

An Overview of Human Resources for Health (HRH) Projection Models

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Why Are Workforce Projections Valuable?

Health workforce planning is necessary in order to ensure that trained and knowledgeable health workers are available to deliver health care services when and where they are needed. Ensuring adequate human resources for health (HRH) is crucial in order to continue progressing toward the realization of the Millennium Development Goals (Dreesch et al, 2005). The purpose of workforce planning is to determine the most appropriate balance among the mix, distribution and number of health workers. As Thomas Hall has noted, workforce surpluses or shortages can decrease productivity and efficiency, deplete scarce resources and squander worker capabilities (2003). Training health workers requires a significant investment of time and resources; therefore, restoring balance to a system in which the health workforce supply is out of sync with the demand for health services can be a lengthy process. In this context, health workforce projections can be very useful.

The aim of this technical brief is to provide a rapid review of different health workforce projection approaches. A list of references serves as a guide for those who would like more information on this subject.

HRH Projection Approaches

This brief will discuss six different HRH projection approaches, based on a review of the current literature. Although the main unit of analysis in these approaches is the number of health care providers, the method chosen to estimate human resources requirements reflects the political and economic choices and social values of a health system (Dreesch et al, 2005). Since most countries do not have integrated administrative data systems to track training, licensing, deployment and financing of health care across the various sectors, some of the required data sources may not be available. The Capacity Project, in collaboration with HRH projection experts, is implementing an integrated HRH information system with a module for workforce projections to assist countries—especially resource-constrained countries—to have the information available for making informed health workforce projections.

Needs-Based Approaches

Needs-based approaches estimate future health workforce needs based on the projected health service needs (both met and unmet) of the current population, adjusted for age and gender (O'Brian-Pallas et al, 2001a; O'Brian-Pallas et al, 2001b; Dreesch et al, 2005). Professional norms and expertise regarding manpower requirements for health services delivery are also incorporated into this approach, in order to discover the most cost-effective method of meeting health care needs.

- **Assumptions:** This approach seeks to address all health care needs and assumes that the use of resources will be prioritized based on need (O'Brian-Pallas et al, 2001a; O'Brian-Pallas et al, 2001b; Hall and Mejia, 1978; Markham and Birch, 1997; O'Brian-Pallas et al, 2001a, as cited in Dreesch et al, 2005).

- **Advantages:** This approach is centered on improving the efficiency of a combination of HRH resources to deliver health care services. Additionally, compared to some of the other HRH projection methods, the needs-based approach is somewhat easier to explain and understand, and therefore can be helpful for advocacy (Hall and Mejia, 1978; Markham and Birch, 1997; O'Brian-Pallas et al, 2001a, as cited in Dreesch et al, 2005).

- **Limitations:** Drawbacks to this approach include the need for models to be restructured in response to changes in medical or other technologies that alter service delivery efficiency. Furthermore, potential problems exist when defining what constitutes “need” in terms of both coverage and quality. Finally, projections generated by needs-based models may call for an unrealistic number of health care providers without adjusting for disparities in the distribution of health services, particularly for disadvantaged populations.

Utilization-Based Approaches

Utilization-based approaches (demand-based approaches) project future health service requirements based on present health service utilization (O'Brian-Pallas et al, 2001a; O'Brian-Pallas et al, 2001b; Dreesch et al, 2005). This approach may incorporate projected trends in the current workforce, such as demographics, turnover, attrition rates, etc.

Good Projection Model Criteria:

- Are based on clearly-identified goals
- Focus on specific, quantifiable problems
- Use data of acceptable quality (either available or collected)
- Are regularly updated to accommodate more reliable data and to reflect new developments in population trends and patterns of health services utilization
- Make projections far enough in advance to allow for time to take action.

(Source: Byrick et al, 2002; Ryten, n.d.; O'Brian-Pallas et al, 2001a)

Forecasting Methods

HRH projection approaches use different types of forecasting methods to make predictions about the future of the health workforce. Health service research borrows methodologies from demography, epidemiology, economics and industrial engineering when forecasting the health workforce (O'Brian-Pallas et al, 2001a).

Population-based models:

Population-based forecasting methodology assumes that the factors that influence workforce supply are linked to demographic and utilization trends (O'Brian-Pallas et al, 2001a). This methodology adjusts for influential variables such as attrition rates and full- and part-time employment patterns, but assumes that neither the behavior of age cohorts nor the use of health services will change over time. While potentially valuable for short-term predictions, this method's limitations may produce inaccuracies when used for long-term projections.

Econometric models: Projections based on econometric modeling consider the relationships between demand factors, such as vacancies and population requirements, and market factors, such as budgets, salaries and workforce supply (O'Brian-Pallas et al, 2001a). These models successfully account for some of the financial forces that affect workforce supply; however, such models are less able to address the influence of policy, budget constraints, social factors and quality of care.

Simulation models: Simulation modeling, either deterministic sensitivity analysis or stochastic simulation, uses mathematical methods that account for uncertainty in population trends, health care needs and service efficiency (O'Brian-Pallas et al, 2001a). Simulation models are able to adapt to real-world, "what if?" scenarios, and can be run repeatedly to accommodate adjustments in hypotheses or model parameters. Limitations of these models include the cost of implementation and the amount and level of detail of the data they require as compared to other models.

■ **Assumptions:** Utilization-based approaches assume that the population currently uses a suitable mix of health services. Future health care needs can be estimated based on predictable trends in population fertility, mortality and migration.

■ **Advantages:** Because future service utilization rates are closely linked to present utilization rates, projected HRH goals tend to remain financially attainable.

■ **Limitations:** This approach is based on the status quo and therefore may not address existing inadequacies in the quality or accessibility of health services. Furthermore, using the status quo does not permit the model to account for future changes in behavior patterns, employment trends or environmental factors (O'Brian-Pallas et al, 2001b). Finally, inaccurate assumptions may lead to considerable miscalculations in the projections.

Health Workforce-to-Population Ratio

A health worker-to-population ratio estimates the current ratio as well as the desired future ratio of doctors to population and of other health professionals to doctors. This method uses a base year ratio, estimating annual changes in future numbers of health workers (Hall, 2001). Projected future health worker supply is compared with projected need and projected costs are compared with projected available funds. Assumptions about growth rates are adjusted until desired ratios are reached. For example, the World Health Report (World Health Organization, 2006) states that countries need a population density of at least 2.28 doctors, nurses and midwives per 1,000 population to ensure skilled attendance at birth. This health worker-to-population density is used across many countries.

■ **Assumptions:** Using a health workforce-to-population ratio assumes that the relative proportion of health workers in a given area is the most important determinant of ability to deliver health services. Additionally, this approach assumes that reasonable decisions can be made about the preferred doctor-to-population and health worker-to-doctor ratios. Assumptions about desired ratios may be based on the ratio of a region or reference country selected as a comparator (Hall Mejia, 1978; Markham and Birch, 1997; O'Brian-Pallas et al, 2001a, as cited in Dreesch et al, 2005).

■ **Advantages:** This approach is quick, relatively simple and may be satisfactory if realistic assumptions are made about growth rates (Hall, 2001).

■ **Limitations:** The health workforce-to-population ratio does not take into account the effects of changes in health services utilization or changes in health workforce mix, productivity, task shifting, etc. (Hall and Mejia,

1978; Markham and Birch, 1997; O'Brian-Pallas et al, 2001a, as cited in Dreesch et al, 2005). Furthermore, disparities in health worker distribution that exist in the base year will likely continue through the target year.

Service Target-Based Approaches

Target-based approaches set targets for specific health care services, based on health worker supply or health services demand (Hall, 2001). Targets are created using information about current services provided, technologies in use, demand and expert opinion (Dreesch et al, 2005). These targets are then translated into staffing requirements for personnel and productivity norms for health care facilities (Dreesch et al, 2005; Hall, 2001).

■ **Assumptions:** The service-target approach assumes that health services standards can be met by health workers and facilities within a specified amount of time (Hall and Mejia, 1978; Markham and Birch, 1997; O'Brian-Pallas et al, 2001a, as cited in Dreesch et al, 2005).

■ **Advantages:** Projections based on the service-target approach account for some of the complexity of the relationships between variables and can complement other projection methods. This approach may be useful in planning critical health care services or services for small populations served by a single institution (Hall, 2001).

■ **Limitations:** This approach may depend on unreliable assumptions.

Adjusted Service Target-Based Approaches

Adjusted service target-based approaches are useful for specific health intervention programs. Targets are established based on priority health services needs, as determined by population demographics, expert opinion and the incidence and prevalence of health problems (Dreesch et al, 2005). Specific interventions addressing priority needs are identified and functional job analyses are used to determine the health worker skills required to carry out each intervention. Health worker time requirements are also estimated and converted into full-time equivalents (FTEs) for each intervention.

■ **Assumptions:** The adjusted service target-based approach assumes that evidence-based interventions can be effectively implemented in all circumstances (Dreesch et al, 2005).

■ **Advantages:** This competency-based approach identifies critical health workforce skills, providing guidance for future training initiatives. Planning is based on the skills and competencies required to provide health services, rather than inserting job titles or positions into plans. In addition, this type of analysis has the potential to improve efficiency through the reduction of overlapping skills and the combination of skill sets that work in synergy.

■ **Limitations:** In order to make projections using this approach, current infrastructure and resources must be available to assist and maintain the health workforce. Projections also require a significant amount of information, including a comprehensive review of the health workforce or accurate health professional expertise.

Facilities-Based Approaches

Facilities-based approaches range from simple to complex methods of target-setting for health care facilities. Thomas Hall has described a sector-level, facilities-target approach focused on improving individual health center capacity, facility mix, geographic distribution of health care facilities and adjustments to the private-to-public sector ratio (2001). Targets are founded on staffing standards in each type of facility, student-to-faculty ratios, the quantity of public health personnel and funding levels required to pay salaries. For example, Uganda estimates its workforce needs based on staffing norms for each type of health facility and estimates the required number of facilities based, in part, upon the population (Ministry of Health, 2007).

■ **Assumptions:** The facilities-based approach assumes that adjustments to the number, size and type of health care facilities, as well as changes in facility staffing standards, will improve the ability of the larger health sector to address health service needs.

■ **Advantages:** Projections created using this approach provide more detailed information and can explore different policy options more easily than the health workforce-to-population ratio, while remaining focused on the point of health services delivery.

■ **Limitations:** This approach cannot easily accommodate information about the quality of health services or patient needs.

Additionally, Keith Hurst has detailed a range of facility-based methods used to make projections about the nursing workforce (2002). For brevity, each method will be described only cursorily.

The *professional judgment method* relies on a simple formula and expert opinion to quickly determine the number of nurses needed based on the number of hours in each shift. Although easy to use, this approach is considered too subjective and inflexible by some managers and does not account for nursing quality.

The *nurses per occupied bed method* uses a ward staffing formula based on a study of 308 hospitals in the United Kingdom. This simple, top-down approach allows for benchmarking, but has been criticized due to its inability to adjust to both differing standards of care and patient needs.

The *acuity quality method* is sensitive to patient needs and occupancy rates, and can be adjusted to reflect individual shifts as well as performance indicators. However, this method is much more

complex and requires detailed data about the nursing workforce and the patient population.

The *timed task/activity method* is a complex approach that combines patient care needs with the time required for 450 nursing interventions. The use of more detailed data may result in increases in projection accuracy. Downsides include the substantial cost and effort to track patient needs and nursing activities.

The *regression analysis method* predicts the necessary number of nurses based on the amount of activity in a health facility. In contrast to some of the other methods, this method requires a smaller investment of time and resources to monitor day-to-day changes in patient needs and nurse activities. However, this model cannot easily adjust to differing levels of productivity or account for qualitative variables.

Suggestions for Choosing a Projection Model

Choosing a projection approach or forecasting method requires deliberate consideration since the type of model used can have a significant effect on the resulting outcomes and recommendations. For example, in a study estimating nursing workforce requirements in Canada, the use of a needs-based model resulted in a projected need for 70,808 nurses, while a utilization-based model using the same data projected a need for 112,000 nurses (Birch et al 1994 as cited in O'Brian-Pallas, 2001a).

Using multiple, complementary projection approaches may provide insight for planning and decision-making, but may also be unfeasible due to the amount of time and data required as well as the increased complexity inherent in combining approaches.

Projection approaches should be selected with consideration of practicality and feasibility, given the data and resource constraints of a given situation. Useful projection models should address a clearly defined, quantifiable objective or problem. Additionally, models should be flexible enough to respond to new data and updated information. Model choice should also take the available data (or the data to be collected) under consideration. For example, using a sophisticated model that requires a large amount of data may produce inaccurate projections if the available data are unreliable, whereas collecting a smaller amount of less detailed but more trustworthy data and using a simpler projection model may lead to more accurate results.

Suggestions for Optimizing the Results of HRH Projections

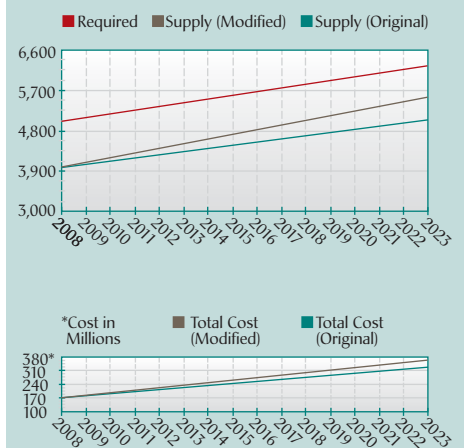
In order to take steps to address the demands on the future health workforce, decision-makers must be able to

HRH Workforce Planning Model Workshop

In December 2007, the Capacity Project organized a health workforce planning model workshop in order to choose a standard workforce projection model on which to base an Open Source software program. Participants decided to use the WHO HRH Workforce Projection Model developed in 1992 by Thomas Hall and Peter Hornby because this model is well-known, powerful and concentrates on the health sector. iHRIS Plan, the Capacity Project's software based on a modified John Dewdney model, initially focuses on short-term HRH workforce planning (see www.capacityproject.org/hris/suite/ihris_plan.php). Subsequent versions will be based on the WHO model. The software is designed to be user-friendly, enabling decision-makers to model the effects of potential workforce policy reforms. All workshop materials are available at: www.capacityproject.org/workforce_planning_workshop/index.html. See Figure 1 as a sample of the type of reports available with iHRIS Plan.

Figure 1: Sample Report from iHRIS Plan

The following is an example of the type of reports that can be created using iHRIS Plan. The upper graph shows the projected 15-year health workforce requirements and the expected supply of health workers with the current retirement policy as well as the change in supply that could be achieved by adjusting the retirement age, moving the supply closer to the requirements. The lower graph shows total costs for the health workforce supply with the current retirement policy and the increased cost of changing the retirement age.



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This publication is made possible by the support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the Capacity Project and do not necessarily reflect the views of USAID or the United States Government.

understand and analyze current workforce capacity (Hall, 2001). Projections provide insight into possible future scenarios, enabling decision-makers to take action today in order to address tomorrow's needs. Nevertheless, planners should remember that projections are only estimations of what is to come and that the process of HRH planning should be iterative (O'Brian-Pallas, 2001a). To remain useful, projections should be updated regularly to incorporate higher quality data and to reflect developments in population trends and health services utilization (Hall, 2001; O'Brian-Pallas, 2001a). Additionally, historical projections should be compared with outcomes in order to improve the accuracy of forecasting techniques

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and models. Finally, although projection models should anticipate health sector developments for ten to 30 years into the future, policies based on projections should look no more than three years ahead (Hall, 2001).

In addition to these suggestions, countries may need additional technical support to change the culture and use of the available information resources. The Capacity Project has developed a participatory process for data-driven decision-making (DDDM) to enhance workforce planning and management. DDDM has three functional areas: 1) collection, integration and dissemination of data; 2) analysis and reporting of data; and 3) procedures for acting on data to influence policy and practice (Adano, 2008).

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