# WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH
## www.wjpmr.com

# DENTAL MANPOWER PLANNING MECHANISMS- GLOBAL SCENARIO; A SCOPING REVIEW

**Dr. Dhanya Raghunathan*[1], Dr. Deepti Vadavi[2], Dr. Harikiran A.G.[3]**

[1]Assistant Professor, Department of Public Health Dentistry, Govt. Dental College, Trivandrm.
[2]Reader, Department of Public Health Dentistry, DAPM RV Dental College, Bangalore.
[3]Professor, Department of Public Health Dentistry, DAPM RV Dental College, Bangalore.

**\*Corresponding Author: Dr. Dhanya Raghunathan**

Assistant Professor, Department of Public Health Dentistry, Govt. Dental College, Trivandrm.

**ABSTRACT**

**Introduction:** Oral diseases are considered as one of the major public health problems globally. An efficient dental manpower planning model can significantly contribute to a healthy nation. This review appraises the various dental manpower planning mechanisms in different countries. **Methodology:** After a thorough literature search, by using appropriate MESH terms and Boolean Operators, a total of 38 articles were obtained after applying the eligibility criteria. **Results:** The various studies have been categorised under four main themes. These themes dealt with the various health manpower planning models, dental manpower planning mechanisms including need based, demand based models, Health and Oral health care workforce in different countries. The use of GIS mapping has become a potential tool in manpower planning. The common dental manpower planning models are need based and demand based models. Need-based planning methods use empirical assessments of the risks to and levels of health in populations as a determinant of the health care services they require whereas the demand for dental services is defined as multivariate functional relationships between quantities of dental services that its members desire to consume over a relevant time period at given levels of prices and goods of services, financial resources etc. A SWOT analysis of manpower planning in India revealed the need for an efficient manpower planning mechanism with equitable distribution of dentists in rural and urban areas. **Conclusion:** These mechanisms helped us to identify the existing lacunae in India's dental manpower planning and addressed the need for an efficient planning mechanism.

**KEYWORDS:** Public health problems globally.

## INTRODUCTION

The increasing global burden of oral diseases serves as a major barrier to the development and achievement of sustainable development goals. Dental Manpower Planning is the process whereby a determination is made regarding the appropriate numbers, types, and distribution of individuals capable of providing dental health services to achieve a desired goal. Thus the reliability of any personnel planning model will be strongly influenced by its ability to estimate future need and demand levels.[1]

All stakeholders should underpin the need for a structured approach toward health manpower planning in the form of a more coherent system of planning, decision making, and control. We need to look at an ideal Dental Manpower planning model where dentist is one of the stake holders and not the only ones. A more efficient dental manpower planning would have resulted in

addressing the oral disease burden and oral health inequity in India.

Various reasons account for the inefficient dental manpower planning mechanism in our country. One of the reasons for this may be the lack of information and knowledge among the authorities regarding the same.

Various dental manpower planning mechanisms are being followed in different parts of the world, but no documents are easily available in the public domain on the merits and demerits of any of these mechanisms. Such a document on dental manpower planning, identifying the existing lacunae, addressing the challenges, will be of great use to various stakeholders in deciding the most appropriate mechanism in the Indian scenario.

This review seeks to address this gap by collating and analysing different dental manpower planning mechanisms. This appraisal makes recommendations to

guide policy makers in effective dental manpower planning.

## METHODOLOGY

A comprehensive search strategy was conducted in the following sources to identify the different dental manpower planning mechanisms:
a. Electronic database
1. Pub med
2. Science Direct
3. Google Scholar
4. Cochrane library
5. Directory of Open Access Journals
6. Biomed Central
b. Books
c. Gray Literature like unpublished literatures, dissertations, conference reports

The keywords from relevant articles were utilized to identify relevant MeSH [Medical Subjective Heading] terms. A finalized list of MeSH terms were constructed, after eliminating redundancies, which are as follows: Dental manpower, Health Personnel, Health manpower, Planning mechanism, Planning model, Need, Demand, Supply, Utilization of services, Dental education, Developed, Developing, Distribution of dentists, Dentist population ratio, Practice population ratio, Stakeholders.

Search strategy using the relevant MeSH terms with appropriate use of Boolean Operators:
1. Health personnel AND Planning model OR Planning mechanism
2. Health manpower AND Planning Mechanism AND Developed countries
3. Health manpower AND Planning model AND Developing countries
4. Health Personnel OR Dental manpower AND Planning Mechanism
5. Dental manpower OR Health Personnel AND Planning
6. Dental manpower AND Planning mechanism OR Planning Model
7. Dental manpower AND Planning mechanism AND Developed countries
8. Dental manpower AND Planning mechanism AND Developing countries
9. Dental manpower AND Need OR Demand AND Utilisation of services

The following filters were activated to limit the search and are as follows:
• Publication Dates: 1970 till 2015
• Article Types: Original research articles, Systematic reviews, Descriptive study, Narrative reviews
• Language: English

The Title and the abstracts of the articles obtained were screened for relevance. Articles which were obtained as a result of conducting the above mentioned search strategies were screened to fit the eligibility criteria and in case of ambiguity full text was referred.

### Eligibility Criteria
a) The title of the article addresses the subject of interest
b) The aim and objectives of the article are in alignment with the study aim and objectives
c) The abstract of the article conveys information regarding
a. Various health and dental manpower planning mechanisms in the world and India
b. Health and Oral health care workforce in different countries

Final outcome of this literature search was 38 articles- 12 review articles and 26 original research articles.

## RESULTS AND DISCUSSION

The 38 articles obtained on manpower planning mechanisms/ models were categorized into the following themes:
1. Health Manpower Planning Models
2. Dental Manpower Planning Mechanism
3. Health Care Workforce in Different Countries
4. Oral Health Care Workforce in Different Countries

### Health Manpower Planning Models
Human resources for health are central to managing and delivering health services, and play an integral part in nation's economy. Health manpower planning models have evolved over the years, and the concepts and principles of these are generally applicable to any country.

Econometric Approach of Health manpower planning focuses conceptual design of 2 models utilizing two different techniques. Macro econometric model involves utilizing aggregate data to investigate issues in comprehensive health planning at the national, state, and sub state levels. Micro simulation model involves treating the interactions of individuals, health manpower personnel, health service institutions, and health professions educational institutions in the analysis of health manpower policies for the nation as a whole.[2] These models help us to obtain an efficient allocation of health manpower and related resources, thus forming the basis for any manpower planning.

Health manpower planning in European countries are typology models of target, process and outcome. This incorporates political, organizational, economic, cultural, technological, social, educational factors and on health labour market situation i.e. unfilled positions in health services, excessive hours of work, easiness of referral, waiting time for elective surgery and consultation, patient satisfaction.[3]

The development of health geographic information system (HGIS)[4] was associated with the wide

availability of software applications, proved to be an important tool in health evaluation and planning. HGIS has proven to be a potent tool for risk assessment, decision making, intervention evaluation and health planning.

In spite of all the obstacles, the transformation of geographic information systems (GIS) into an epidemiological tool adapted to the health system (HGIS) can now be done in a relatively short span of time, with a minimal investment in terms of budget and manpower. The advantages of HGIS includes identifying the health trends, tracking the spread of infectious diseases, utilizing personal technology, incorporating social media and incorporating services.[4]

WHO has been using mapping techniques coupled with surveillance to monitor the global health situation and present it through user-friendly and modern tools such as geographic information systems.[5] Public health mapping utilizes the technology of geographic information systems to add value to information for public health planning and decision making.

The role of health mapping has many aspects and influences the performance of health systems in many ways. It improves the ability of decision-makers, planners, academicians, researchers and health care professionals to organize and link thematic and spatial datasets. These links help in discovering and creating new health knowledge which can be translated into action or policies.

Health manpower planning is crucially important for countries with scarce indigenous human resources, such as the oil-rich developing countries in the Middle East. Most of these countries have adopted a policy of indigenization. An integrated computer-based model which enables simulation of alternative human resources and health system infrastructural strategies has been opted in these countries.[6] The model attempts to project recruitment of expatriate and national staff in the future, and also to study the likely levels of indigenization that this will entail.

**Dental Manpower Planning Mechanism**
The three most common ways to develop models of dental personnel are need-based models, demand-based models, and Dentist-to-population ratios.[7] The ultimate choice of a model is based on either the availability of data to support the model or on the political or philosophical basis of those doing the evaluation.

Need-based planning methods use empirical assessments of the risks to and levels of health in populations as a determinant of the health care services they require.

The Indian Health Service (IHS) plan for the needs of the entire American Indian and Alaskan Native (AI/AN) population and distribute resources as equitably as possible. The need-based approach to manpower planning developed by the IHS Dental Program has exhibited utility and flexibility over time. It allows a determination of clinic size (number of operatories) and dental staffing requirements, and generalizable to other public health programs if an accurate assessment of utilization rate and treatment need can be made for the defined population.[8]

A model in a private clinic determined the time spent for each service and mean annual effective practice time of service providers. Data gathering tool was a self-administered questionnaire, involving type of services they provide for patients in their private clinics, mean time they spend to provide above services and the total weekly time they deliver care in their clinics.[9]

The results of this study could be used to estimate dental workforce. This study shows that general practitioners equally involve in all type of services.

According to a survey on utility and demand of dental health care by people, the majority of people's demand is provided by general dentists in comparison with other dental health care providers.[10]

The most frequently used need based techniques in manpower planning are FDI technique and system dynamics model. In FDI technique, the projected population was divided into five age groups and the dental service need was calculated on the basis of lifetime of care for each age cohort. The service need also includes the need for maintenance care, repeated care and replacement care.[11] System Dynamics Model is a complex model was used to predict service needs in each age group in this technique. System Dynamics Modelling, is the computerized model based on the conceptualized interactions of multiple factors within the study system. The model explained the change in behaviour of treatment need according to the changes in the input factors such as treatments, socio-economic factors, trend of oral diseases, and structure of health service.[12] However, the projected service need was converted into manpower requirements in the same manner as in the FDI.

The demand for dental services is defined as multivariate functional relationships between quantities of dental services that its members desire to consume over a relevant time period at given levels of prices and goods of services, financial resources etc.[13]

Thus the demand for dental care depends on underlying oral health status, perceptions of efficacy of oral health care, and the cost of oral health care.

Demand will be less than need because seeking care involves out of pocket cost, travel and waiting time, lost wages, discomfort, emotional or psychic costs.

A combination of demand and need based manpower planning is opted by many countries. Srilankan Manpower Planning Model has two components, representing supply and demand for dental-care services. The supply-side component uses system dynamics to represent the career progression of dentists.The demand-side model calculates a range of future demand scenarios for dental care, based on different assumptions about Sri Lanka's potential future economic development.[14]

To assess the Influence of distribution of Wisconsin dentists across the state's 72 counties, a multivariate regression model was used to estimate the expected number of dentists (general practitioners and specialists, separately) in a county based on the population and socioeconomic and demographic characteristics of each county.

The model incorporates data on population size, population age and gender, land area, local rents, median household income, percent Medicaid eligible, average number of DMFS (national data), and the percent of population with fluoride-deficient water. The model was used to generate information about current dentist shortages/surpluses by country.[15]

Manpower estimation in Thailand involved the whole population and the population in 5 different age groups- 0-5, 6-14, 15-29, 30-59, and 60 years old and over- in the target year were estimated from the growth model.The DMFT (decay, missing, filling) and CPI (community periodontal index) from the three National Oral Health Surveys were used to project the trend of oral diseases in each age group by using simple regression analysis. The future active supply of dental personnel was calculated by subtracting projected losses of dentists from the current active supply and the annual output of the new graduates.[16]

The data for estimating Dentist Population Ratio (DPR) was obtained from various sources and using GIS, DPR in each county was calculated. The same method was followed in Mississipi and Australia.[17,18]

**Health Care Workforce in Different Countries**
All workforce categories in Oman have grown substantially over the last two decades. Increased self-reliance was achieved despite substantial growth in workforce stocks. Stocks of physicians and nurses grew significantly during 1985–200. Beginning with the formulation of a strategic health workforce development plan in 1991, the stage was set for adopting workforce planning as an essential strategy for sustainable health development and workforce self-reliance.[19]

Key concept of Canadian workforce planning begins with "medical career life cycle," beginning with entry to medical school and ending with exit from practice. To apply this concept, it is essential to have a current information base that will contain data on numbers of physicians, where they are, what they do, and how active they are.They assessed recent initiatives in the establishment of physician-resource databases in Canada by medical associations, governments, licensing bodies, certifying colleges, and other groups with a respect to comprehensiveness and comparability of key data elements and their ability to address key policy questions in physician-resource planning and to identify opportunities for collaboration and links.[20]

Workforce models vary from one country to another based on the needs and demand of people.

**Oral Health Care workforce in different countries**
Mainly Private dental practitioners delivered oral health care in United States. As of 2009, there were 186,084 professionally active dentists and 91.7% of them were private practitioners. The dentist/population ratio in the US is 0.6/1000 population. Currently, 35 states have policies that allow dental hygienists to work in community-based settings to provide preventive oral health services without the direct supervision of a dentist. At the same time, 15 states recognize and reimburse hygienists as Medicaid providers.[21]

Oral health care in the UK is delivered in three ways: secondary and tertiary dental services are delivered in acute hospitals (and some single-specialty hospitals); community dental services, such as screening of schoolchildren, oral health promotion and dental services for patients with special needs are provided in community settings.[22]

There are seven types of recognized dental auxiliaries: dental nurses (dental assistants), dental hygienists, dental therapists, orthodontic therapists, dental technicians, clinical dental technicians (denturists) and oral health educators. Dental hygienists may only work under the direction of a dentist, who must prepare a treatment plan, but need not be on the premises during treatment.[22]

Oral health care in France and Canada is mainly provided by self-employed practitioners. While there is no real public dental service in France, a small number of practices are owned by the State Health Insurance schemes, municipalities, or mutual insurance companies. A number of allied dental professionals support dentists in their work, including dental hygienists, dental assistants and dental technologists. In select jurisdictions, dental therapists and denturists have legislated practice, and offer services independent of dentist.[23]

In Brazil, there are five recognized oral health care professionals: dentist, dental hygienist, dental assistant, dental technician and dental technician assistant. The last two professionals are permitted to produce technical work under the prescription of a dentist, but cannot work in the mouth. The Federal Council of Dentistry is the Brazilian authority responsible for the registration and regulation of all oral health care providers.[24]

**SWOT Analysis and Conclusion**

A SWOT analysis of Dental health care workforce in India revealed that the main strength being a progressive increase in training capacity in the past two decades. Key finding regarding workforce production is the increase in training capacity because of the growth in private sector involvement in dental education. This trend seems likely to increase, since incentives and regulation relaxations have been introduced to encourage private investment in dental education.

Weaknesses being the primary data used in any study involving the numbers of dental health personnel registered with the Dental Council of India have several limitations. These councils do not maintain live registers. The information they provide may be inaccurate owing to non-adjustment for deaths, migrations and retirements, or double counting of workers registered in more than one state. Furthermore, not all state councils follow the same procedure for registration, which may compromise direct comparisons.[25] Data for dentists in some states (e.g. north-east India) are not available because there are no state-specific professional councils.

Threats to the Dental health care workforce elicited in literature includes though privatization of dental education has helped to overcome the shortcomings resulting from inadequate expansion of the training capacity in the public sector, but also raised questions on the quality of dental training, the gross inequality in the distribution of the training institutes among the different states, increased mismatch between dentists production and job opportunity in government hospitals/public health sector. The biggest challenge is the need for dental health planners with relevant qualifications and training in public health dentistry. There is a serious lack of authentic and valid data for assessment of community demands, as well as the lack of an organized system for monitoring oral health care services need to guide planners.[26]

The production of dental graduates is increasing at a rapid rate and the future of these dental graduates is unpredictable especially with regard to job opportunities. There is a necessity to stop the opening of new dental colleges, to reduce the existing number of undergraduate seats and to promote the participation of dental auxiliaries in oral health promotion, prevention and treatment.

**REFERENCES**

1.  Jain Hemant, Agarwal Aparna. Current Scenario and Crisis Facing Dental College Graduates in India. JCDR, 2012 Feb 15; 6(1): 1–4.
2.  Yett DE, Drabek L, Intriligator MD, Kimbell LJ. Health Manpower Planning. Health Serv Res, 1972; 7(2): 134–47.
3.  Coelho G, Batenburg R. Health manpower planning in European Union countries Explaining crossnational variation, 2010.
4.  Karsenty E, Leventhal A. [Health Geographic Information System (HGIS)-a tool for health planning and epidemiology]. Harefuah, 2002 Dec; 141(12): 1070–5, 1089.
5.  World Health Organisation; Regional Committee for Eastern Meditteranean. Health Manpower Planning [Internet]. 2007 [cited 2015 Nov 24]. Available from http://apps.who.int/iris/bitstream/10665/122558/1/E M_RC54_Tech_Disc_3_en.pdf.
6.  Ghosh B. A Health Manpower Planning Model for Oil Rich Nations [Internet]. IIM, Bangalore; Available from: http://www.iimb.ernet.in/research/sites/default/files/ wp.iimb_.59.pdf.
7.  Godman H, Weyant R. Dental Health Personnel Planning: a Review of the Literature. J Public Health Dent, 1990; 59(1).
8.  Dental Manpower Planning in the Indian Health Service - Collins - 2007 - Journal of Public Health Dentistry - Wiley Online Library [Internet]. [cited 2015 Nov 6]. Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1752-56.
9.  B Sharma, F Faizal. Dental care provision in private clinics: an introductory explanation for dental manpower estimation and dentistry educational needs assessment. J Med Educ, 2005 Winter; 6(2): 137–9.
10. Murphy G, Birch S. Needs-Based Health Human Resources Planning; The Challenge of Linking Needs to Provider Requirements. Can Nurses Assoc Can Med Assoc, 2007; 1(1): 1–36.
11. Komson Punyasingh SU. Baseline projection of requirements for dental health manpower in Thailand (1995-2015 AD.). Hum Resour Health Dev J, 1997; 1(1): 24–34.
12. Homer JB, Hirsch GB. System Dynamics Modeling for Public Health: Background and Opportunities. Am J Public Health, 2006 Mar; 96(3): 452–8.
13. Albert DA, McManus JM, Mitchell DA. Models for delivering school-based dental care. J Sch Health, 2005 May 1; 75(5): 157–61.
14. Brailsford S, De Silva D. How many dentists does Sri Lanka need? Modelling to inform policy decisions. J Oper Res Soc, 2015 Sep; 66(9): 1566–77.
15. Groenewegen PP, Postma JH. The supply and utilization of dental services. Soc Sci Med 1982, 1984; 19(4): 451–9.
16. Duangjai Lexomboon KP. Supply Projections for Dentists, Thailand (2000-2030). Hum Resour Health Dev J, 2000; 4(2): 94–105.
17. Krause D, Frate DA, May WL. Demographics and distribution of dentists in Mississippi: a dental work force study. J Am Dent Assoc 1939, 2005 May; 136(5): 668–77.
18. Tennant M, Kruger E, Shiyha J. Dentist-to-population and practice-to-population ratios: in a shortage environment with gross mal-distribution what should rural and remote communities focus

their attention on? Rural Remote Health, 2013 Dec; 13(4): 2518.

19. Zurn P, Dal Poz MR, Stilwell B, Adams O. Imbalance in the health workforce. Hum Resour Health, 2004 Sep 17; 2: 13.

20. L B, S N. An overview of Canadian physician work force databases. Clin Perform Qual Health Care, 1996 Dec; 5(2): 56–60.

21. Neumann D, Quinonez C. A comparative analysis of oral health care systems in the United States, United Kingdom, France, Canada, and Brazil. Netw Can Oral Health Res [Internet], 2014; 1(2). Available from:
http://ncohr-rcrsb.ca/knowledge-sharing/working-paper-series/content/garbinneumann.pdf.

22. Boyle S. United Kingdom: Health System Review. Eur Obs Health Syst Policies, 2011; 13(1): 1–22.

23. Thomson S, Osborn R. International Profiles of Health Care Systems [Internet]. The Common Wealth Fund; 2013. Available from:
http://www.commonwealthfund.org/~/media/Files/Publications/FundReport/2013/Nov/1717_Thomson_intl_profiles_hlt_care_sys.

24. Saliba NA, Moimaz SAS, Garbin CAS, Diniz DG. Dentistry in Brazil: Its History and Current Trends. J Dent Educ, 2009 Feb 1; 73(2): 225–31.

25. Vundavalli S. Dental manpower planning in India: current scenario and future projections for the year 2020. Int Dent J, 2014 Apr; 64(2): 62–7.

26. Chauhan LS. Public health in India: issues and challenges. Indian J Public Health, 2011 Jun; 55(2): 88–91.