

Implications of the Growth of Dental Education in India

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Abstract: By influencing the supply of trained human resources, the dental education sector can play a significant role in influencing policy goals of ensuring good quality and equitable access to oral health services in developing countries. Our research goal was to assess quantitatively the size of the Indian dental education sector, its growth over time, and the implications of this growth for equity and quality in oral health care. Information on the location of teaching institutions, the year of establishment, type of ownership, and seat capacity was obtained from government sources, the Dental Council of India, and websites of individual institutions to estimate the growth in the undergraduate dental education sector, including the role of the private sector from 1950 to 2005. Data on location of training capacity and institutions were used to assess the geographical distribution of undergraduate dental education capacity in India. Registration data on dentists, the size of available faculty relative to regulatory requirements, and penalties imposed on offending faculty and education institutions were used to assess the impact of the growing Indian dental education sector on graduate quality and equitable access. Dental colleges and enrollment capacity have grown rapidly over the five decades since 1950, mainly due to a growing private sector. There is regional inequality in the location of dental education schools in India with a bias toward economically better-off regions. The growth in the dental education sector has translated into increased overall access, although accompanied by rising inequality in access and possibly lower quality of dental education.

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Ensuring adequate access to oral health care services and improving the level of oral health in developing countries such as India are increasingly major concerns of health policy.¹ Human resources are a key input into health, so that dental health professionals are likely to be a major determinant of oral health outcomes for individuals and the costs with which such outcomes are produced.² When dental professionals are disproportionately allocated to the private sector relative to a public sector that provides subsidized services, financial affordability also becomes a barrier in the care of the less well off. These concerns are evident in India, where an estimated 45 percent of the population above fifteen years has some form of periodontal disease, nearly 3 percent of the population above thirty-five years has oral cancer, the prevalence of fluorosis is 5.5 percent, and a large number of people live below the poverty line.³

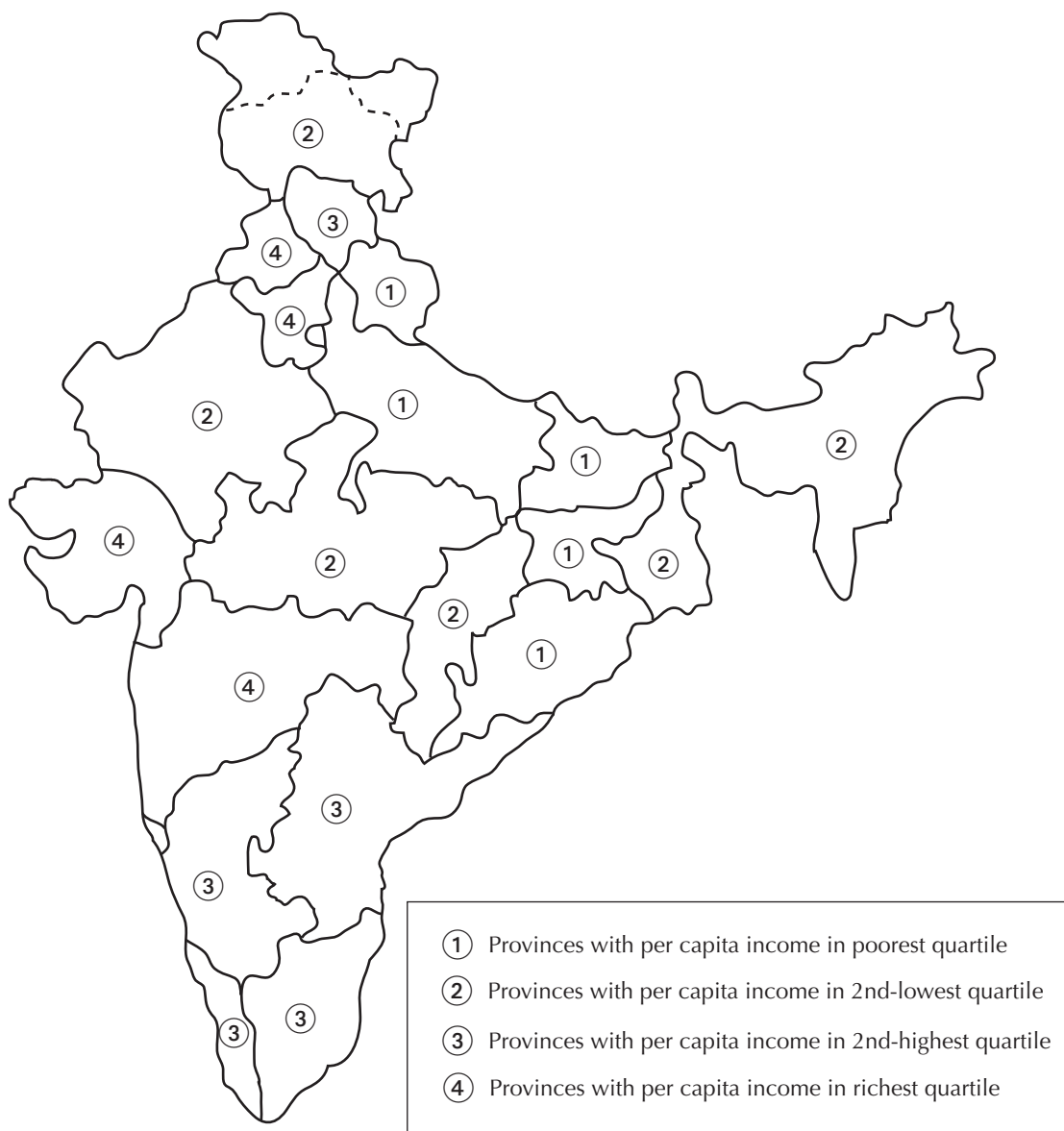
The distribution of dental professionals across geographical regions is also crucial for ensuring equality in physical access to oral health care in developing countries where various strategies to guide health personnel into underserved areas have been

tried.⁴⁻⁷ Regional differences in access constitute an important concern in India due to the large economic differences that exist across provinces. Figure 1 presents a map of India, ranking states from the poorest (1) to the richest category (4) in terms of per capita income. Provinces in categories 3 and 4—typically in the southern, western, and northwestern parts of India—enjoy per capita incomes that are two to four times the per capita income in provinces comprising region 1, located in the central and eastern parts of India.

This article assesses the structure of and trends in the dental education sector in India, primarily its size, the relative importance of public and private sectors, and the regional distribution of dental colleges. It concludes with a discussion of the implications of these trends for policy goals such as gains in access to oral health care, greater equity in access, and the improved quality of such care.

Background and Data

The Indian dental education sector provides training at the undergraduate, postgraduate, and



Note: The provincial and international boundaries depicted in this map are only approximate.

Figure 1. Geographical distribution of Indian states ranked by income per capita, 2000

super-specialization levels. The first degree, B.D.S. (Bachelor of Dental Surgery), comprises undergraduate training of four years, followed by one year of internship. The curriculum, prescribed by the Dental Council of India, a statutory body comprised of dental health professionals, supports basic training in most major areas of dental care and is also the prerequisite for further training in residency education.

Postgraduate training includes residency programs of two and one-half to three years duration, culminating in an M.D.S. (Master of Dental Surgery). The National Board of Examinations, an autonomous organization established by the Government of India, offers a Diplomate of the National Board (DNB). DNB certification is recognized as equivalent to the M.D.S. and is offered at selected hospitals across

the country. Thus far, the DNB program has offered certification only to candidates who already possess an M.D.S. degree.

Nine specialties of dentistry are offered at the postgraduate level: prosthetic dentistry, oral surgery, periodontics, orthodontics, pedodontics, conservative dentistry and endodontics, oral medicine and radiology, community dentistry, and oral pathology. In addition, there are two-year certificate/diploma courses that are offered for parodontal training, such as dental mechanics (dental laboratory technology), dental hygiene, and dental assistance.

Admissions to seats in government-owned dental colleges and roughly half of the seats in private dental colleges in any given state, also referred to as merit seats, are typically carried out along the following lines: a) 15 percent of the available merit seats are assigned to students from other states on the basis of an all-India entrance examination; and b) the remaining merit seats—85 percent of the total—are allocated on the basis of a “merit ranking” from a state-level entrance examination among long-term residents of the state. The construction of the merit ranking of candidates from the state-level entrance examination is not a straightforward exercise though, due to the preferential assignments to candidates from lower castes and other categories of individuals deemed to belong to needy categories, subject to a prespecified maximum. This maximum may vary from state to state.

The main advantage of being admitted under the merit seat category is that tuition fees charged by dental colleges are much lower than fees paid by students who are admitted against “non-merit” slots in privately owned dental colleges, which comprise 50 percent of all private college seats. Admission to a large majority of these non-merit seats, referred to as payment seats, is also based on a common entrance examination and also subject to a merit ranking. About 15 percent of the payment seats and sometimes an even higher proportion, however, are allocated to foreign students, without the requirement of the common entrance examination. Tuition fees for this last group, not subject to an entrance examination, are the highest among all admitted students.

Under the law, private sector dental colleges in India must be organized as nonprofit entities. The nonprofit nature of these institutions was further emphasized by decisions of the Indian Supreme Court in the early 1990s that forced private sector institutions to be subject to fee limits set by states consistent with the requirement of being self-financed, with

half their seats to be made available to meritorious students at subsidized fees.⁸ In practice, the notion of self-financing of dental education is so loosely defined as to be open to a variety of interpretations, and the reality is that substantial under-the-table fees are paid to secure admissions to private sector dental schools. Establishing a new dental college requires two sets of permissions, one at the level of the province (state government and state university approval), and one by the Indian Ministry of Health, with appropriate recommendations of the Dental Council of India (DCI). Criteria include a minimum number of permanent faculty, disciplines, acceptance of curriculum requirements of the DCI, and satisfaction of infrastructure and support staff requirements.

Data Sources

For this project, information was collected on the name, location, year of establishment, current enrollment capacity for training programs, and whether the institution was government-owned, or -operated, or in the private sector. These data were primarily obtained from publicly available information on official websites of the Indian Ministry of Health and direct communication with individual institutions or their websites.

Two types of data were used to assess long-term trends in India’s dental education sector. First, we examined the growth in the number of dental colleges from 1950 until 2005. Second, we sought to construct a time series on enrollment capacity in institutions. We were not able to obtain information on enrollment capacity of institutions for years prior to 2005. Instead, we used current enrollment capacity as a proxy for previous years’ enrollment capacity for individual institutions. Note that this exercise yields an upper ceiling to the enrollment capacity and the number of dental students graduating in any given previous year if we make the reasonable assumption that enrollment capacity of dental colleges does not decrease over time. Note also that the heavy demand and the high fees paid for admissions strongly suggest that dental college enrollment capacity is fully exhausted by admitted students in any given year. Summing up over enrollment capacity since 1950, our estimates of the maximum possible number of dental surgeons (B.D.S. or M.D.S.) that could have been trained in India between 1950 and 2005 came to 88,500, which is higher than the numbers of dental surgeons who registered over the same period, as

reported by the Dental Council of India at 55,344.⁹ Documentation of registration of dental college graduates was very poor up until 1990; this probably explains much of the discrepancy in the two sets of numbers. Nonetheless, bias may result from the fact that, within any given college, enrollment capacity may increase over time and student attrition may be non-zero. To avoid this bias we focused primarily on trends in the number of dental colleges.

In order to compare the growth of dental colleges across states, we also constructed an economic ranking of states based on per capita income in the year 2000. States were grouped into quartiles 1 to 4 based on these rankings, after appropriate weighting by population, as shown in Figure 1.

Results

Table 1 shows the number of dental colleges for undergraduate dental education in India during the period 1950-2005 and shows significant differences between the public and private sectors. The number

of private dental colleges, zero in 1950, is currently 175, nearly six times the number of government dental colleges, which grew much more slowly over the same period. Students in private sector schools account for nearly 90 percent of total enrollment in undergraduate dental education in India, and 85 percent of all dental schools are private.

Table 1 also presents trends in enrollment capacity, assuming that current capacity is the same as in earlier years. Because enrollment capacity in an institution is likely to grow over time, this assumption underestimates the rate of growth of enrollment capacity. In the public sector, annual enrollment capacity grew by at least 1,390 percent over the period 1950 to 2005. By contrast, the private sector saw enrollment capacity increase from no students in 1950 to ten times that of the public sector in 2005. From 1970 to 2005, private sector undergraduate enrollment capacity in dental colleges grew by at least 14,000 percent.

Table 2 presents trends in the regional distribution of dental colleges, based on population quartiles ranked by per capita GDP. Over the period from 1950

Table 1. Trends in dental education in India: numbers of dental colleges and seats, 1950-2005

Year	Number of Seats (000s)			Share of Seats (%)		Number of Colleges			Share of Colleges (%)	
	Public	Private	Total	Public	Private	Public	Private	Total	Public	Private
1950	0.10	0.00	0.10	100.0	0.0	3	0	3	100.0	0.0
1960	0.57	0.00	0.57	100.0	0.0	10	0	10	100.0	0.0
1970	0.75	0.10	0.85	88.2	11.8	13	1	14	92.9	7.1
1980	0.93	0.40	1.33	69.9	30.1	17	5	22	77.3	22.7
1990	1.15	2.36	3.51	32.8	67.2	24	31	55	43.6	56.4
2000	1.39	7.75	9.14	15.2	84.8	30	104	134	22.4	77.6
2005	1.49	14.07	15.56	9.6	90.4	31	175	206	15.0	85.0

Note: The estimates of the number of seats for years prior to 2000 have been derived on the assumption that the seats in dental colleges in earlier years are the same as 2005 levels. The estimate of the number of institutions in various years has been derived from the information on the year of establishment of each dental college.

Table 2. Trends in regional distribution of dental colleges, 1950-2005 (number of dental colleges)

Provincial Ranking by GDP/Capita Quartiles	1950	1960	1970	1980	1990	2000	2005
1	1	1	1	2	10	23	35
2	1	1	2	2	3	10	25
3	0	4	5	8	26	63	93
4	1	4	6	10	16	37	53

Note: States are allocated to quartiles based on GDP in year 2000 (Source: Government of India, 2003); quartile categories and per capita income: 1 (Bihar and Jharkhand, Orissa, Uttar Pradesh and Uttaranchal): Rupees 7,955; 2 (Assam, Arunachal Pradesh, Jammu and Kashmir, Madhya Pradesh and Chhattisgarh, Manipur, Meghalaya, Mizoram, Nagaland, Rajasthan, Sikkim, Tripura, West Bengal): Rupees 12,055; 3 (Andhra Pradesh, Himachal Pradesh, Karnataka, Kerala, TamilNadu): Rupees 15,840; 4 (Chandigarh, Delhi, Goa, Gujarat, Haryana, Maharashtra, Pondicherry, Punjab): Rupees 27,757.

to 1990, regions with the richest 50 percent of the Indian population accounted for about 80 percent of all dental colleges, but after that period, their share declined to about 70 percent of the total number. Thus, the population-weighted share of dental colleges in economically less well off states continues to remain considerably smaller than states that have more economic strength.

Trends in the regional distribution of the number of dental colleges (and enrollment capacity) have been driven largely by growth in the private sector, since only thirty-one of a total of 206 institutions are in the public sector. Table 3 indicates the location of new dental colleges for four periods in India's history: before 1950, between 1950 and 1970, between 1970 and 1990, and after 1990. We find that undergraduate dental education in the private sector in the poorer states lags considerably behind that of the states with the most affluent 50 percent of the population. For instance, in the period 1970 to 1990, only six out of thirty (or 20 percent) among all new private sector dental colleges were created in states with the poorer 50 percent of the population; and nearly 30 percent (forty-three out of 144) of new

private dental colleges in the period 1990 to 2005 were located in states with the weakest economies. The share in total private sector enrollment capacity of the states with the poorest 50 percent of the population currently stands at about 25 percent.

Table 4 presents information for 2005 and highlights the fact that the private sector dominates in the provision of M.D.S., accounting for about 69 percent of all current enrollment capacity, lower than its share in B.D.S. enrollment capacity. There are also differences in the location of M.D.S. enrollment capacity vis-à-vis B.D.S. enrollment capacity. Table 4 shows that 92 percent of all current enrollment capacity (1,195 out of 1,298) in M.D.S. programs was located in states with the richest 50 percent of the population. The share in total private sector M.D.S. enrollment capacity of the states with the richest 50 percent of the population currently stands at about 94 percent.

We also assessed the location of training courses for dental mechanics (dental laboratory technicians) and dental hygienists. A total of nearly forty dental colleges provide certificates/diplomas for two-year programs for parodontal personnel. About

Table 3. New dental colleges by region and period of establishment, 1950-2005

Establishment Date of Institutions	States in Income Quartiles 3 and 4		States in Income Quartiles 1 and 2	
	Public	Private	Public	Private
Before 1950	1	0	2	0
1950-1970	10	1	1	0
1970-1990	7	24	4	6
1990-2005	2	101	4	43
All Years Combined	20	126	11	49

Source: Estimates are constructed using data from the Indian Ministry of Health and Family Welfare and information from individual dental colleges.

Table 4. B.D.S./M.D.S. seats by institutional ownership and income ranking of state, 2005

Provincial Populations by GDP/Capita	B.D.S. Seats		M.D.S. Seats	
	Public	Private	Public	Private
1	160	2,620	28	54
2	290	1,780	21	0
3	420	6,180	110	703
4	620	3,490	243	139
All India	1,490	14,070	402	896

Note: States are allocated to quartiles based on GDP in year 2000. The information in this table does NOT include DNB (Diplomate of the National Board) positions, which are based almost entirely at private hospitals. Data are from the Health Information Bureau of the Directorate General of Health Services, Ministry of Health and Family Welfare, India.

80 percent of colleges providing such courses are located in states with the most affluent 50 percent of the population, and the inequality is particularly glaring in the case of private colleges providing such courses, with more than 90 percent located in the economically stronger states. However, the maximum output of parodontal personnel in India is only about 800 per year, and thus the share of these personnel in the total dental workforce in India is miniscule.

Discussion and Conclusions

The private sector in undergraduate dental education in India has grown significantly over the years in terms of numbers of institutions and currently accounts for 90 percent of undergraduate enrollment capacity. It also accounts for 69 percent of all postgraduate dental education enrollment capacity, starting from negligible levels in the 1960s. The growth of private schools has also been a major factor in influencing the geographic distribution of dental education in India. In 2005, 86 percent of the dental colleges were located in regions with the richest 50 percent of the population. Although the private sector has a significant presence in poorer states as demonstrated by the private ownership of forty-nine of sixty dental colleges, poorer states continue to lag behind richer states in attracting dental education institutions.

Budgetary constraints that have held back public sector financing and growth in the dental education sector is one explanation for private sector growth.¹⁰⁻¹¹ A second explanation is the climate of openness and increased privatization ushered in by the Indian government, starting in the mid-1980s, in the form of relaxed regulations.^{8,12} Third, political leaders and special interest groups found an avenue for large earnings from investments in the relaxed regulatory climate including revenues from providing dental education, in the form of “capitation fees” and high levels of tuition fees from those who could afford to pay.¹² State governments, eager to please special interests and to balance competing caste and ethnic interests, facilitated this process.⁸

The growth in the private dental education sector has the potential of enhancing access to oral health care in India. Indeed, had the growth in capacity described in this report not occurred so that the public sector would have continued to grow at the levels actually seen, our calculations suggest

that the number of trained dental surgeons in India today would have been less than half of their current levels.

The growing private sector also has the potential of influencing inequalities in access to oral health care in India. For instance, data from other countries show that doctors often practice medicine in proximity to their place of training.^{4,13} Available evidence supports a similar conclusion for India, particularly because of the advantages that local/regional candidates have in securing admissions to dental colleges compared to out-of-state residents.¹⁴ Of the merit seats in each state (about 55 percent of all capacity in both public and private schools), 85 percent are reserved for that state’s residents. About 15 percent of payment seats in the private sector are allocated primarily to nonresident Indians and foreigners who can be expected to go abroad after graduation. The remaining payment seats in the private sector are usually open to residents of other states, including poorer ones, but only on substantial payment of fees and in competition with residents of richer states. Assuming that this residual of payment seats is uniformly distributed across all states, we conclude that 60 percent of new graduate dentists will practice dentistry in states with the more affluent 50 percent of the population and 40 percent in states with the lowest per capita income. Even these data do not capture the extent of the inequality involved, because the high cost of dental education increases incentives for dental school graduates to practice in regions of the country with high per capita incomes, which are primarily in urban areas. Indeed, 87 percent of all registered dentists in India are located in states with the richest 50 percent of the population.¹⁵

There are also concerns with regard to the quality of training provided. Despite laws requiring transparent merit-based admissions and a variety of infrastructure and faculty standards, poor implementation of these laws appears to be common. Concerns have been raised about improper admissions under the payment seat categories, given that at least some seats are offered to students at a premium of several hundred thousand rupees (U.S.\$1=45 Rupees).⁸ The fifth year of undergraduate training, which comprises the internship program, is not effectively implemented. Many private dental schools encourage students to complete their internship at another institution (generally in their own home state or town) to save the parent college from the burden of training students for another year. This may well result in less than adequate practical training for students.

There is evidence that many dental colleges are short on staff. Indeed, the rapid growth in the student body and in the number of dental colleges of the type seen in India is highly likely to result in shortage of qualified faculty. At any given time, a typical dental college in India will have almost 500 students, given their annual intake of 100 students and a program of five years' duration. The 150 new dental colleges set up during the period 1990 to 2005 would have needed at least 8,700 new faculty members under the rules of the Dental Council of India. Moreover, nearly 3,000 of the new faculty would be required to have an M.D.S. with at least three years experience under the regulations. These requirements mean that 45 percent of the roughly 6,600 individuals who graduated with an M.D.S. from 1970 to 2002 would be needed to serve as faculty, which is large, given emigration rates of 10-15 percent among graduates, demand from preexisting institutions, and the obvious preference for private practice after several years of expensive training. Not surprisingly, faculty members in many dental colleges are engaged in significant private practice with comparatively less time to devote to teaching. The Dental Council of India recently issued "show cause" notices to many faculty members for not performing full-time work and the management in several dental colleges for lacking infrastructure.¹⁶ The Indian Ministry of Health and Family Welfare, on its website, listed several dental colleges in the state of Bihar as being "ineligible" to admit students, presumably owing to a lack of infrastructure and faculty.¹⁷ The shortage of faculty and lack of infrastructure at private dental colleges may be a temporary bottleneck, however. The recent emphasis on postgraduate education in dental colleges has eased some of this pressure, particularly in dental colleges located in the southern region of India.

Even apart from concerns relating to the quality of education provided to dentists, there are other policy issues of interest in the Indian context. Dental professionals in India are trained mainly to provide treatment with a strong curricular emphasis on technical skills, with minimal emphasis on prevention of oral disease. In this connection, there is resistance to employing paramedics and parodontal personnel in oral health prevention and oral health care delivery programs. One consequence has been the very low number of dental hygienists and dental mechanics trained in India, some 800 annually, who could potentially help with addressing regional inequalities and preventive work at lower costs.

From our perspective, the following policy steps have the potential to address concerns about quality and access in the Indian dental education sector. First, some regulatory caps may need to be imposed on states with very large numbers of dental colleges. These caps need to be accompanied by efforts to promote, with appropriate regulatory support, the development of dental colleges in northeast India, central India, and the northernmost Indian state of Kashmir, which lack dental colleges. Related to this, there is a need to increase the number of parodontal personnel (dental hygienists, dental mechanics) because so few are trained each year. A special cadre of chairside dental assistants (expanded duty dental assistants), which does not currently exist in India, is also needed. These individuals can assist the dental surgeon in carrying out reversible procedures such as fillings, impressions, placement of orthodontics brackets, etc, and thereby reduce the demand for highly trained personnel for such procedures. Finally, we suggest increased one-year diploma and certificate courses in a few disciplines for those wishing to upgrade their clinical skills and who, by taking up junior faculty positions, may potentially help overcome the temporary acute shortage of faculty in Indian dental colleges.

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