For Technical Healthcare Professionals

TALENT GROOMING PROGRAMME (COHORT 12)

PROJECT PROPOSAL

SUPPLY AND NEEDS-BASED REQUIREMENT PROJECTIONS OF MALAYSIAN DENTAL SPECIALIST (NON-HOSPITAL BASED) USING SYSTEM DYNAMICS APPROACH
2025 – 2035
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by

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1. INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Human resource for health is vital in providing essential health interventions to the population. A successful health system depends on the provision of effective, efficient, accessible, sustainable and high-quality services by a workforce that is sufficient in number, appropriately trained and equitably distributed. Currently, the dental workforce in Malaysia is largely made up of general dentists, with some specialists, and dental auxiliaries.

Specialist services in Ministry of Health Malaysia commenced in 1950 with the establishment of oral surgery centres in Johore Bahru and Penang. In recent decades, Malaysia has strived to produce dental specialist by rapidly increasing the number of postgraduates' programmes both in public and private local institutions.

The Dental Act 2018 came into force on 1st January 2022 when the Dental Regulations 2021 was adopted. The new Act requires that dental surgeon who fulfil the criteria entitling them to register as a specialist must be registered under this Act to practice in their registered specialist field legally. Twelve dental specialty fields has been recognised by the Malaysian Dental Council namely oral and maxillofacial surgery; paediatric dentistry; oral pathology and oral medicine; special care dentistry; forensic odontology; oral and maxillofacial radiology; dental public health; orthodontics; periodontics; restorative dentistry; prosthodontics; and endodontics

Taking into cognisant of the current development of dental specialties in Malaysia and needs of the population, evidence on supply and requirement of dental specialist has become a necessity to guide policymakers to formulate solutions to overcome the challenges in oral health workforce planning.

1.2 PROBLEM STATEMENT

Although supply and needs-based requirement projections using system dynamics approach has been established for dental surgeons in Malaysia, it did not cover the projection of dental specialist. Hence, the current resource planning process for dental specialist is done manually and limited to the Ministry of Health which leads to unreliable and slow in retrieving the information needed for strategic planning by the policymakers as they ascertain the demand and supply of dental specialists. This study therefore intends to develop models to be used for the supply and requirement projections of selected dental specialists in Malaysia.

1.3 RATIONALE FOR STUDY

- To ensure that the number of dental specialists corresponds to the change in the population's oral health needs in the years to come.
- To investigates the nature of oral health care services and factors influencing the supply and requirement of dental specialists.

1.4 OBJECTIVE

1.4.1 AIM
To develop models to be used for the supply and requirement projections of non-hospital based dental specialists in Malaysia.

1.4.2. SPECIFIC OBJECTIVES
- To forecast the supply and requirement of orthodontists, periodontist, restorative dentistry specialists and dental public health specialist for the country over the planning horizon up to 2035.
- To identify the effect of various future health population trends and scenarios on non-hospital based dental specialists supply and requirements by conducting the what-if and gap analysis**.**

2. LITERATURE REVIEW

2.1 HEALTH HUMAN RESOURCE PLANNING

The health human resource is the pillar of health systems, fundamental towards achieving universal health coverage (UHC) and meeting sustainable development goals (SDGs) (Balasubramanian et.al.,2021). The World Health Organization's global strategy on human resources for health includes an objective to align investment in human resources for health with the current and future needs of the population. Although oral health is a key indicator of overall health and wellbeing, and oral diseases are the most common non communicable diseases affecting half the world's population, oral health workforce planning efforts have been limited to simplistic target dentist-population or constant services-population ratios which do not account for levels of and changes in population need (Ahern et.al.,2019).

Planning for the future health human resource involves complex process, requiring trade-offs across multiple health professional objectives in education, training and regulation, and numerous uncertainties due to transition health environments (demographic, epidemiologic and technology). The philosophy behind planning is to ensure the right number of health personnel, with the right training and skill sets are available at the right place and at the right time to meet population needs, but at an acceptable cost and quality (Balasubramanian et.al.,2021).

Health human resource planning (HRP) dates back to the 1960s and over the past two decades, there has been a growing body of published health human resource planning literature, broadly covering demand-based, supply-based and more recently a limited number of needs-based planning approaches mainly for physicians, general practitioners and nurses (Ahern et.al.,2019).

Planning for the future oral health human resource in general presents its unique challenges. One of the challenges that is related to the dental specialty is the distinct

specialist dental professionals exist, which not all can gain equal importance in the planning exercise (Balasubramanian et.al.,2021).

2.2 APPROACHES TO HEALTH HUMAN RESOURCE PLANNING

Traditionally, four broad approaches to health human resource planning have been identified in the literature: needs-based, utilisation or demand-based, health workforce to population ratio, and target setting approach. Each of these approaches includes at least one or more of the basic building blocks in modelling: supply, demand and need (Balasubramanian et.al.,2021).

Supply models estimate the number of health personnel available based on the current stocks, flows/migration, and newly trained personnel. Demand or needs model estimate health personnel required to meet the underlying population demand or needs respectively. Needs are identified through epidemiological surveys, accounting for diseases prevalence and health status. Demand is identified through health service utilisation. Supply and demand/needs models are usually presented together, so the combined model can determine the gap in health personnel availability (Balasubramanian et.al.,2021).

A study done by Cave (2014) found diversity in the methods used for HHP, perhaps demonstrating a lack of coherence in how best to approach this important requirement. The most frequently used approach is to rely on traditional models based on current levels of supply and/ or utilization. Very few models used a needs-based approach.

Birch et al. (2007) recommended a needs-based model for HHP to address the deficiencies of traditional demographic-based models (i.e., models where only the size and age distribution of the population change). In this approach, ratios of provider or utilization to population are variable and determined by 1) health care needs and risks; 2) the level of service that policy makers plan to provide for different risk groups in the population; and 3) the productivity of the workforce associated with the models of service

delivery to be used, taking into account opportunities for alternative skill mix (O'Malley, et al., 2022).

Compared with existing HHP models, the needs-based model is aligned directly to the objective of healthcare systems, meeting the needs of populations and patients, and relates service and workforce levels to needs explicitly. In this way, the approach ensures that estimated workforce requirements reflect needs for care in the population and responds to changes in needs over time (Birch, et al., 2021).

Gallagher et al. (2013) noted that application of this need-based model requires data to be collected periodically and consistently on the needs of the population, not merely the services provided to patients This has obvious resource implications and might be a reason why less sophisticated approaches to HHP are still adhered to (O'Malley, et al., 2022).

Implementing a needs-based planning model is not without its challenges. This approach must be data driven and primarily requires data on the needs of the population, evidence-based care pathways, and productivity. It is unlikely that "perfect" data will be immediately available for each element of an integrated need-based model. A first step would be to obtain an agreed understanding of how systems can benefit from a need-based approach and what data are required to inform HHP and policy. Implementation is most likely to be incremental, where there is a gradual move toward the ideal data requirements (O'Malley, et al., 2022).

System dynamics modelling is the preferred modelling tool for the Centre for Workforce Intelligence (CfWI), UK since it is most appropriate to complex systems with feedback e.g. health and social care workforce planning, and can easily be extended or revised to address additional issues as they arise (Cave et.al., 2014).

The use of a system dynamics approach meant that robust, evidence-based supply and demand models could be created to test future potential policies and their impact. It also meant that the model was "transparent" and made it possible to synthesise the expertise

of several hundred stakeholders from within the dentistry system. The model also enabled rapid policy analysis to be carried out, allowing the impact of different policy levers to be explored (Cave et.al., 2014).

3. METHODOLOGY

In this study, the HHP forecasting will be carried out based on the framework from the study on Supply and Needs-Based Requirement Projections of Malaysian Human Resources for Health Using System Dynamics Approach 2016 – 2030 (Planning Division, 2019). The framework was adapted from Birch et al. (2007) and Tomblin-Murphy et al. (2009) that consists of three main modelling components in the framework: the Supply, Requirement and the Gap models.

3.1 SUPPLY MODELLING

The supply projection model is devoted to identifying how many dental specialists are or will be available to deliver health services to the population. It requires careful calculation of the numbers of new entrants into the health workforce, the capacity to produce more or fewer health workers in the future and recruit them into the health services industry, and the loss rates through retirement, emigration, death or pre-retirement leaving. (Planning Division, 2019).

3.2 REQUIREMENT MODELLING: THE NEEDS-BASED APPROACH

With the needs-based approach, the requirement of dental specialists will be estimated based on population, health care needs and have considered the following four main factors i.e. (1) demography; (2) epidemiology; (3) level of service; and (4) productivity (Planning Division, 2019).

3.3 SUPPLY AND REQUIREMENT GAP ANALYSIS

Gap analysis is simply a comparison between the output from the supply model to output from the requirement model, which is the number of dental specialist supply and dental specialist requirement. The outputs are in full-time equivalent (FTE) and headcount unit. In the event of substantial undersupply or oversupply, possible intervention can be simulated through scenario analysis (Planning Division, 2019).

3.4 APPLICATION OF SYSTEM DYNAMICS APPROACH IN DENTAL SPECIALIST WORKFORCE MODELLING

Vensim software will be used as a tool to build the system dynamic (SD)-based projection models. SD enables complex dental specialist workforce supply and requirement to be better understood and their behaviour over time to be quantified and projected using computer simulation (Planning Division, 2019).

In this project, various dental specialists and experts in SD modelling from public universities, will be together developing the system dynamic models based on the modelling framework. The models will be used to provide the supply and requirement projections of five selected non-hospital based specialist professions, namely orthodontists, periodontist, restorative dentistry specialists and dental public health specialist.

3.4.1 Supply Sub-Models

The supply consists of three (3) sub-models; Training, Population and FTE as illustrated below (Planning Division, 2019):
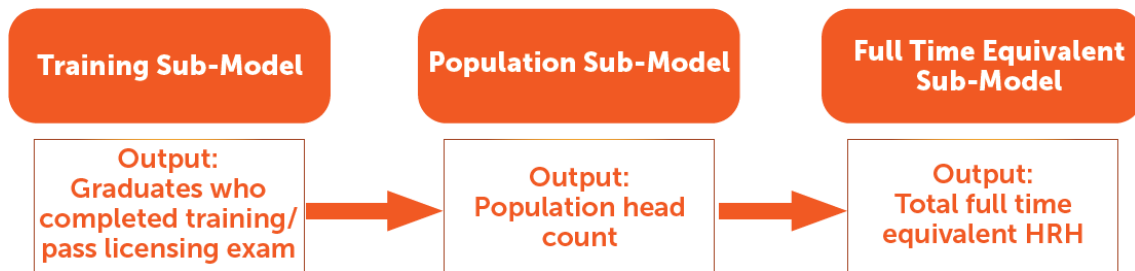
3.4.2 Requirement Sub-Models

By using the system dynamics approach, the requirement model will be used to determine the number of dental specialists required to attain the population health care needs (as opposed to health care demand/utilisation). The needs will be derived from the factors included in the Needs-based approach and defined from the perspective of health care providers. The requirement sub-models will be structured based on two (2) categories of Malaysian common health care provider's services which are the preventive care and disease-based care (Planning Division, 2019).

REQUIREMENT MODEL	
Service Category	**Sub-Model**
1. Preventive Care	1. Preventive Care
2. Disease-based care	1. Dental caries 2. Periodontal 3. Malocclusion

3.5 DATA USED IN DENTAL SPECIALIST PROJECTION MODELLING

Data to project supply and requirement of dental specialists in this study will be obtained from various combinations of primary and secondary sources. The broad list of data and possible data sources that will be obtained and considered to be used in the study are as follow:

a) Training Sub-Model

Data on training including the number of post-graduate student intakes, enrolment, drop-out, number of graduates by training institutions will be obtained from dental faculty in local universities, MOH Training Management Division and education sponsorships agencies

b) Population Sub-Model

Data on total stocks, newly graduated/ gazetted dental specialist, number of health professional by age group and gender as well as service data, which includes resignation, retirement and death, will be obtained from MOH Human Resource Division, MOH Training Management Division, dental faculty in local universities and Dental Services Malaysian Armed Forces. Age-specific mortality rate will be obtained from the Department of Statistic.

c) FTE Sub-Model

Data on distribution of dental specialist in direct and indirect patient care, postgraduate and post-basic study and maternity leave will be obtained from dental faculty in local universities, Human Resource Division and MOH Training Management Division.

d) Requirement Model
- Incidence and prevalence of disease data from National Oral Health Survey of Adults 2010 (MOH Oral Health Division, 2012).
- The utilisation of healthcare services and service coverage data will be obtained from the National Health and Morbidity Survey, Health Information Management System and the Oral Health Programme annual reports.

In the model development phase, multiple stakeholders such as experts in respective fields will be consulted to construct the model. In addition, Clinical Practice Guideline (CPG) of services and Standard Operating Procedures (SOP) will be used as a guide.

Stakeholder will be consulted to assist in identifying the most suitable data to be used in the supply and requirement model. If data is unavailable, inputs from expert opinions will be used by gathering it using appropriate tool/ method.

4. PROJECT WORK PLAN

The table below shows the anticipated schedule for the project. It is divided into two segments for clarity given the two-year duration of the project.

Task	2022						
	Jun	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Research proposal							
Data collection							

Task	2023												2024
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**
Data analysis and modelling													

Interim report writing						▓								
Final report writing										▓	▓	▓		
Project submission													▓	

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