Critical Issues in Dental Education

State Financing of Dental Education: Impact on Supply of Dentists

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Abstract: In 2000, the thirty-six states with public dental schools provided an average subsidy of $49,347 per dental student. In contrast, nineteen states provided little or no subsidy. Since states invest in dental education, in part, to ensure an adequate supply of dentists, we examined the factors that explain dentist variation among states. We found that population size, per capita income, and the number of students from the state enrolled in dental school had a significant and positive impact. The level of state support for dental education and the presence of a dental school had a negative or nonsignificant effect, respectively. Apparently, dentists locate based primarily on the demand for their services and, to a lesser extent, on where they were raised. The states’ investment in dental education had little impact on number of dentists because some states had many dentists but invested little in dental education. We identified two states that collectively account for 15 percent of enrolled students even though they provide minimal subsidy for dental education. We discuss the implications of these findings for states that do not have dental schools and need more dentists. This research was supported in part by grants from the Connecticut Health Foundation (Dental Workforce in Connecticut: Issues and Options), the Robert Wood Johnson Foundation, and the California Endowment (Pipeline, Profession, and Practice: Community-Based Dental Education).

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While the current crisis in state finances is particularly acute, there has been a general trend for both federal and state governments to reduce their support for dental education.¹ The reasons for this decline are unclear, but the increasing ability of medical schools, and to a lesser extent dental schools, to support their operations from clinical income, research grants, and tuition is a factor. Whatever the reasons, publicly supported dental schools face major challenges as they try to adjust to declining revenues from state governments.

In 2000, thirty-six of the fifty-four U.S. dental schools were public institutions, four were private state-related, and fourteen were private. Thus, 74 percent of dental schools receive significant amounts of money from state governments. Of course not all states provide funds to schools. Nineteen states do not have a publicly supported school of dentistry.

In this article we examine: 1) trends in state support for dental education over the past ten years; 2) the relative importance of public support for dental education on the supply of dentists in states; and 3) the policy implications of these findings.

Methods

We used data from the 1991 to 2000 Annual Surveys of Predoctoral Dental Education, conducted by the American Dental Association (ADA) in conjunction with the American Dental Education Association (ADEA).² These surveys provide detailed information on the major sources of dental school revenue and the number of dental students, residents, Ph.D. students, and dental hygiene students enrolled in programs offered by dental schools. We used ADEA data to determine the state origin of students enrolled in dental school and the state of their training.³ From the United States Bureau of the Census we obtained state-specific data on population size.⁴ From the United States Department of Commerce we obtained data on state per capita income and median gross rents.⁵ We used the ADA’s report on the Distribution of Dentists in the United States for the year 2000 to acquire the number of professionally active dentists in each state.⁶

We present descriptive analyses of trends in state funding from 1991 to 2000, and we examine
variation in the level of state support. We identify states that provide little or no funding for dental education, but have a large number of students from the state enrolled in dental schools. Likewise, we identify states that have publicly supported dental schools that educate large numbers of out-of-state students. We explore the number of dental students from each state and discuss the reasons for the variation among states.

To determine the factors that influence the number of dentists in a state, we use a model that incorporates the key variables that influence the demand for and supply of dental services. A linear regression is specified and estimated with Ordinary Least Squares. The dependent variable is the number of professionally active dentists in the state, and the independent variables are state population, average per capita income, median gross rent, financial support for dental education, residents enrolled in any dental school, and the presence of a dental school(s). The median gross rent is used to control for variation among states in the input prices for running dental practices.

Results

As background information, Figure 1 presents the sources of revenues for all dental schools (public, private, and private-state related) in the United States, Puerto Rico, and the District of Columbia for the year 2000. On average, 32 percent of funds come from state governments, 27 percent from student tuition and fees, 19 percent from clinical income, 9 percent from the federal government, and 13 percent from other sources. The latter includes mainly endowments and gifts. The level of state support varies by type of school (data not shown). The mean state support for public dental schools is 45 percent; for private state-related schools, 15 percent; and for private schools, 2 percent. As expected, the revenues from tuition and fees and clinic income are much greater for private (53 percent, tuition and fees; 21 percent, clinic income) compared to public (15 percent, tuition and fees; 17 percent, clinic income) schools. The other sources of revenues vary little by type of school.

Figure 1. Source of revenues (percent) for public, private, and private state-related dental schools combined, 2000

Figure 2 shows the average level of state support per dental student equivalent (DDSE) for all types of dental schools combined from 1991 to 2000 in both inflation-adjusted and unadjusted dollars, using the Consumer Price Index to make the adjustments. DDSE is the number of undergraduate dental students, residents, graduate students, and dental hygiene students in training at the school. Based on inflated dollars, state support declined from 1991 to 1995 and then increased from 1995 to 2000. Over the ten-year period, states increased the subsidy to dental schools by 13.1 percent. In inflation-adjusted dollars, state support actually declined 14.0 percent.

In 2000 the average level of subsidy per DDSE was $28,640. If the subsidy is based on dental students alone, it is 40 percent larger or $40,096. The subsidy just for publicly funded schools averaged $35,248 per DDSE or about $49,347 per dental student (data not shown). The average state subsidy per DDSE for the four private state-related schools is $7,495 and for the fourteen private schools is $448.

The variation in state support per DDSE for public dental schools is seen in Figure 3. The modal level of subsidy is between $25,000 and $34,000. Seven states provide less than $25,000 per DDSE, and five states provide a $45,000 or greater subsidy. The highest level of subsidy in one state is over $70,000 per DDSE (data not shown).

Sixteen of the nineteen states without publicly supported dental schools provide scholarships to state residents enrolled in dental school or per student payments to specific dental schools where they have a special arrangement to accept students from their states. The average level of scholarship or direct school subsidy varies, but it generally allows students to pay a reduced out-of-state tuition rate that is close to the in-state tuition rate. For example, one state reports an amount under $11,000 per student per year and covers relatively few students.

Some states without public dental schools provide little or no subsidy to dental students from their states, but have large numbers of students enrolled in out-of-state dental schools. One such state has over 500 state residents enrolled in out-of-state dental schools. Another state with public dental schools has over 2,000 state residents enrolled in private or out-

Figure 2: Average state support per dental student equivalent in inflation-adjusted and unadjusted dollars for public, private, and private state-related schools combined, 1991-2000

Figure 3. Variation in state support for public dental schools per dental student equivalent, 2000


Figure 4. Distribution of dental students per 100,000 population for fifty states, 2000

of-state dental schools. These are extreme examples of states that provide minimal subsidy for dental education, but still have large numbers of state students in dental schools.

In contrast, several state dental schools accept large numbers of out-of-state students. Although these students usually have to pay higher out-of-state tuitions, they are still heavily subsidized by the state. Seven schools fall into this category; collectively, they educate approximately 1,150 out-of-state students per year.

Figure 4 gives the distribution of enrolled dental students per 100,000 population for the fifty states. There is great variation, ranging from a low of .6 and a high of 22.5 enrolled dental students per 100,000 state residents. The modal number of dental students is three to four. The two states at the extremes do not have state dental schools and provide very little support for state students enrolled in out-of-state dental schools.

The results of the linear regression, estimating the relative impact of the independent variables, are presented in Table 1; the regression coefficients, mean values, and standard deviations are seen in Table 2. Using the total supply of professionally active dentists in the state as the dependent variable, we see that all but two of the independent variables are statistically significant at the .01 level. For a 10 percent increase in population, there is a 7.7 percent increase in the supply of dentists. The supply of dentists is even more influenced (12.0 percent) by the average per capita income of state residents. States with higher per capita income have a greater number of dentists. The amount that states spend on dental education has a small but significant negative association with the supply of dentists. States with more residents enrolled in dental schools have a greater supply of dentists. The supply of dentists was not related significantly to median gross rents or the presence of a dental school.

**Discussion**

This analysis is based on financial data reported by dental schools in an ADA survey. Although there is no independent check on data reliability and validity, we assume that the information supplied by the schools is a reasonable approximation of the true values. We know that some universities provide dental schools hidden subsidies (e.g., physical plant maintenance at less than full costs) and that some schools have “special” arrangements with the state Medicaid program and get reimbursed on a different basis than non-university providers. These special subsidies and arrangements are indirect ways to subsidize dental education. To the extent this happens, this report underestimates the full contributions of state governments to dental education.

**State Funding Trends**

As a share of total revenues (all dental schools), state support dropped from 45.6 percent to 31.6 percent from 1991 to 2000. Most of the decline took place in the early 1990s when states were having fi-
nancial difficulties. Schools responded to the relative decline in state funding by increasing student tuition and fees by an average of about 10 percent a year for the past ten years. Schools also increased revenues from patient care, but expenses for patient care went up at about the same rate as clinic revenues, resulting in minimal change in net income from this activity. This trend suggests that public and private schools must depend mainly on tuition/fees and gifts/endowment to generate significant net increases in their operating revenues.

The current crisis in state budgets comes at a particularly bad time for dental schools. The modest increases in state support that occurred from 1995 to 2000 have come to an end. More importantly, the overall ten-year decline in inflation-adjusted support leaves schools in a precarious position to deal with the large budget reductions that many schools experienced in 2002 and 2003. These reductions are likely to continue into 2004. Operationally, this means schools will have to further reduce the number of paid faculty and staff, limit faculty time for research and other scholarly activities, defer maintenance of physical facilities, and continue to increase student tuition and fees. These cutbacks have serious implications for the quality of dental education, academic scholarship, and faculty and underrepresented minority and low-income student recruitment.

Generally, private schools are better positioned to deal with these financial problems than public or private state-related schools. Private schools receive relatively little public subsidy, depend far more on student tuition and fees, operate more efficiently with larger classes, and have more effective private fundraising programs. Public schools will have to use these same types of financial strategies as state funding continues to decline.

Level of State Subsidy

In 2000 the average level of state subsidy for public dental schools was $35,248 per DDSE and $49,347 per dental student. To assess the “reasonableness” of this level of subsidy, the average state subsidy per dental student is substantially lower (68 percent) than per medical student. Even this comparison is misleading because most states do not subsidize the clinical training of medical students. These costs are usually picked up by hospitals and other health care organizations where medical students receive their clinical experiences. In contrast, dental schools own and operate their own delivery systems, and these systems require a large subsidy because they are teaching laboratories rather than patient-centered care systems. If the actual cost of medical student clinical training in community delivery sites were added to the state subsidy, societal costs for medical student training are probably twice that for dental students. As more dental schools move some of their clinical curriculum to community-based delivery sites, the subsidies needed to operate their clinical programs may decline.

Sixteen of the nineteen states without dental schools do offer a few state students scholarships directly or have an arrangement with an area dental school to accept students from their state. In turn, these schools receive a direct payment from the other state. Overall, there is great inequity among states in their support for dental education.

The great majority of state dental schools recruit most of their students within state. This makes sense from the states’ perspective, since, as reported here, in-state students are more likely to practice within the state. The reasons that seven state schools have significant numbers of out-of-state students are not fully understood. Some of these schools have arrangements with neighboring states, such as the Western Interstate Commission for Higher Education (WICHE) program, where students from the neighboring states are given preference and treated as in-state students. In other cases, it appears that the number of within-state applicants is so low that the school cannot recruit qualified students just from within the state. There may be other explanations as well.

State Variation Among Enrolled Dental Students

The dramatic differences in enrolled dental students per 100,000 population among states is a surprise finding. There is no simple explanation for these differences. One state in particular produces more than twenty-two dental students per 100,000 population when the modal figure is three to four students. Some factors that may account for this variation include the number of residents obtaining college degrees and the quality of undergraduate education. It is hard to believe that these factors alone could be the full explanation. In all probability, there are cultural or value differences among state population groups that also play a role.

Whatever the explanation, these differences in enrolled students per 100,000 population are impor-
tant for the state’s supply of dentists. As noted previously, students tend to practice in the states where they were raised; the dental schools attended appear less important in selecting practice locations. This finding offers states that need dentists a strategy for increasing the number practicing in the state.

In this regard, two states that put minimal resources into dental education have some 2,500 students receiving a dental education. This is about 15 percent of all dental students. This high concentration of students from just two states may have a significant impact on the distribution of dentists nationally.

State Supply of Dentists

The estimated model fits the data very well. The R-Square value (.984) indicates that over 98 percent of the variation in professionally active dentists is explained by the independent variables. Thus, other factors, such as licensure, are unlikely to have a significant impact on the distribution of dentists.

The results of the multivariate analysis were generally predictable. Larger and more affluent states have more dentists. This reflects the fact that dentists locate in areas where there is greater demand for their services. The negative association between number of dentists and state spending for dental education suggests that some states spend little money on dental education but have large numbers of practicing dentists. Likewise, a few states provide large subsidies for dental education, but the supply of dentists is mainly related to high per capita incomes of state residents. Another possible explanation is that students are attracted to states that subsidize dental education but return to their own states after graduation. These explanations are not mutually exclusive.

The primary policy implications from these findings relate to strategies states can use to increase their supply of dentists. These include direct financial subsidies for state students and the establishment of regional dental schools.

Student Subsidies and Regional Schools

Some smaller and rural states have few residents who apply to dental school and have low acceptance rates for those who do apply. One option for these states is to increase the subsidy available to successful candidates to dental school. As the level of subsidy increases, more state students are likely to apply to dental school, and equally important, the quality of the applicants is likely to increase. We predict that students interested in graduate training in medicine, engineering, biology, and other professions will take another look at dentistry as a career if state subsidies substantially reduce the cost of their dental education.

The data suggest that it makes little difference where these students attend dental school. A large percentage of them will return to their home states to practice. To ensure that students receiving subsidies return, states can also consider the use of “pay-back” programs that forgive graduates their educational debt if they practice in the state or in certain underserved areas of the state for a period of time. For this strategy to work on a large scale, the required payback time in underserved areas should not exceed two years, and the time spent in residency programs in the state should count for the payback time. Otherwise, few students will be interested in the program.

This strategy has a number of advantages. First, it is much less expensive than starting dental schools, where the initial investment and continued operating subsidies are substantially greater. Second, it discourages the development of small, poorly funded, and academically weak dental schools. Third, schools will have to compete for these high-quality students by improving the quality of their educational programs. Fourth, this strategy will lead to more equity in state support for dental education.

Another option for states without dental schools or with small dental schools that require high subsidies per student is the development of regional dental schools. The regional models that currently exist, e.g., WICHE, have had some success but have limitations. The problem is that relatively few students from the participating states are enrolled in the regional dental school. Also, the level of contribution by the participating states is often much less per student than the subsidy of the state with the dental school.

Many regional models are possible, and it is beyond the scope of this article to go into this issue in any depth. In general, larger regional dental schools with classes of 150 or more students per class are likely to be financially and academically stronger than smaller dental schools.

We appreciate that these options have little political feasibility in the short term. However, if the financial problems of dental schools continue to grow...
and if the demand for dentists increases, especially in rural areas, these options may be worth further investigation.

**Conclusions**

Public support for dental education appears to be in a period of long-term decline. Even during the period of economic expansion from 1995 to 2000, the rate of increase in state support for dental education barely kept up with inflation. For the 74 percent of dental schools that receive state support, the level of support varies substantially. Indeed, a significant number of state or state-related dental schools receive so little state support that they function as private schools, operationally.

Nineteen states do not have a state-supported college of dentistry and spend relatively little subsidizing dental education. A few of these states have private dental schools or have a great many state residents enrolled in out-of-state schools, so the lack of a school is not a problem. For states with relatively low per capita incomes, it is an issue because they have difficulty attracting dentists. In the short term these states cannot respond to this challenge by increasing their population or per capita income, two of the major predictors of dentist supply. Our analysis indicates a more promising strategy relates to the fact that the number of state residents enrolled in dental school is a significant predictor of the state’s supply of dentists. Thus, states can expect to increase the number of practicing dentists by increasing the subsidy for state residents interested in dental careers. The subsidy is likely to attract more people and more highly qualified people into dentistry. This strategy is less expensive, and perhaps more politically feasible, than starting new dental schools. Another option for small states with or without a dental school to consider is the establishment of regional dental schools.

The current state budget crisis is likely to further reduce public support for dental education. The strategies that states and dental schools develop to deal with these financial issues will have a significant impact on the future of dental education, the dental profession, and possibly, the oral health of the American people.

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