dentists each year leave active practice, with that number going up as the workforce slowly expands. To place the impact of dentists retiring from active practice into perspective, the UNC-Chapel Hill School of Dentistry currently graduates 75-80 dentists per year, not enough to replace those leaving practice. This situation has existed for some time. These and other issues cited above deserve careful and intensive attention as North Carolina considers its need for more dental education capacity.

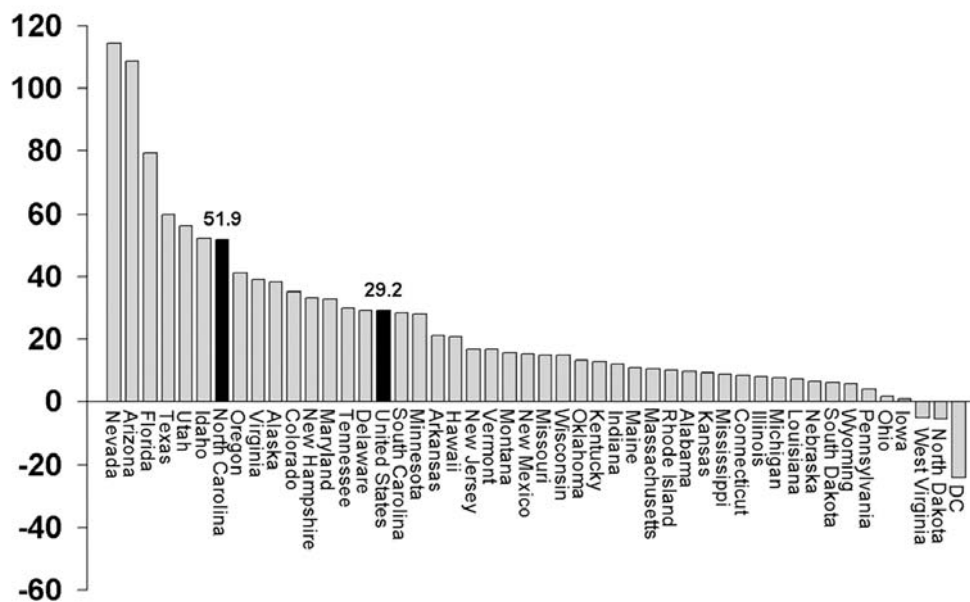
Discussion

In calling for an increase of the dentist workforce in North Carolina, together with incentive measures to promote enhanced access to dental services for rural and underserved populations, the rise of contrary perspectives can be expected. In part, this may arise because workforce and population projections are imperfect, by definition. In a similar vein, some may suggest that dentists' productivity increases have not been sufficiently considered. That is true; though the current access-to-care concerns have arisen even while dentists' productivity, nationally, grew 1.12% per year during the 1990-2002 period.¹⁷ (One assumes North Carolina dentists exhibited similar productivity growth during that period.) Moreover, as was indicated previously, productivity increases have less impact where there is a significant dentist shortage involved. Others may point out that career/practice styles may be changing, in part by the continuing influx of women in the dental profession. Some may question why in-migration of dentists has not been separately considered in the current overview. Also not accounted for are the state's large African American, Hispanic and retired elderly populations, all of whom appear likely to be underserved and may be assumed to exhibit above-average dental needs. In short, while a formally constructed dental workforce analysis would be more illuminating, the following points appear to be a fair and robust reflection of the current dentist workforce concerns facing North Carolina.

- North Carolina ranks 47th out of 50 states in terms of the dentist-to-population ratio.
- The United States has 6.0 dentists per 10,000 persons; North Carolina has 4.1 dentists per 10,000 people. The

Figure 2.

Absolute Population Growth (in thousands) by State: 2000-2030



Adapted from US Census Bureau, Population Division Interim State Population Projections, 2005. Internet Release Date: April 21, 2005.

national ratio is close to 46% better than North Carolina's.

- North Carolina has only eight counties whose dentist-to-population ratio approaches or exceeds the national average of 6.0 per 10,000.
- 79 North Carolina counties are 'federally designated dental shortage areas'.
- The North Carolina dental hygiene workforce has expanded progressively during the past 25 years, considerably exceeding the growth rate of the North Carolina dentist supply.
- The United States Census Bureau projects North Carolina as the nation's fifth fastest growing state, becoming the seventh most populous state by 2030, implying significant future growth in dental service needs.

It is apparent that the North Carolina General Assembly continues to be sensitive to the public policy dimensions of the dentist workforce shortage in North Carolina. Specifically, the legislature has gone beyond its initiatives in 1998 and 2001 (encompassed in Senate Bill 861), and has appropriated \$2.0 million in fiscal year 2005-2006 planning funds with the goal of rapidly and cost-effectively expanding dental school enrollment in North Carolina.

The legislature also continues to rely on the North Carolina Area Health Education Centers system to help ensure that dental student practitioners gain rural and community-based dental care experiences. These student rotations are typically focused on North Carolina rural health clinics, but also on state mental health centers, on Indian Health Service facilities, military and coast guard installations, as well as Veterans Affairs (VA) hospitals.

Aside from the powerful and appropriate influence of market forces, the size of the future dental workforce needed in North Carolina will be largely defined by two additional considerations. The first of these is that North Carolina's current position as 47th out of 50 states with respect to dentist-to-population ratios must be rectified. A preferred ranking would see North Carolina positioned around the middle of the range, say 25th out of the 50 states. The second consideration, as already shown, is the state's projected population growth, which significantly exceeds the national growth rate, and thus may push North Carolina into becoming the seventh most populous state in just 25 years. With a 2030 estimated population of 12.2 million, this alone will account for 4.2 million more people than in North Carolina's 2000 census. Essentially, the current dental workforce shortage, overlaid with a North Carolina population estimated to be 51.9% higher than in 2000, dramatizes the need for a substantially larger and responsive oral healthcare workforce.

North Carolina has considerable dental education capacity. In 2005, the state operated 12 dental hygiene programs, 11 of which are based in the Community College System. In addition, there are 15 dental assistant education programs, 14 of which

are community college-based, and there is one community college-based dental technology program. The state's dental school is based at UNC-Chapel Hill, where the maximum current annual enrollment is 80 dental students. Interestingly, it would appear that all of these programs function at a sub-optimal size. A recent economics study by the American Dental Association determined that the economies of scale in university-based dental education were such that the lowest per-student costs were approached as a dental school's total enrollments entered the 800-1,300 DDSE* range.¹⁴ The DDSE estimated for the UNC-Chapel Hill School of Dentistry at the time this paper is published is approximately 526.

This commentary on North Carolina's dentist workforce status has focused largely on the availability and distribution of general dentists, because that is where the dental care access problem is the most acute. It is recognized, however, that dental assistants, dental hygienists and dental technicians are also key members of the dental team, and all contribute to the quality and productivity of dental care services delivered. For that reason this commentary has offered a relatively brief glimpse at the growth of North Carolina's dental hygiene work force, relative to that of dentists.

In the same vein, and with respect to advanced dental education, North Carolina currently has four general dental practice residency programs, located in Charlotte, Winston-Salem, Greenville, and Chapel Hill. A fifth general dental practice residency program is being considered for the Asheville area. The University of North Carolina also trains specialists for all dental specialties recognized by the American Dental Association. At the current time, there appears to be a need in the state for more pediatric dentists, as well as for dentists trained to serve the special needs of the ever growing elderly population, a significant proportion of whom are medically compromised and/or dependent on extensive pharmaceutical regimens. Access to dental care for institutionalized seniors is marginal at best. The supply and distribution of dental specialists in North Carolina may well deserve a future workforce study.

Conclusions

This commentary has presented a basic analysis of the current dentist workforce situation in North Carolina. The assessment offered does not represent a formal, fully specified and nuanced workforce study. Taking into account this limitation, the analysis suggests that North Carolina's dentist workforce supply, while qualitatively excellent, is quantitatively insufficient, ranking North Carolina nearly last out of 50 states. Such a position is generally perceived as undesirable with respect to healthcare policy norms.

Moreover, the massive projected population growth, changing demographics, disease trends, alterations in demand for care, and potentially significant changes in dental practice styles all

* DDSE is the DDS Undergraduate Equivalent. It is obtained by weighting each category of students by a teaching intensity factor, and summing the resultant weighted components. E.g., DDSE = (1.0 x undergraduate DDS enrollment) + (1.7 x dental specialty enrollment) + (1.7 x non-clinical graduate student enrollment) + (0.6 x allied dental enrollment) + (1.2 x non-specialty advanced dental education enrollment).

further reinforce the view that North Carolina urgently needs to develop substantially increased capacity for enrolling and graduating high-quality dentists. Committing to an enrollment increase program, together with increased community-based training experiences, would directly improve dental care access for people in North Carolina, would also contribute to greater economic development in the state, and would lead to positive distributional benefits.

Within acknowledged limitations, the current assessment of the dentist workforce status in North Carolina permits the following conclusions:

- Significant dental workforce expansion in North Carolina is justified by the existing dentist shortage, the current maldistribution of dentists, and the very strong population growth projected out to 2030 for North Carolina by the United States Census Bureau.
- In terms of dentist supply, North Carolina's goal should be to climb from its current 47th position to rank near 25th out of the 50 states with respect to the dentist-to-population ratio.
- Significant dental student enrollment expansion in North

Carolina is necessary and should seek to capitalize on the acknowledged economies of scale achievable by encouraging institutions to enroll students up into the 800-1,300 DDSE range.

- Dental and dental hygiene student enrollment expansion must include additional linkages with North Carolina AHEC to help facilitate increased training capacity and to encourage dental training in appropriate rural and community settings.
- Dental and dental hygiene student enrollment expansion should make it possible to provide admission priority to academically qualified candidates from rural North Carolina.
- Expansion of general dental practice residency programs and pediatric dentistry specialty programs should be strongly encouraged.

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Editorial Note: Dr. Stamm uses figures from the North Carolina State Board of Dental Examiners, which report the numbers of dentists active as of January each year. The Issue Brief in this issue of the Journal uses figures from the NC Health Professions Data System provided by the Cecil G. Sheps Center for Health Services Research, which reports active dentists through October of each year. Because the numbers are collected and reported ten months apart, the numbers of dentists and dental hygienists reported in this commentary may differ from those in other papers in this issue of the *North Carolina Medical Journal*. These differences are not considered to have significant implications for the policy analyses or conclusions drawn from their use in any case.

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