

Planning the future of oral health care workforce: Moving beyond demographic change

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The adoption of Universal Health Coverage for oral health care will not be sufficient to ensure that health care resources are accessible in accordance with needs for care. Government intervention in planning and allocating resources will be required to replace traditional market forces if market failure is not to be replaced by government failure. In this paper we explore the limitations of current ‘fixed in time’ approaches to planning the oral health care workforce and present an enhanced dynamic model for workforce planning that responds directly to changes in population, evidence-based best practice and new models of care.

Keywords: *Oral Health, Health Workforce, Population needs*

Introduction

Recognition of market failure in health care, under which the assumptions of ‘free market’ to allocate health care resources in line with health care goals and objectives, underlies government intervention in health care. In particular, consumers of health care rely on the providers of health care for advice on what care to consume so, the assumption of independence between supply and demand is violated and the market cannot be relied on to allocate resources efficiently. However, government intervention will not resolve the challenge unless it is based on planning and allocating resources that relates directly to public goals. As increasing attention is given to the use of Universal Health Coverage to achieve access to care in accordance with the needs for oral health care in populations, the need for policies to promote efficient workforce models for oral health services and innovative solutions to deliver optimal oral healthcare for all has been recognised (Ahern *et al.*, 2019; Birch *et al.*, 2021; Glick & Williams, 2021; WHO, 2021).

In this paper, we focus on the development of an oral health workforce planning framework required to support policies aimed at providing oral health care in accordance with the needs of populations. We show how traditional approaches to health workforce planning are based on simple, ‘fixed in time’ extrapolations of existing service coverage and rates of utilisation that fail to respond to dynamic changes in the needs of the populations being served, the evidence-based services required to meet those needs and developments in the models for delivering those services. An alternative approach is presented that relaxes the ‘fixed in time’ assumptions in order to produce an integrated planning framework for the oral health workforce that links and is responsive to changes in epidemiology, technology, and models of service delivery.

Approaches to estimating the future

The costs of health care are predominantly associated with the cost of health care workers. ‘Producing’ health care workers is generally a long-term process because of the length of training programmes, so getting this ‘wrong’ is a costly outcome which cannot be corrected easily. The political and economic consequences of having too many, or too few, dental professionals (i.e., Dental Therapists, Dental Hygienists, Clinical Dental Technicians and Extended Duties Dental Nurses) are substantial. Therefore, careful consideration needs to be given to the approaches used. Three broad approaches can be used for estimating future workforce requirements:

Projecting the future: Similar to a cinema projector, this extrapolates the current situation (or picture) into the future (or onto a large screen) to project the current situation (levels of supply measured by the dentist-population ratios) onto the expected future population to estimate how many more dentists will be required in the future. In some cases, supply might be measured by the levels of service utilisation in the population and services per capita are extrapolated onto the future population with the required number of dental professionals estimated using assumptions about productivity. Projecting the future assumes that the only change occurring into the future is the size of the population. This has largely formed the basis of most health workforce (as well as health service) planning.

Forecasting the future: Similar to weather forecasting, this enhances projections by allowing for known or expected changes in the external environment in addition to changes in the population size. As with weather forecasting, where future changes in conditions can be accurately predicted from existing factors, this avoids assuming everything remains the same. However, because these changes are external to the forecaster and cannot

be influenced by his or her actions, the purpose of the forecast is to protect from the consequences of these changes (e.g., take an umbrella tomorrow if it is forecast to rain, even though it might be sunny today). In health workforce planning, this means no consideration is given to policies aimed at changing the factors giving rise to the need for health workers.

Planning the future: This involves identifying known or expected changes in the future and responding to those changes that can be influenced by policy, i.e., innovations in health and health care. For example, public health measures can be (and have been) used to change the future prevalence of conditions. Water fluoridation and fluoride in toothpastes provide examples of policies aimed at reducing the future rate of prevalence of dental caries compared to the present, evidence-based clinical research provides examples of changing the services delivered to address oral prevention and disease.

Effective health workforce planning requires a shift from the ‘fixed in time’ extrapolations and ‘nothing can be done about change’ forecasts to planning the workforce as part of an overall integrated strategy of ‘planning for change’. The challenge for health workforce planners is to develop innovations in the approaches to planning the health workforce to realise the gains from the innovations in population health, health care production and delivery.

The example of household production illustrates the difference between extrapolations and plans. In the 1950s considerable (largely female) time was spent on household production such as cooking, cleaning, and washing clothes and caring for young children. Over time (1) as children reached school age, less time was required for caring for them, (2) innovations in technology led to the availability of washing machines, vacuum cleaners, microwaves etc that meant less time was required to deliver the same number of outputs (meals, clean rooms, and clothes). If the ‘fixed in time’ approach to household time had been used, as it is in health workforce planning, the same amount of time would be projected to household production *even though it was not needed*. Instead with reduced need for childcare and innovations in the way household services are produced, time in household activities was released for other activities (e.g., greater female participation in the labour force). In contrast for oral health care, substantial reductions in the prevalence of caries in children following the introduction of fluoride in toothpastes and water released considerable dentist time from treating childhood caries, but dentist time was not reduced. Dental workforce planning did not incorporate this change in the epidemiological profile of the population being served, so the planned number of dentists reflected an underlying assumption of a constant rate or prevalence of caries.

Traditional approach for planning the future health workforce: Demography gone wild

Currently, oral health policy on future health workforce requirements is based largely on projecting the present workforce onto the expected future population using the following formula:

$$N_{T+1} = [Q_T/P_T] \times P_{T+1} \quad (1)$$

Where N is the size of the dental workforce, P is the size of the population and T, T+1 are the present and future time periods. So as the population increases the required size of the dental workforce increases. The current provider to population ratio (N_T/P_T), is adopted as some type of standard or constant for estimating the required workforce for tomorrow (T+1). The only variable in determining the estimated future workforce requirements is the demographic variable, P_{T+1} . Note the needs of the population, the services required by the population and the methods of delivering those services are not considered, even though these are all actively being managed through other health policies. Similarly, any existing problems faced by the oral health care sector, whether they be matters of under provision (unmet need), overuse (inappropriate care) or inefficient delivery will be incorporated in this standard for estimation and hence perpetuated in estimates of future workforce requirements.

Absence of any consideration of population needs, evidence-based service responses and efficient models of service delivery in the formula implicitly assumes that these are all constant (fixed in time) and hence do not affect the estimated future workforce requirements. However, much evidence exists to indicate that these three elements are not constant (so cannot be ‘projected’ as constant) and are not outside the influence of health policy (so cannot be forecasted as exogenous influences on future workforce requirements).

Changes in what services are needed – epidemiology:

In economically developed countries there has been a rapid epidemiological transition in oral health, in terms of, for example, reductions in the rate of tooth loss and edentulism (Harford, 2009), and reductions in the prevalence of caries (Frencken *et al.*, 2017; Whelton *et al.*, 2019) indicating that health workforce policy should respond to these changes to ensure an appropriate size and mix of the future workforce. Many of the elements of the epidemiological transition have resulted from policy changes that aimed to change the level and types of needs for oral health care in the future. For example, dental public health programmes leading to reduced sugar intake (Wen *et al.*, 2022), the use of fluoride in caries prevention (Dos Santos *et al.*, 2013; Whelton *et al.*, 2019) and improved oral health behaviour such as inter-dental cleaning (Hujoel *et al.*, 2006) were all aimed directly at changing needs, but workforce planning has been based implicitly on constant needs.

Changes in what services are provided – evidence-based protocols:

Studies examining referral practices of primary care dentists have identified ‘excessive’ referrals of patients whose needs could be managed effectively in the primary care setting thus freeing up secondary care resources for addressing more complex needs. Approaches to diverting inappropriate referrals to secondary care using evidence-based protocols or efficient sources for oral health needs assessment have been developed and evaluated (Jung & Kim, 2016; Goldthorpe *et al.*, 2018a;b).

Similarly, advances in dental care technologies have included dental implants, digital dental imaging (Shah *et*

al., 2014), robotics (van Riet *et al.*, 2021), bioceramics-based dental restorative materials (Khan & Syed, 2019), nanotechnology-based restorative materials (Melo *et al.*, 2013), minimum invasive dentistry technologies in caries management (Tassery *et al.*, 2013). Each of these technologies changes what services are provided to patients with oral health problems and so their adoption requires that these changes be reflected in planning the future health workforce.

Changes in how services are delivered – new models of care:

Innovation in service delivery such as telemedicine and telehealth can improve the efficiency of health systems. For example, telehealth has been found to be associated with increasing quality of care, lowering its costs, improving access and professional education as well as increasing patient satisfaction (da Costa *et al.*, 2020; Emami *et al.*, 2022). Its adoption in practice changes the level and mix of providers required to meet the oral health care needs of a given population, but workforce planning is based implicitly on the needs of the future population being addressed using the same models of care as the present.

Similarly, expanding skill mix in the delivery of oral health care can be used to improve access to care and the increasing use of different skill mix must be reflected in estimating future provider requirements (Balasubramanian *et al.*, 2021). The impact of skill-mix in improving oral health team productivity has been demonstrated (Harper *et al.*, 2013; Ab-Murat *et al.*, 2015; Brocklehurst & Macey, 2015; Wanyonyi *et al.*, 2015).

A ‘fit for purpose’ framework for oral health workforce planning to support policy change in oral health policy

In order to transform the ‘fixed in time’ projection model that adjusts the current size of the health workforce in accordance with demographic change, into an effective planning model we must incorporate the needs of the population, the services to be delivered to treat those needs and the approaches to be used to deliver those services. In the projection model, each of these variables is treated as fixed and hidden in the provider-population ratio (N_T/P_T). This is done by disaggregating the provider-population ratio into three elements, each representing a separate determinant of workforce requirements:

$$N_{T+1} = [N/Q]_{T+1} \times [Q/H]_{T+1} \times [H/P]_{T+1} \times P_{T+1} \quad (2)$$

Where: H/P is the expected future prevalence of oral health problems per 1000 population (i.e., epidemiology), Q/H is the type and level of services planned to respond to those health problems (using evidence-based protocols) and N/Q is the number and type of providers required to deliver those future services efficiently (e.g., providers per 100 services, or the inverse of provider productivity). If each of these three elements were to be constant over time, then cross cancelling of Q and H in equation (2) would revert the equation to the simple, fixed in time approach in equation (1). However as illustrated

above, these elements do not remain fixed in time, but are dynamic elements of health care systems.

Discussion

Traditionally, health system planning has been performed as a series of separate activities relating to services, workforce, and funding without any recognition of the integrated nature of these functions and the role of population needs as the focus of health systems. It is therefore not surprising that health workforce problems appear to occur on a regular basis and in ways that often appear insurmountable. Moreover, health workforce planning has traditionally been performed using a ‘silo’ based supply-focussed approach relating to levels of supply in individual health professions overlooking the interdependencies between different health professions associated with integrated care pathways, different skill mixes and different settings in which health care is delivered (e.g., urban, rural, and remote populations).

This paper presents an integrated approach for health workforce planning in which the estimated requirement for future dentists is derived from the estimated needs of the future population, the services planned to address those needs and the models of service production planned to deliver those services. In addition, it provides an effective tool for exploring the system-level requirements for new developments, whether they relate to new service developments (e.g., expanding screening programmes to different population groups) or new ways of delivering care (e.g. expanded scope of practice and skill mix changes).

Although the integrated planning approach requires data on developments in epidemiology, and evidence-based services as well as future models of production these developments can be incorporated through use of iterative planning methods that respond rapidly to such changes. Moreover, cohort-based models can be used to identify non-constant trends in needs. For example, rapid changes in oral health in the past among children can be used to model impacts on future levels of health in older populations in the future.

The framework, although developed as a model for planning, also provides a tool for understanding current challenges in the system, identifying the sources of those challenges, and evaluating the impact of different strategies. Particular groups might seek to explain current system problems result from workforce shortages, the framework can be used to identify whether the problems are associated with unanticipated changes in epidemiology (e.g., increased levels of caries prevalence), and/or unplanned changes in service levels (e.g., increasing screening frequency or expansion of screening to lower risk groups) and/or or unplanned changes in productivity (e.g., patient contact hours per provider). This helps to understand whether a system problem is due to a shortage of providers, a shortage of provider hours given changes in provider working hours or failure to adopt evidence-based services or the result of increasing prevalence of needs for care.

The framework can be used at different levels of the health care system to develop plans for the overall health system, or for particular sectors (primary, secondary, tertiary care), services (e.g., screening and prevention),

patient groups (e.g., children's oral health) or the population of particular jurisdictions.

Although the framework is built around data relating to expected future values of different elements of the health care system which are unknown at present, this is common to any form of planning for the future. The key feature of the framework is not to constrain planning to adopting current, or in many cases past, values of these variables on the assumption that they are not variables at all. But the future value of these variables will largely depend on current policies relating to epidemiology, services, and models of delivery. Because health tomorrow is the outcome of determinants (diet, oral health behaviours, availability of fluoride etc.), we already have information that helps us estimate future needs for care and how they will differ from current needs (Birch *et al.*, 2013; Mason *et al.*, 2015; Whittaker *et al.*, 2016; Lenzen and Birch, 2023). Similarly, policies aimed at the adoption of new technologies and new models of care delivery (e.g., team-based care) can be used to explore the implications of these policies for the health workforce. This is essentially to avoid the appropriate adoption of effective policies for changing needs, services and models of care leading to unexpected shortages and surpluses across the oral health professions.

Finally, effective workforce planning cannot be performed in a periodic way in response to system crises. Because it addresses requirements for the future, it must be adopted as an iterative, on-going process that draws on the impact of new policies and the availability of new data on a continual basis. In this way, health care can be transformed from a system that responds to the past to one that plans for the future.

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