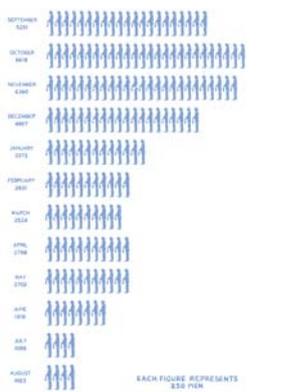


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Abbreviations and acronyms

CAR	Cumulative attrition rate
GDP	Gross domestic product
HRH	Human resources for health
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WHO	World Health Organization
WISN	Workload indicators of staffing needs
WPRO/RTC	Western Pacific Regional Office / Regional Training Centre
WWPT	Western-Pacific Workforce Projection Tool

Models and tools for health workforce planning and projections

Contents

1. Introduction	3
2. Overview of workforce projection models	5
3. Projection model case studies	9
4. Moving forward	13
References	15

List of figures

Figure 1 HRH Action Framework	07
Figure 2 Outline concept for linking health workforce requirements and supply projections	08
Figure 3 Projected loss by 2015 in the skilled health workforce and associated education costs due to HIV/AIDS mortality, according to three scenarios of the future evolution of the epidemic, Guinea	12
Figure 4 Projected cumulative five-yearly attrition by profession, Australia, 2000-2005	15

Table

Table 1 Cumulative attrition from the physician (generalist) and nursing workforce, Australia, 1985–2005	15
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1

Introduction

For a number of reasons many countries lack the human resources needed to deliver essential health interventions, including limited production capacity, emigration of health workers, poor mix of skills and demographic imbalances. It is increasingly recognized that the effective mobilization of the health workforce is the single most important obstacle to improving the performance of health systems and achieving key health objectives, particularly in low- and middle-income countries. In addition, most countries – developed and developing – face significant public financing constraints for health service provision at a time when levels of public demand and expectation are rising.

The formulation of national human resources for health (HRH) policies and strategies requires evidence-based planning to rationalize decisions. A range of tools and resources exists to assist countries in developing a national HRH strategic plan (Capacity Project, 2008a; Nyoni et al., 2006; World Health Organization, 2008a, Birch, S et al., 2007). Such plans normally include short- and long-term targets and cost estimates for scaling up education and training for health workers, reducing workforce imbalances, strengthening the performance of staff, improving staff retention and adapting to any major health sector reforms (e.g. decentralization), while also being harmonized with broader strategies for social and economic development (e.g. the national poverty reduction strategy paper). They should also address the human resources development needs of priority health programmes and aim to integrate these into a primary health care framework, based on epidemiological evidence. A critical component is the identification of a set of explicit benchmarks and indicators and the means for their measurement. It is important to start by gathering accurate and comprehensive data about the HRH situation and health priorities, and projecting these over the next 5 to 20 years. The results of the projections should be used to inform the development of an action plan and a corresponding monitoring framework. A number of guidance materials are available to steer the process of identifying and adopting an appropriate monitoring and evaluation framework at <http://www.who.int/hrh/tools/en/index.html>.

Many ministries of health make projections, or at least short-term forecasts, of their future human resource requirements.¹ However, they are frequently made without specific reference to current or projected health service plans or education capacity within a given country. Few developing countries that are faced with health worker shortages have developed detailed HRH policies and strategic plans to guide investments in education and health, in order to build the required human

infrastructure of their health systems (Adano, 2006). Planning often consists of incremental changes in staffing on a year-to-year basis, using static standards and norms, combined with short-term (tactical) adjustments to services and staffing in response to emerging health crises. Frequently this results in a ministry of health that operates without a sustained or informed direction, and a workforce that is unresponsive to the specific health needs of the population it serves. HRH approaches may also be driven by the needs of targeted programmes or projects, for example those responding to the Millennium Development Goals. Such approaches tend to reinforce existing imbalances in the geographical and professional skills distribution across health facilities, and are often not based on an analysis of primary care and human resources needs.

Underlying all of this is a common misconception of what planning for the future is all about. When projections are made of future health workforce requirements and supply, they are based, firstly, on past and planned production and movements of the workforce and, only secondly, on predictions of how the national situation, health needs and delivery of services will change in the future. In making such projections, however, planners in the health ministry or other stakeholder agencies are faced with substantial uncertainties including:

- the nature of changes in the country situation (demographic, epidemiological, economic, etc.);
- the capacity (both current and projected) for implementing the proposed interventions;
- conflicting priorities between various government departments/ministries; and
- leadership turnover, as well as actions of government, civil society and other stakeholders that can impact on health systems development.

It is therefore critical that plans include mechanisms for adjustment according to changing ongoing circumstances. Making projections is a policy-making necessity, but is also one that must be accompanied by regular re-evaluation and adjustment. The primary purpose of projections is not to set distant targets, but rather to identify what actions need to be taken in the near future to ensure movement towards achieving longer-term objectives.

The objective of this paper is to take stock of the available methods and tools for health workforce planning and projections, and to describe the processes and resources needed to undertake such an exercise. Including this introduction, the paper is divided into four sections. In the next section, an overview of workforce projection models and their applications is presented. Then the operationalization of selected models is described in some detail. Lastly, the pathways by which projection results can be optimized to inform decision-making for policies and programmes are discussed.

¹ Workforce projections can be defined as estimates of what will happen in the future using calculations based on assumptions. Workforce requirements can be defined as the numbers and types of staff needed (in relation to demand or needs).

This review is not meant to be exhaustive, but illustrative of the tools and resources available and commonly used in countries, with special attention to computer-based tools available in the public domain. Some of the common challenges in securing essential data are also discussed, as are selected empirical findings from various countries and contexts. While many of the tools presented here have been designed with the expectation of being applied in low- and middle-income countries, the case studies also draw on examples from countries with developed market economies, in order to optimize the sharing of country experiences and learning best practices.

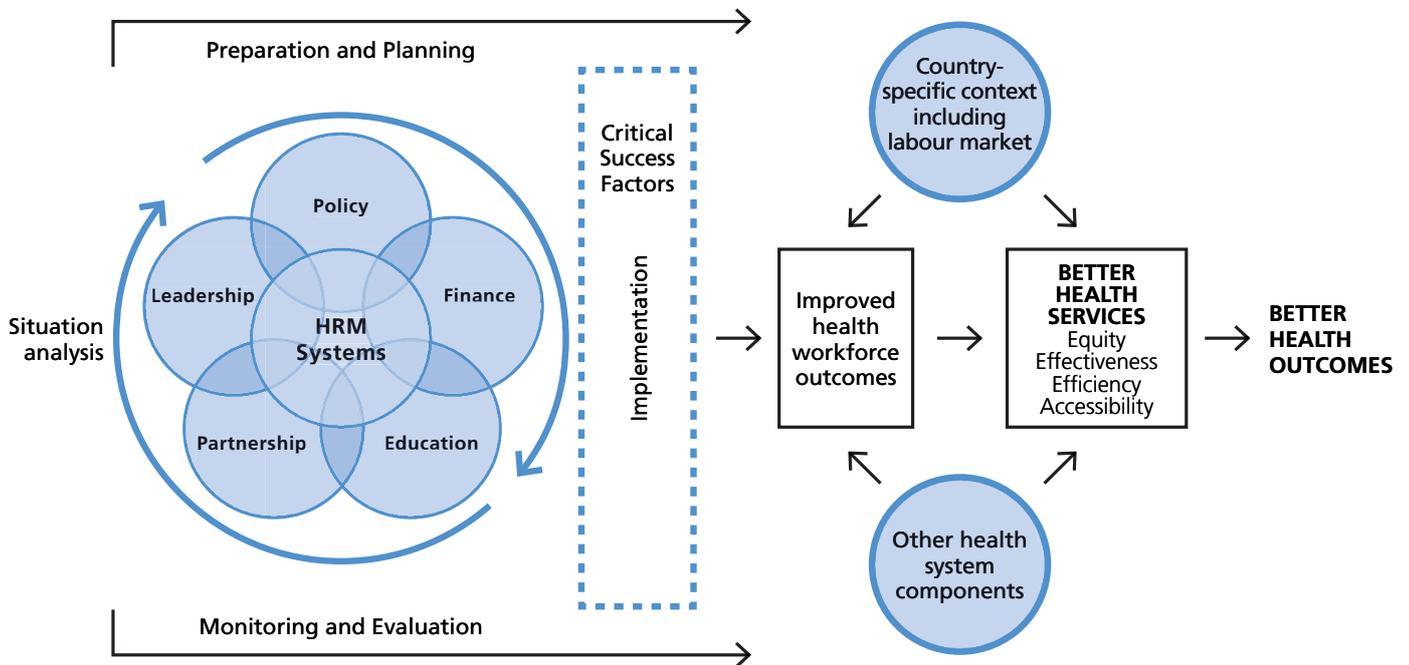
Comprehensive approach in health workforce planning

In an era of health development through partnerships and with renewed emphasis on primary health care, workforce development plans need to be increasingly formulated through a collaborative process. Ministries of health now need to plan health workforces for pluralist health systems and this cannot be done without including other sectors. For this approach to apply in a methodical way, WHO and several partners have developed the HRH Action Framework (see Figure 1).

It is designed to assist governments and health managers develop and implement strategies to achieve an effective and sustainable health workforce. The HRH Action Framework is a global effort to bring a shared approach and resources to bear on complex HRH issues at the country level. It reflects general agreement among global and country stakeholders on a comprehensive approach to HRH (Dal Poz et al., 2006).

The HRH Action Framework includes six action fields (human resource management (HRM) systems, leadership, partnership, finance, education and policy) and the action cycle which illustrates the steps/phases to take in applying the HRH Action Framework (situational analysis, planning, implementation and monitoring and evaluation (M&E)). To ensure a comprehensive approach to a given HRH challenge, all action fields and phases of the action cycle should be addressed, paying particular attention to a set of critical success factors (see <http://www.capacityproject.org/framework/> for guidance on involving various sectors during the development of a human resources development plan and indication of background materials for each area).

Figure 1. HRH ACTION FRAMEWORK



2

Overview of workforce projection models

The starting point for development of any HRH plan is a workforce situation analysis, which incorporates the major factors that may influence its size and shape in the future. This provides a base from which decision-makers and managers can explore the implications of internal and external changes on the need for and supply of human resources in the health system.

2.1 Linking workforce plans and projections

The purpose of workforce projections is to rationalize policy options based on a financially feasible picture of the future in which the expected supply of HRH matches the requirements for staff within the overall health service plans. Figure 2 provides an outline for identifying the elements through which this supply-requirements balance can be achieved.

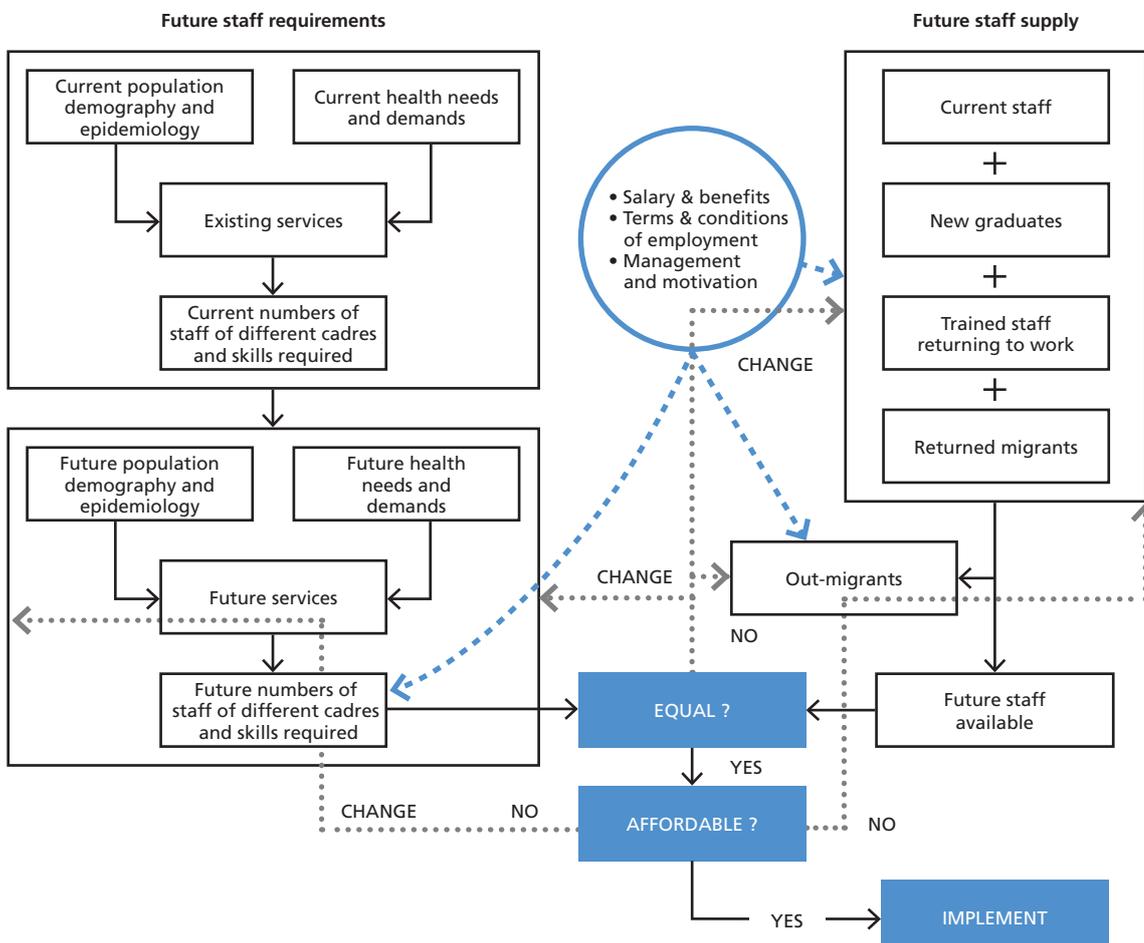
The process of simulation is the major tool for assessing the potential impact of various changes on future HRH metrics.

Typical questions that may need to be addressed as part of simulations include:

- What are the implications for staffing numbers and mix if salaries and benefits are increased with no budget change?
- What are the training and staffing implications of substituting one category of health worker in favour of another to alleviate particular shortages? What is the political feasibility of doing this type of substitution?
- What will be the impact of an expanding private health sector on the training and recruitment of new and existing staff in the public sector?

Health workforce models used as the basis for making projections focus on different aspects of HRH dynamics, including requirement projections, supply projections, workload and work activities, as well as staff development and movement. A variety of projection models have been developed and applied to support ministries of health and other stakeholders in their HRH planning.

Figure 2. OUTLINE CONCEPT FOR LINKING HEALTH WORKFORCE REQUIREMENTS AND SUPPLY PROJECTIONS



The appeal of using such models is their potential for exploring options about the future. Depending on the underlying assumptions, computational models can be distinguished by whether they are deterministic or stochastic. Deterministic models assume that an outcome is certain; in other words, they always deliver the same result for the same input values. These are, by far, the most commonly used for HRH projections for a number of reasons, including:

- they provide an unambiguous result that is easy to understand;
- they can be developed using commonly available computer software ; and
- they generally do not require advanced information technology programming skills (other than what would normally be expected of someone working in data processing and analysis).

Stochastic (or non-deterministic) models allow for the introduction of random changes and provide some means of introducing uncertainty during the planning process. This type of model delivers different results each time it is run and, over the course of multiple runs, will reveal the most likely outcomes and the most robust array of inputs. These models create more complex programming and analysis challenges. Examples in the literature of the use of stochastic models for HRH projections include Joyce et al., 2006; Song et al., 1994.

Regardless of the type employed, the use of models is an essential feature of making projections, and provides a mechanism for defining the nature of the issues to be addressed and testing and communicating possible solutions. In Section 3, the more commonly used deterministic models are assessed.

2.2 The determinants of workforce requirements and supply

As a first step, the variables that play a part in determining future health workforce requirements need to be identified. Typically, these include: demographic growth and change; health policy and related legislation; technological change; burden of disease; service and provider utilization; relevant service quality standards; organizational efficiency; skills mix; individual provider performance; public demand and expectations; and availability and means of financing. For example, changes in the birth rate and in policies on maternal, newborn and child health services have an impact on the age profile of a given population as well as the service delivery environment and its staffing (such as shifts in the needs for midwifery personnel and their deployment, as well as for specialists to serve an ageing population).

While there may be little question about the relevance of these variables to establish future HRH requirements,

countries of various levels of development have differing capacities for assembling and analysing the data required to assess the impact of changes in these variables over time. Differences in capacity will be reflected in the type of approach taken to project future workforce requirements.

The approaches commonly used to project future health workforce requirements include:

- (i) The workforce-to-population ratio method: This is a simple projection of future numbers of required health workers on the basis of proposed thresholds for workforce density (e.g. physicians per 10 000 population). This approach is least demanding in terms of data, but does little to explicitly address other key variables, aside from population growth, that can be expected to affect the type and scale of future health services provision and the associated workforce. This approach is based on the assumption that there is homogeneity at the levels of the numerator (all physicians are equally productive and will remain so) and of the denominator (all populations have similar needs, which will remain constant). Such assumption is clearly risky.
- (ii) The health needs method: This is a more in-depth approach that explores likely changes in population needs for health services, based on changes in patterns of disease, disabilities and injuries and the numbers and kinds of services required to respond to these outcomes. This approach entails collecting and analysing a range of demographic, sociocultural and epidemiological data.
- (iii) The service demands method: This approach draws on observed health services utilization rates for different population groups, applies these rates to the future population profile to determine the scope and nature of expected demands for services, and converts these into required health personnel by means of established productivity standards or norms. Again, this approach requires consideration of multiple variables, as well as collecting and using the data relevant to these variables.
- (iv) The service targets method: This is an alternative approach that specifies targets for the production (and presumed utilization) of various types of health services and the institutions providing them based on a set of assumptions, and determines how they must evolve in number, size and staffing in accordance with productivity norms.

As reviewed by Dreesch et al. (2005), each of these approaches has its advantages and limitations. Problems in securing data are invariably encountered and some compromises must be made with respect to the degree of precision with which the variables are specified. At some

point, health system planners and managers must determine which variables are the dominant ones in any consideration of future requirements, including which of them are most amenable to policy intervention.

The supply side of workforce projections is conceptually simpler to address, but requires careful accounting of: the numbers of new entrants into the health workforce; the capacity to produce more, fewer or different types of 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. This requires in-depth study of who is leaving and why, as well as the human resources policies that influence their movement into, through and out of the health sector. The workforce supply issue does not simply encompass the number of available health service providers, but also the way they are mobilized, organized and motivated.

2.3 Selected models and tools

A number of health workforce projection models exist, including freely available tools for computer-aided applications. Each of these and related models start from a specification of existing services and staff and build a case for the future, but with different approaches to how future staff requirements and supply are to be determined. Those widely used in low- and middle-income countries include:

(i) The World Health Organization's workforce supply and requirements projection model: a software package designed to support the long-range planning of health personnel (WHO, 2001). This spreadsheet application offers various options that depend on the underlying technical capacity and political decisions, including the workforce-to-population ratio and needs-based approaches to projecting requirements mentioned earlier. Developed by Thomas Hall (Hall, 1998), it is one of the most powerful and useful of the current freely available HRH projection models because it provides an automatic means for calculating the effects of changes between linked elements. Because of the software's capacity, simulations of alternative institutional development and staffing scenarios can be carried out easily, improving health authorities' ability to explore "what if?" questions. The model has been used to support health workforce planning in various contexts (Lexomboon and Punyashingh, 2000). The development of future scenarios provides a basis for exploring the implications of capacity building and management in order to determine an optimal growth or change in the workforce around a rigorous framework of calculated staff requirements and supply.

(ii) The WHO Western Pacific Regional Office, Regional Training Centre (WPRO/RTC) health workforce planning model: a computer-based workbook outlining a step-by-step process for producing a workforce plan (Dewdney, 2001). Commissioned by WPRO/RTC, this model includes both text and spreadsheet files and has been used in a number of countries in Africa, Asia and the Caribbean (Dewdney and Kerse, 2000). Originally designed for developing island nations, it is considered most useful in contexts where the population size and the staff categories needing to be projected are small.

(iii) The United Nations Development Programme's integrated health model: a spreadsheet application developed in the context of supporting countries to estimate the resource requirements for achieving the health-related Millennium Development Goals (UN Millennium Project, 2007). This model can be used in health systems planning by means of projection and costing of all required public health resources, including human resources, to deliver an integrated package of services.

Other models recently developed to complement the WHO instruments listed above include the Western Pacific Workforce Projection Tool (WWPT) (WHO, 2008b) and the iHRIS Plan software package (Capacity Project, 2008b). The WWPT tool is a software application designed to facilitate the production of comparative, cadre-specific and summary reports for health workforce projections and cost parameters. The model incorporates a limited number of variables, including population growth, as well as health worker training costs, salaries and attrition rates. The results obtained using this simplified tool may serve as guidance on which countries can base their HRH plans and strategies. It is currently being field-tested in a number of countries of the WHO Western Pacific Region.

The iHRIS Plan is an open source software application for human resources information systems strengthening developed by the Capacity Project with financial support from the United States Agency for International Development (USAID). "Open source" refers to computer software distributed freely under a license that allows anyone to study, copy and modify the source code without restriction. This means that users can continue to use and improve their software systems without paying onerous licensing or upgrade fees. A demonstration version of the HRH planning and modelling software, developed in collaboration with WHO, the World Bank and other stakeholders, became available in September 2008.

2.4 Special studies and applications

Models cannot account for all of the many complexities of a real health system and, inevitably, many compromises and simplifications must be made. The level of detail and complexity reflects, to a considerable extent, both the availability of data and underlying assumptions about technical capacity and prioritization of policy and programmatic interventions. An essential task is to take into account those resources and activities that collectively define the major characteristics of the health system and its labour market.

Special studies can be completed to project the requirements of specific or rapidly changing programmes and/or small but especially important occupational categories. Some selected methods and tools that have been used in the context of workforce planning and projections, and to support decision-making for policies and programmes include:

- (i) The workload indicators of staffing needs (WISN) methodology: a tool developed and field-tested by WHO for setting activity (time) standards for health personnel and translating these into workloads as a rational method of setting staffing levels in health facilities (WHO, 1998). Where they occur, imbalances between staffing and workload often reflect that staffing has been based on facility capacity (e.g. number of in-patient beds) and not on service utilization. Ministries of health are paying increasing attention to approaches for improving efficiency in the deployment of staff and the WISN methodology incorporates a mixture of professional judgement and work activity measurement to determine workload-based staffing norms. The method has been used to improve HRH planning in some countries, such as Bangladesh, Turkey, Uganda and Indonesia (Hossain and Alam, 1999; Namaganda, 2004; Ozcan and Hornby, 1999, Kolehmainen- Aitken, RL et al., 2009).
- (ii) Trend analysis: using observed trends as assumptions for predicting the future. Such techniques have been used for projecting likely growth in the private health sector, as illustrated in a Canadian study drawing on household health expenditure data and in particular the public versus private share (Health Canada, 2001). An area of frequent uncertainty is the number, size and staffing of private sector health facilities. It remains a significant challenge in many countries to estimate how the private sector will grow, which reflects changes in the economic status and health-care expectations of the population, and also the extent to which alternate employment opportunities are open to health service staff.
- (iii) Regression analysis: This is a technique for the modelling and analysis of numerical data consisting of values of a dependent variable (response variable) and of one or more independent variables (explanatory variables). The technique can be used to develop, for example, the information and evidence base to guide HRH planners and managers. Future requirements for different categories of workforce numbers are predicted by drawing on a range of workload indicators so that the needs and demands of clients and staff are met (Queensland Health, 2007).
- (iv) Meta-analysis: A technique to assess and reconcile potential variances in coverage, classification and reporting of data, by means of amalgamating, summarizing and assessing all available information on a specific dimension and applying statistical techniques to measure outcomes on a common scale. Although meta-analysis has been most often used in health research to assess the clinical effectiveness of health-care interventions, by combining data from two or more randomized control trials, it can also help provide better quality measurements of health workforce metrics. In particular, Buchan and Calman (2005) argued that the most robust evidence on the effectiveness of different skill mixes included studies that use meta-analysis, although there are currently relatively few examples available. A number of computer-based tools can be used to facilitate meta-analyses, including some freely available software programmes (Rothstein et al., 2001).
- (v) Econometric analysis: This is an application of statistical techniques focusing on market factors that are assumed to influence labour participation and health service utilization, such as access to services and preferences of health consumers. For example, econometric analyses were used by Scheffler et al. (2008) for forecasting of population demand for physicians given a country's predicted future growth in national income. In this type of application, single health occupation studies are common; however, they often fail to consider other factors such as practice organization, inadequate service levels, or the effects of shared competencies and substitution between health occupations (O'Brien-Pallas et al., 2001).
- (vi) Simple models for consideration of other health aspects, such as the impact of HIV on the workforce: Specialized analysis of a given issue drawing on available data can also help to underscore (often at relatively low cost) the need among decision-makers and development partners to take immediate action to address the health workforce situation to mitigate potential future scenarios. As an illustration, drawing on administrative data from the ministries of health and finance on the active health workforce and estimated costs for educating professionals, Dioubaté et al. (2004) applied basic demographic and

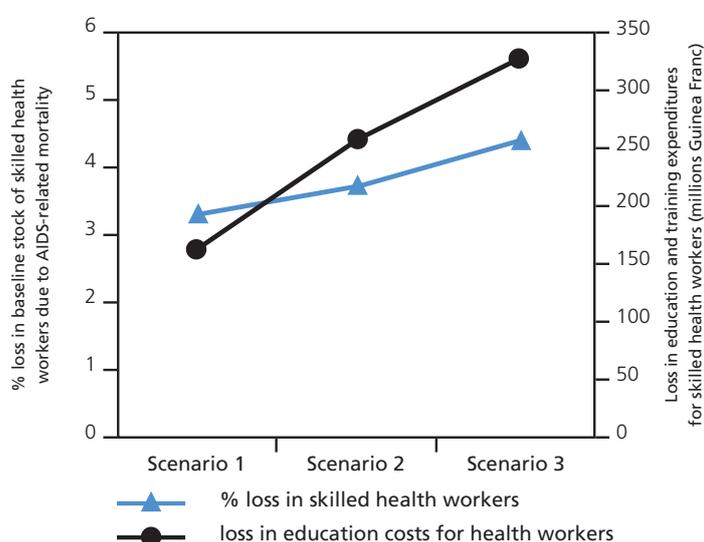
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Projection model case studies

epidemiological modelling to project the loss of skilled health workers and associated education and training costs due to AIDS mortality, according to three different scenarios of the future evolution of the epidemic in Guinea (Figure 3). The scenarios were constructed following consultations with various stakeholders in health, HIV, education and development.

In this section the steps and data requirements to operationalize selected workforce projection models are discussed. First, the WHO supply-requirements model is outlined. Then an approach to supply projections focusing on a specific stage of the working lifespan is presented. The objective is not to detail the statistical methods used in workforce projections, but to highlight certain applications that have been used in one or more countries and that could readily be adapted to others. These case studies provide sufficient information to guide readers through decisions on whether to invest additional learning time to use the technique to address a specific HRH planning question in their context.

Figure 3. PROJECTED LOSS BY 2015 IN THE SKILLED HEALTH WORKFORCE AND ASSOCIATED EDUCATION COSTS DUE TO HIV/AIDS MORTALITY, ACCORDING TO THREE SCENARIOS OF THE FUTURE EVOLUTION OF THE EPIDEMIC, GUINEA



Note: Adult HIV prevalence rate assumed to vary between 2,8% and 6,5% in 2015 depending on the scenario.

Source: Dioubaté et al., 2004

3.1 Operationalizing the WHO model for workforce requirements and supply projections

The WHO workforce projection model, and in particular its variation of the service targets approach to estimating future HRH requirements, is among the most useful tools available for HRH planning and projections for most low- and middle-income countries. The elements of the targets method builds its projection around the development of services and institutions.

Operationally, the model consists of a set of tables that quantify the elements of the underlying approach, describing the current health service and workforce situation and a number of projected future changes, all of which ultimately lead to the projection of future HRH requirements and likely supply. The model's electronic interlinking also facilitates exploration of different future scenarios. This is an important feature as there are often a variety of views, both political and technical, on what is the appropriate way forward in health system development.

The WHO software application incorporates two tests of the validity of the projections made: The feasibility of the proposed eventual stock of health workers is first tested against the likely finances available and, second, against the ability of the health and education systems to produce the type and size of the workforce proposed. These tests ensure that management is presented with viable policy proposals.

While all projection models require data to make meaningful policy recommendations, the quantity and quality of the data directly determine how accurately the model reflects the real situation and therefore how reliable the projected workforce requirements and supply will be. The sources for these data are multiple, including published studies, reports and databases as well as unpublished information from the ministries of health, education and finance, the central statistical office, professional regulatory bodies and others.

Typically, the data requirements are as follows:

- Demographics: total population in the starting (base) year; population distribution by age and sex; anticipated average population growth rate over the plan/projection period; urban/rural distribution of the population and how it has been changing.
- Epidemiology: current major causes of morbidity and mortality; expected changes in patterns of sickness and disease over the plan period.
- Health workforce stock and flows: total staff numbers for each cadre in the public and private health sectors; staff distribution by age and sex; expected annual percentage attrition rate for each category of staff over the plan period; numbers of new graduates from health education and training institutions (both public and private institutions); net flow of trained health workers into or out of the health services industry (for both the public and private health sectors).
- Remuneration and other recurrent costs: salary bands for each type of staff (minimally for public health sector staff); current average annual remuneration for each of the personnel categories including all pay and other benefits; projected changes in the annual real wage costs (excluding any changes that are simply correcting for inflation).
- Economic growth: gross domestic product (GDP) for the base year; average predicted annual percentage change in GDP over the plan period; total current recurrent expenditure for the public health sector as a whole and disaggregated between expenditure coming from the national government and that coming from donor organizations (if any); current recurrent public health sector expenditure on personnel, again distinguishing between national versus international sources; current recurrent public health sector non-personnel expenditures, by source; projected changes in these expenditures over the plan period.
- Private health sector economic data: percentage allocation of public health non-personnel funding to the private health sector; estimated private sector expenditure in health care; personnel costs as a percentage of private health sector expenditure.

With regard to future workforce supply, data on outputs of health education and training programmes are usually more commonly available. However, obtaining detailed data to measure workforce attrition rates and the movement of staff between the public and private health sectors, and out of the health system generally, poses greater challenges.

In the absence of reliable data, informed estimates based on professional judgement of key stakeholders may be required. A more general and sensitive method of determining the likely change in the supply of human resources, known as cohort analysis, can also be used. A case-study using a cohort supply-based projection model to estimate workforce losses due to retirement is presented in section 3.2.

In addition to the basic education and training output data required, more information may be needed on the capacity of training institutions, including current and expected student enrolment and graduation rates for each cadre of skilled health service provider, as well as the ratio of students to instructors.

Data requirements specific to the creation of projections on the development of services and institutions pertain to:

- Health facilities: the current and projected number of health facilities of each type, both those with in-patient beds (such as general hospitals, long-term care hospitals and mental health facilities) and those without (health centres and sub-centres, maternal and child health centres, health posts, etc.) and across both the public and private health sectors; average capacity of each facility type (e.g. number of beds, bed occupancy rate, number of discharges per year, activity rates, e.g. ambulatory visits, surgeries, etc.).
- Facility staffing: current number of staff by type and sector of facility, and by category of staff; current staffing ratios (i.e. staff to facilities, staff to beds, skills mix ratio); projected changes in staffing norms.

Where possible, data should also include, the intended catchment population for each type of facility.

In addition, the health workforce is composed of a large number of personnel located outside health facilities.

This includes health workers in:

- government ministries and departments;
- regional or district health offices;
- public health offices;
- armed medical services;
- management and support of nongovernmental organizations delivering health services (either for-profit or not-for-profit);
- home-based and community-based health services;
- research institutions;
- education and training;
- self-employment.

All of these workers are essential to the functioning of health systems. While there may be some difficulty in obtaining precise data on all of these categories, the values proposed will serve as a marker for the model in determining future staffing requirements.

It is likely that the overall health system will have a large number, even hundreds, of different job titles. It is common practice to group workers into categories, such as by education level, skill specialization or salary band. Emphasis is often placed on a selected number of occupations that require advanced education and training (notably physicians, nurses,

midwives, dentists and pharmacists). At some point it may become desirable to subdivide the overall projection to separate out more categories of human resources for health (such as public health scientists, laboratory technicians, traditional and complementary medicine practitioners, or senior management staff) or into regional and district projections.

3.2 Estimation and forecasting of workforce attrition to retirement: a case-study from Australia

In terms of projecting workforce stock and flows, while there are uncertainties around the capacity and output of health education and training institutions and the extent to which future production can be controlled, perhaps the greatest difficulty is in determining current productivity of the workforce and attrition rates from the health system and projecting future losses.

In particular, losses through retirement can generally be assessed from workforce age distributions. Ageing of the population and the health workforce is a well recognized problem in many countries. However, precise data about the actual retirement rate of health workers are very scarce (WHO, 2006). Rather, it is common to estimate retirement by applying an arbitrary retirement age – for example, statutory pensionable age – although the average age of retirement may be either higher or lower and there can be considerable variance in retirement ages.

Accordingly, there is a need to develop an approach to estimating retirement that captures both the age and distribution of retirement from the health workforce to facilitate effective succession planning. This section provides an Australian case-study demonstrating an approach used to estimate workforce attrition at retirement age. The methods were first applied in a study on physician and nursing retirement (Schofield and Beard, 2005). The minimum data required are the stock of health workers by cadre at different time points, as well as their distribution by age and work activity. Presented here is an application for a number of health professions drawing on data from two main sources.

Time-trend data are derived for physicians from professional registries (annual Medicare data from 1984 to 2005) and medical labour force surveys (annually from 1995 to 2003), and for other health occupations from successive national population censuses. Fortunately, the inclusion of questions on occupation in the census allowed identification of the full range of health professions in Australia along with their sociodemographic characteristics (including age, sex and hours worked). Micro-data extracts were obtained from the 1986,

1991, 1996 and 2001 censuses. To preserve respondent privacy, only a limited number of variables were released by the Australian Bureau of Statistics (2006) and some data were grouped.

As individuals cannot be followed from one census to the next, age groups are followed as cohorts. Five-yearly cohorts of health professionals aged 45 years and over were followed from one five-year period to the next to estimate net attrition, or the net effect of gains and losses from the workforce. Older age groups tend to have small numbers of newly educated entrants to the health workforce, and also tend to be largely unaffected by migration (Australia Department of Immigration, 2005). Leaving the workforce may be due to various factors including retirement, migration, change of profession, ill-health and death. In the Australian context, attrition for those aged 45 years and over was broadly grouped as retirement.

Net attrition rates were calculated for every five years of data as the percentage reduction in total health professionals over the previous five years. Cumulative net attrition was the sum of the attrition for all previous years.²

The data were then “aged” from the base (or start) year of 2000, so that they represented the health workforces aged 45 and over in 5, 10, 15, 20 and 25 years time. To do this, the attrition rates were applied to the cohorts aged 45 years at five-yearly intervals to 2025 to project future attrition from the workforce.

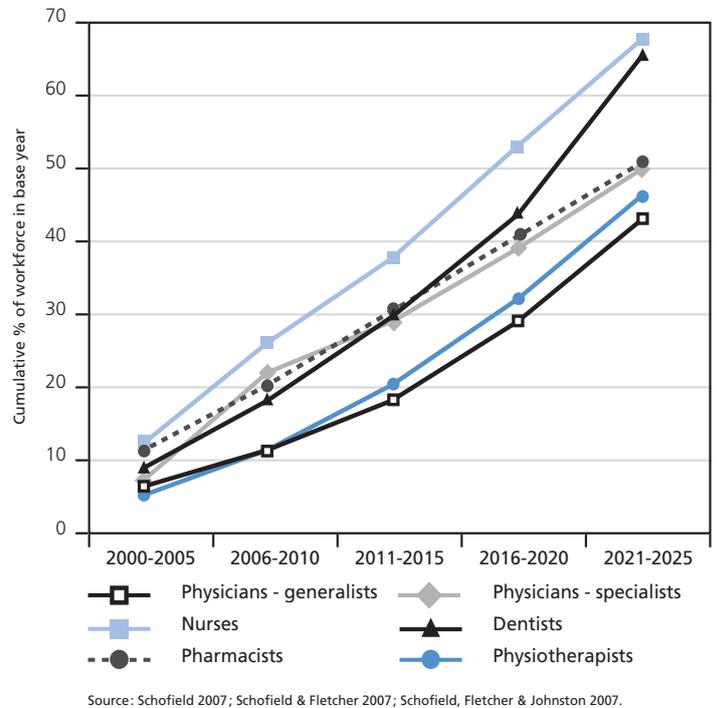
Table 1 provides an example of the calculation of attrition applied to physicians and nurses. The findings reveal a relatively low net rate of attrition from the physician (general medical practitioner) workforce before age 65; of those aged 45–49 years in the base year (1985), only 2% would have left the workforce before this age (i.e. over the next 15 years). While net attrition rates grow steadily after age 65, a large proportion of general practitioners keep working well into older ages. Over half (52%) of physicians aged 50–54 in the base year were still in the workforce 20 years later at ages 70–74, and 28% of those aged 65–69 in the base year were still working past age 80. By contrast, nurses retire much earlier. Only 12% of registered nurses aged 50–54 in the base year remained in the workforce 20 years later, and none of those aged 65–69 in the base year were still working at age 80.

Extending the analysis to other cadres it was found that approximately 40–70% of health professionals were expected

² The calculation of cumulative attrition rates was as follows: $CAR = 1 - N_{ti}/N_{t1}$; where CAR = cumulative attrition rate, N = number of people, t_i = time period i , and t_1 = first year of data in the series.

to retire by the year 2025 (Figure 3). Generally, predominantly male occupations such as general and specialist medical practitioners and pharmacists were predicted to have a lower net rate of retirement, particularly until around the year 2015. Predominantly female occupations such as nursing were predicted to have higher rates of retirement over the same period, partly due to population ageing – 60% of nurses were aged over 40 in 2001 – and partly because, on average, women retire earlier than men (Schofield 2007; Schofield, Fletcher and Johnston 2007). Applying the same methods to examine gender differences in attrition, women medical practitioners in Australia were found leave the workforce sooner than men, but there was almost no difference in attrition rates among female versus male nurses (Schofield and Beard, 2005). Physiotherapists, although mostly female, were not projected to have as high a retirement rate as nurses largely because of the high proportion of physiotherapists under the age of 40 at the start of the projection period. Physiotherapy also differs from nursing in that private practice in this specialization provides opportunities for higher remuneration, which may favour retention.

Figure 4. PROJECTED CUMULATIVE FIVE-YEARLY ATTRITION BY PROFESSION, AUSTRALIA, 2000-2005



Source: Schofield 2007; Schofield & Fletcher 2007; Schofield, Fletcher & Johnston 2007.

Table 1. CUMULATIVE ATTRITION FROM THE PHYSICIAN (GENERALIST) AND NURSING WORKFORCE, AUSTRALIA, 1985–2005

Number of years later	Age group						
	45–49	50–54	55–59	60–64	65–69	70–74	75–79
Physicians (general practitioners)							
Base year							
5 years	0%	1%	2%	10%	23%	39%	20%
10 years	0%	6%	15%	32%	49%	63%	100%
15 years	2%	21%	40%	59%	72%	100%	100%
20 years	20%	48%	67%	78%	100%	100%	100%
Nurses (registered)							
Base year							
5 years	12%	28%	51%	78%	74%	55%	100%
10 years	34%	66%	88%	93%	81%	100%	100%
15 years	60%	86%	96%	100%	100%	100%	100%
20 years	78%	88%	100%	100%	100%	100%	100%

Note: Cumulative attrition rates calculated using data on health occupations extracted from successive national population censuses (1986, 1991, 1996 and 2001) and Medicare statistics (professional registrations in each state and territory).
 Source: Schofield 2007; Schofield and Fletcher 2007.

4

Moving forward

In many countries, planning and implementation of health workforce strategies have had limited success in the past due to several factors, including: insufficient attention to the planning process (i.e. how the plan was prepared); lack of access to and use of planning methods and tools suitable for addressing the challenges facing many low- and middle-income countries; lack of appropriate and accurate data and information such as that related to workforce supply, deployment, staff retention and attrition, staff productivity, service needs and outputs, and the private health sector; low levels of involvement of stakeholders in the planning process; and insufficient advocacy to attract resources for implementation.

The first critical step in workforce planning is establishing a comprehensive documentation of the HRH development situation in the country. Using the key findings from such a situational analysis, workforce projections can be constructed to inform the development of a recommended strategy and operational plan that includes both long- and short-term actions. Management decisions must be made regarding which model(s) is/are preferred for use by the country, but having the necessary underlying data is a prerequisite (Nyoni et al., 2006).

Workforce projections cannot be undertaken in isolation. They are highly dependent on other developments in the health system and even the broader social and economic context of the country. Consequently, they are normally part of some larger strategic process. If the strategic planning process – one that capitalizes on plausible projections – is to be successful, among the considerations that need to be addressed and the related processes coordinated from the initial stages are:

- Leadership and commitment by senior officials.
- Priority given to HRH development and management.
- Availability of resources (human, financial and technical) for data collection, processing and analysis.
- Availability and use of appropriate data and tools for HRH projections.
- Identification of – and consensus on – HRH strategic objectives.
- Availability of resources for implementation of the HRH strategic plan.
- Harmonization with other national health and development plans.
- Interministerial working group bringing together the ministries of health, finance, education and labour as well as professional associations and the public service commission for early alignment of essential inputs.
- In a low-income country context, inclusion of development partners and major nongovernmental organizations working in health services provision is also recommended. This can be achieved by creation of a multistakeholder working group which meets regularly.

In particular, in the development of the HRH strategic objectives, consensus must be reached among all the principle stakeholders in health and development on a series of benchmarks and targets for both the short- and long-terms. The latter should be at least 10 to 15 years, as anything much less does not allow adequate time for many changes to take effect. This is especially pertinent for setting education targets, given the lengthy periods required for producing highly-skilled medical personnel.

Formal political commitment is important because it provides the necessary instruction to form a task force (or national coordinating mechanism) to implement the plan and a steering committee (advisory body) for its oversight. The steering committee, generally comprised of senior managers drawn from a cross-section of relevant departments and partner agencies, will function to authorize and approve the work of the task force. They will set out how the process is to be managed and how staff should be allocated to do the work. High-level engagement and a sound governance structure are imperative because developing and monitoring implementation of a national plan is a major activity, one that should not be seen as something to be done in the spare time of individuals who have other work to do.

It is likely that the task force will have health system and services planners, human resources planners and data analysts as its core. Their first assignment is to assemble all the required information to input into the projection model(s). In most contexts, it is unlikely that prior data collection will fit the precise needs of the selected model and further work will often be required to supplement, validate and adjust existing data.

At an early stage in the development of projections, it will be essential for the task force to meet with the steering committee to clarify the strategic objectives that determine the direction and scale of the changes that are desired, both in the provision of health services and in the staffing of health facilities. This often entails a major national workshop to determine policy priorities. The workshop, or series of workshops, may also serve to gain consensus on the baseline information to be used as inputs to the projection model, especially where no reliable data are currently available.

Once an agreed set of objectives and targets has been established, it then becomes necessary to define how implementation will take place. This requires determining how planning and re-planning is to be conducted within the ministry of health and which, if any, of the current policies must be amended to achieve the targets. Therefore, a review and assessment of all policies that can potentially impact upon HRH must be part of the situation analysis described above.

Ultimately, the results and conclusions of the situation analysis should be brought together as a concise document that outlines the strategic plan and its implementation, monitoring, evaluation and reporting processes, such as through the use of a results-based management framework to link objectives to outcomes. Authors should use their judgement in deciding the level of detail required, considering issues such as whether the information exists elsewhere (and thus does not need to be replicated) and maximizing the probability that the document will be read and used, thereby restricting length to a manageable size (Treasury Board of Canada, 2001).

There are many potential users of HRH planning and performance management information and the reporting strategy should consider all of their needs, be they policy-makers, programme managers, health practitioners or other (national or international) stakeholders. Uses of this information will depend on the type of user and could include management decision-making, accountability, communication and information sharing (Treasury Board of Canada, 2001). It is essential to clearly outline the assumptions behind the planning tools, maintain a flexible approach and adapt the planning strategy as needed. The plan does not have to be perfect. To be most effective, health workforce planning and projections should be viewed as an iterative process in which the ability to measure and tell the performance story improves over time.

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The formulation of national human resources for health (HRH) policies and strategies requires evidence-based planning to rationalize decisions. A range of tools and resources exists to assist countries in developing a national HRH strategic plan. Such plans normally include short- and long-term targets and cost estimates for scaling up education and training for health workers, reducing workforce imbalances, strengthening the performance of staff, improving staff retention and adapting to any major health sector reforms, while also being harmonized with broader strategies for social and economic development. The objective of this paper is to take stock of the available methods and tools for health workforce planning and projections, and to describe the processes and resources needed to undertake such an exercise. This review is not meant to be exhaustive, but illustrative of the tools and resources available and commonly used in countries.

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