An approach to estimating human resource requirements to achieve the Millennium Development Goals

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In the context of the Millennium Development Goals, human resources represent the most critical constraint in achieving the targets. Therefore, it is important for health planners and decision-makers to identify what are the human resources required to meet those targets. Planning the human resources for health is a complex process. It needs to consider both the technical aspects related to estimating the number, skills and distribution of health personnel for meeting population health needs, and the political implications, values and choices that health policy- and decision-makers need to make within given resources limitations. After presenting an overview of the various methods for planning human resources for health, with their advantages and limitations, this paper proposes a methodological approach to estimating the requirements of human resources to achieve the goals set forth by the Millennium Declaration. The method builds on the service-target approach and functional job analysis.

Key words: health planning, human resources for health, health interventions, tuberculosis, maternal health, child health, malaria, HIV/AIDS

Background

Human resources play a critical role in delivering health services to the population. Health planners and decision-makers have to ensure that the right number of people, with the right skills, is at the right place at the right time to deliver health services for the population needs, at an affordable cost. A comprehensive definition of human resources for health (HRH) planning is as follows:

[It] is the process of estimating the number of persons and the kind of knowledge, skills and attitudes they need to achieve predetermined health targets and ultimately health status objectives. Such planning also involves specifying who is going to do what, when, where, how and with what resources for what population group or individuals, so that the knowledge and skills necessary for adequate performance can be made available according to predetermined policies and time schedules. This planning must be a continuing and not a sporadic process, and it requires continuous monitoring and evaluation. (Hall and Mejia 1978)

Planning the health workforce is not only a technical process, but also a political one, as decisions on the number, types and distribution of health workers depend on the political choices and values enshrined in the organization of national health systems (Fulop and Roemer 1987; Dussault et al. 1997). Therefore, the methods chosen to estimate human resources requirements reflect the political and economic choices and social values that underlie a particular health care system. For example, in a health system where health care is publicly funded and the access to services is allocated on the basis of need, epidemiology is the main determinant of HRH requirements. In a health system where health care is privately funded and access to services is based on ability and willingness to pay, economic factors are the main determinant of human resources requirements (Birch et al. 2003).

Rational policies and strategic planning are thus necessary in the context of imperfect health labour markets. The purpose of the HRH planning process is to seek a balance or to address the mismatches between what is available in terms of HRH and what is actually required to deliver the health services. Various approaches have been proposed and used for estimating the supply and the requirements for human resources for health. These various methods have different assumptions, different data requirements, different costs, and answer different kinds of questions.

The supply side represents the availability and the characteristics of the health workforce at the present moment or at a future point in time, based on assumptions on the inflows (inputs), losses and use. The approach used is to
assess the availability of human resources (‘active supply’) as the difference between future increments (from new graduates, transfers from other occupations, immigration) and projected losses (through deaths, retirements, emigration, transfer to other occupations, and ‘inactive supply’, usually unemployed health workers). It usually requires extensive data collection and assumptions on attrition rates, both from training institutions and the health system (Hall and Mejia 1978).

To estimate the HRH requirements, four methods have been traditionally described: needs-based approaches, utilization or demand-based approaches, health workforce to population ratios, and the target-setting approach (Hall and Mejia 1978; Markham and Birch 1997). Table 1 presents the advantages and limitations of these methods as well as those of the approach proposed in this paper.

With the exception of the health workforce to population ratios approach, these methods seek to translate the required number and types of health services into time estimates, and then express these as full-time equivalents of health personnel, using norms and standards on the actual productive time. The difference between these methods resides in the way in which the required health services are identified. For instance, in the needs-based approach, the number and type of health services to be delivered are estimated based on the health needs of the population, assuming that all health needs can and should be met, and using professional judgments on what are the most appropriate services and technologies to meet those needs. However, this approach does not take account of users’ perspectives based on their values, culture and traditions. Neither does it take into account the different perceptions of patient/client need as viewed by the various types of health workers, who all may hold vastly different perceptions based on their values, traditions and professional judgments.

In the target-setting approach, the number and types of services are set by health authorities as specific targets, at various levels of care, considering the current level of technology, the demand of the population for certain services and the various services already performed by health workers. The utilization-based approach usually takes the current level of health services utilization as being appropriate to meet the health needs and projects the future requirements of the health workforce based on future changes in the structure of the population (Hall and Mejia 1978; Hornby et al. 1980).

Once the number and types of services have been identified, translating them into time requirements can be done in two ways. One way is by using professional judgments or expert opinions on the expected time required to deliver specific health interventions. For example, a panel of experts (the Delphi technique) is asked to make assumptions on what is the time required to deliver specific health interventions, given specific technological resources and at various levels of care, by various professional categories. Another way is to actually measure the time taken to deliver specific services through time-motion studies, patient flow analysis or activity sampling techniques (WHO 2001).

There are many methodological limitations to these approaches for HRH planning at country level. Most of the time HRH planning is seen as an isolated technical process, not linked with national health policy, the health needs of the population or health outcomes. Often HRH planners and decision-makers do not have adequate data on which to base their decisions, and there is too much emphasis on quantitative aspects, with too little on the qualitative. Planning is most often profession-specific, considering only one or two of the health professions, usually doctors and nurses. It does not consider teams and ignores the variations in practice and the possibility of using substitute health workers, or changing the current level of productivity. Usually these methods do not consider the level of resources committed to health care and other economic aspects, and the assumptions they use need to be evaluated for relevance and accuracy (O’Brien-Pallas et al. 2001a; Murphy 2002). Further detailed methodological discussion and policy considerations on planning approaches have been proposed in the literature, although they do not specifically address the developing country context (Bloor and Maynard 2003).

Various authors have proposed adaptations and amendments of these methods to overcome these shortcomings (Adams and Wood 1990; O’Brien-Pallas et al. 2001b; Birch et al. 2003; Kurowski et al. 2003). The adjusted service target approach was proposed by Adams and Wood (1990) to estimate physician requirements for Canada. The model attempted to establish appropriate service targets by critically examining the current levels of services and adjusting to reflect expert opinion on the methods by which they are delivered. In effect, it uses utilization data, adjusted to reflect expert opinion on norms of care, within a known environment. However, the model only addressed physicians’ requirements, without looking at the potential substitution between health professions.

Another approach, called NTTP (needs, service targets, time and productivity), was proposed to estimate the human resources requirements to deliver health interventions related to the Millennium Development Goals (Kurowski et al. 2003). The quantity of services was estimated for 33 priority health interventions recommended by the Commission on Macroeconomics and Health, which were advocated to address the disease burden attributable to tuberculosis, malaria, childhood disease, maternity-related conditions and HIV/AIDS. This method is very close to the approach presented here, the difference being in the way the interventions are identified and in the way time estimates are elicited.

The World Health Organization (WHO) proposed ‘coordinated health and human resources development’
<table>
<thead>
<tr>
<th>Method for estimating HRH requirements</th>
<th>Description</th>
<th>Assumptions</th>
<th>Advantages</th>
<th>Limitations</th>
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<tbody>
<tr>
<td>Needs-based</td>
<td>Estimates future requirements based on estimated health deficits of the population Projects age- and gender-specific ‘service needs’ based on service norms and morbidity trends Converts projected service needs to persons requirements using productivity norms and professional judgment</td>
<td>All health care needs can and should be met Cost-effective methods to address the needs can be identified and implemented Resources are used in accordance with needs</td>
<td>Has the potential of addressing the health needs of the population using a mix of HRH Is independent of the current health service utilization Is logical, consistent with professional ethics, easy to understand Is useful for some programmes such as prenatal and child care Is useful for advocacy</td>
<td>Ignores the question of efficiency in allocation of resources among other sectors Requires extensive data If technology changes, it requires norms update Is likely to project unattainable service and staff targets</td>
</tr>
<tr>
<td>Utilization-based (or demand-based)</td>
<td>Estimates future requirements based on current level of service utilization in relation to future projections of demographic profiles</td>
<td>Current level, mix, distribution of health services are appropriate Age- and sex-specific requirements remain constant in the future Size and demographic profile of the population changes in ways predictable by observed trends in age- and sex-specific rates of mortality, fertility and migration</td>
<td>Economically feasible targets due to no or little change in population-specific utilization rates (assumed)</td>
<td>Requires extensive data Overlooks the consequences of ‘errors’ arising from the assumptions proving to be invalid Produces a ‘status quo’ projection, since future population segments are assumed to have similar utilization rates as base year segments</td>
</tr>
<tr>
<td>Health workforce to population ratio</td>
<td>Specifies desired worker-to-population ratio</td>
<td>Often based on current best region ratio or a reference country, with a similar but presumably more developed health sector</td>
<td>Quick, easy to apply and to understand</td>
<td>Provides no insight into personnel utilization Does not allow to explore interactions between numbers, mix, distribution, productivity and outcome Base year maldistribution will likely continue in target year</td>
</tr>
<tr>
<td>Service target-based</td>
<td>Sets targets for the production and delivery of specific outcome oriented health services Converts these targets into HRH requirements by means of staffing and productivity standards</td>
<td>It assumes that the standards of each service covered are practicable and can be achieved within the timescale of the projection</td>
<td>Relatively easy and understandable Can assess interactions between variables</td>
<td>Potentially unrealistic assumptions</td>
</tr>
<tr>
<td>Adjusted service target approach</td>
<td>Identifies service needs based on epidemiological and demographic profile, and programmatic targets Identifies tasks and skills required to deliver the evidence-based strategic interventions for the specific programs, based on functional job analysis Estimates time requirements for each intervention, based on time-motion studies or expert opinion Translates the time requirements into adjusted full-time equivalents, based on productivity</td>
<td>Effective evidence-based interventions can be delivered in all settings/conditions</td>
<td>Useful for specific programmes Looks at efficiency issues and potential for combination of skills Useful to identify training needs Goes beyond the traditional occupation-based training/practice towards competency-based training and service</td>
<td>Requires detailed workflow studies or expert assessment and opinion Can only be effective if infrastructure, supplies and logistics are in place to support HRH</td>
</tr>
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</table>

as a more comprehensive and systematic approach for health systems and human resource development (WHO 1990). The approach proposed fundamental changes in the philosophy of planning towards interdisciplinary and intersectoral planning. However, the shift was very difficult to transfer from theory into practice, particularly in the context of public and health sector reforms (IHHRDP 1995). Public sector reform drives during the 1990s were characterized by a focus on implementing stringent fiscal reforms, often resulting in public sector hiring freezes. At the same time, more pluralist health systems emerged, with a lack of stewardship exercised towards the development of a balanced health workforce. There is a perceived need today to use a combination of quantitative and qualitative methods and techniques, as well as managerial and economic approaches, which will contribute to a better integration and coordination of human resources planning in national health planning and policy development.

The Millennium Development Goals

In the context of the Millennium Development Goals (MDGs), human resources for health pose a new challenge for health policy- and decision-makers in countries, and the question of having the right number, the right skills and the right distribution of health workers to meet the MDGs is one that many governments are struggling with.

Three of the eight MDGs address health issues and aim at reducing child mortality, improving maternal health, and combating HIV/AIDS, malaria and other diseases (United Nations 2000).

The burden of each of the health problems addressed by the MDGs is well known. The HIV/AIDS pandemic continues to spread unabated in many parts of the world, although some countries have shown that political leadership and concerted action by all sectors of society can lead to tangible progress. The goal of covering 3 million people suffering from HIV/AIDS with antiretroviral therapy (ART) by the year 2005 was proposed at the International AIDS Conference held in Barcelona in July 2002. It was also embraced by WHO, and declared one of the major priorities of action by the newly appointed WHO Director General, Dr JW Lee, in 2003 (Lee 2003).

Tuberculosis (TB) has re-emerged as a major cause of death and disability in many countries, and the development of multidrug-resistant strains has complicated its clinical management. The WHO-recommended TB-control strategy known as DOTS is a cost-effective combination of technical and managerial components, which has proved successful in large and small countries, both rich and poor, in the treatment of tuberculosis. The five elements of the DOTS strategy, considered essential for global TB control, are: political commitment; case detection using sputum microscopy among persons seeking care for prolonged cough; standardized short-course chemotherapy under proper case-management conditions, including directly observed treatment; regular drug supply; and a standardized recording and reporting system that allows assessment of individual patients as well as overall programme performance (WHO 1999).

However, many countries have failed to achieve the global targets of detection (70% of infection cases) and of cure (85% of those detected) by the year 2000, citing human resource constraints as a major bottleneck (Bergstrom 2002; WHO 2003). Overall, it is estimated that less than 27% of the world’s active TB cases are under DOTS care (WHO 2003).

Malaria causes at least 300 million cases of acute illness each year, and is the leading cause of death in young children. Pregnant women are the main adult risk group in most endemic areas of the world. Each year, around 90% of the more than 1 million deaths from malaria worldwide occur in Africa; this constitutes 10% of the continent’s overall disease burden (WHO and UNICEF 2003).

The Integrated Management of Childhood Illness (IMCI) strategy targets children for specific interventions that have the potential to reduce the most important causes of childhood mortality (pneumonia, diarrhoea, malaria, measles, HIV/AIDS, neonatal causes and malnutrition) (Gove 1997; Tulloch 1999). Children under five bear 19% of the total global mortality (Mathers et al. 2002), and nearly all deaths (97%) occur in poor developing countries (Mathers et al. 2003). A limited set of evidence-based interventions, including those contained within IMCI, could prevent two-thirds of mortality by 2015, and thus help reach the MDG related to child mortality (Jones et al. 2003). However, efforts to attain universal coverage with these interventions need to be stepped up substantially. This requires reaching out to communities (Bryce et al. 2003) and addressing financial as well as human resource barriers (Bellagio Study Group on Child Survival 2003).

The ‘Making Pregnancy Safer’ initiative is promoting strategies to ensure skilled care is provided to all pregnant women, women in childbirth and newborns in order to reduce maternal and perinatal mortality and morbidity. Every year approximately 8 million women world-wide endure pregnancy-related complications and over half a million die as a result; some 3.9 million newborn babies die during their first week of life and another 3 million are born dead (WHO, UNICEF and UNFPA 2004). One of the key interventions to reduce the burden of maternal and newborn morbidity and mortality is to ensure that births are attended by skilled health workers, who are accredited health professionals such as midwife, doctor or nurse, who have been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in women and newborns (WHO 2004).
Strategies and constraints to implementation

The global strategies that each programme at WHO proposed to address these challenges have several elements in common; for example, the strong dependency on human resources; the need for strong surveillance and monitoring systems; the requirement for accessible and affordable drug supply; the focus on prevention; and the need for programmes for particular target groups and emergency situations (WHO and UNICEF 1999; WHO 1999, 2002b, 2002a). The actual implementation of these strategies faces several constraints, spanning a range from weak political commitment and financial constraints, through to managerial and organizational weaknesses, lack of a primary health care infrastructure and limited access to drugs.

However, the major constraint that each of the specific programmes has noticed in the implementation of their strategies relates to human resources for health. For example, a study commissioned by the Global Alliance for Vaccines and Immunization (GAVI) found that management and human resources represent a major constraint in 40 Vaccine Fund-eligible countries, in 18 being the primary barrier for immunization scale-up (McKinsey Group 2003). The annual review of the STOP TB programme found that 10 of the 22 high burden countries reported major deficiencies in staffing at central level, while another seven countries struggle with inadequately trained staff at periphery level (WHO 2003). Reviews of the implementation of IMCI noted human resource barriers as critical health system constraints and recommended that, in order to achieve the under-five targets of the MDGs, countries and implementing partners urgently needed to increase and make better use of the existing human and financial resources devoted to child health programmes (WHO 2002b; DfID et al. 2003).

The main HRH constraints to deliver priority health interventions are:

- inadequate number of health staff due to low financial resources;
- uneven distribution of health workers at different levels;
- high attrition and low replacement rates;
- inappropriate or inadequate training with curricula that are not needs-based;
- poor policies and practices for human resources development (poor career structures, working conditions and remuneration);
- high staff turnover;
- lack of supportive supervision;
- lack of integration with the private sector;
- poor access to information and knowledge resources; and
- low morale and motivation.

In the following section we provide a method to estimate the human resources requirements to achieve the MDGs, as one step towards addressing the above concerns. The method builds on the service target approach and the functional job analysis, and seeks to identify skills and time requirements, as well as potential efficiency gains across various priority health programmes.

An approach to estimating HRH requirements to achieve the MDGs

An inter-cluster collaborative working group within WHO is working towards developing a methodology to estimate the HRH requirements for priority health interventions. The approach involves the following steps:

1. Identify the needs for services, based on the incidence and prevalence of health problems, demographic characteristics of the population, and (internationally) the targets set forth by the MDGs, or (at country level) targets identified in health sector strategic plans.
2. Identify the interventions required to deliver these services, at each level of care, based on the strategies proposed by various programmes.
3. Identify the tasks and skills required to deliver those specific interventions, at each level of care, using a functional job analysis.
4. Estimate the time requirements for each of the interventions, at each level of care, based on programme expert opinion or data provided by time-motion studies; express time requirements in full-time equivalents.
5. Identify possible overlap/synergies between skills and possible time-savings effected by combining various skills; build in productivity.

Figure 1 presents schematically the adjusted service targets approach for estimating the human resources requirements for priority health problems.

The framework builds on the functional job analysis or task analysis (Moore 1999). A task is defined as a unit of work which can be described in a task statement, which answers the following questions: who performs what action, to whom or what, upon what instructions or sources of information, using what tools, equipment or work aids, in order to produce what output. The task analysis seeks to define and describe the knowledge, skills and abilities (KSA) involved in a job. These KSA serve to specify both what is required by the job and the health worker qualifications for the job. KSA are the essential information needed by organizations for carrying out their diverse HRH functions and can provide an excellent basis for estimating personnel requirements.

A matrix has been developed, in which the various programmes can list the tasks that need to be performed at various levels of care (Figure 2). The levels of care and the task categories are listed in Table 2. Using this matrix, each programme can identify the skills required to deliver...
their interventions, at each level of care, as well as the training needs, which in this case refer to the additional in-service training required from the perspective of each programme, based on the case management tasks identified. Pre-service training is not considered here, as this is taken as a prerequisite and does not consume time from the health worker on the job. Nevertheless, the principles of functional job analysis are equally valid for...
The process of getting from the listing of tasks and identification of skills/competencies to estimating the time requirements for all the programmes has been tested initially within the specific context of two countries (Ghana and Ethiopia). A first attempt to use this matrix has been made from the perspective of one programme (Roll Back Malaria); the exercise emphasized the importance of contextual factors in defining skills and competencies, at the national strategic level (Marsden et al. 2003).

Table 2. Levels of care and task categories

<table>
<thead>
<tr>
<th>Levels of care</th>
<th>Task category</th>
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<tbody>
<tr>
<td>national</td>
<td>programme management</td>
</tr>
<tr>
<td>provincial/state</td>
<td>prevention</td>
</tr>
<tr>
<td>district health office</td>
<td>diagnosis</td>
</tr>
<tr>
<td>hospital</td>
<td>treatment</td>
</tr>
<tr>
<td>health centre</td>
<td>counselling</td>
</tr>
<tr>
<td>other lower health facility</td>
<td>pharmaceuticals</td>
</tr>
<tr>
<td>community-level activities</td>
<td>surveillance</td>
</tr>
<tr>
<td></td>
<td>data management</td>
</tr>
<tr>
<td></td>
<td>action for social behaviour change</td>
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</tbody>
</table>

Discussion

There are a number of reasons for choosing this particular approach in planning for HRH requirements: the MDGs set specific objectives for health and there are a number of specific interventions to achieve these objectives, when delivered to the population in need. It is also possible to set service targets based on these interventions. The functional job analysis allows for clearly identifying the skills required to deliver specific tasks, and for identifying potential synergies and time savings across specific interventions. The data required for this exercise are not very complex, and the involvement of the actual providers in estimating the time requirements gives the approach a participatory nature, which is absent in all the other approaches for HRH planning.

However, several limitations need to be considered when using the approach proposed here. There are technical difficulties in some settings to actually define the tasks that need to be performed, and often the skills required do not match with those existing. When timing the various tasks at various levels, there is a danger of over-estimating the requirements by adding up apparently small differences observed at lower levels of care. Then, in terms of planning, the exercise should consider the feasibility of getting the estimated number of staff, given the available resources. While this method only focuses on the priority health problems related to the MDGs specifically in the developing country context, the approach could be extended to other health problems that are considered priorities for a given country at a given moment in time.

In attempting to integrate human resources planning across health priority programmes, it will be necessary to analyze three questions: why to integrate, what to integrate, and at what level of care. It is important to understand that by integrating some of the tasks performed by various staff for various health interventions, it is possible to achieve efficiency gains. It is, however, equally important to identify the various functions that need to be integrated, like deployment, planning, supervision, service delivery. Finally, some of these functions could be better performed at central level, while others could be delivered using a horizontal approach at the local level. The nature of the tasks within each category varies per level. For example, at central level the task related to diagnosis may be to set diagnostic standards and to
determine and ensure equipment needs, whereas at health centre level it may be more related to the diagnostic process itself. However, such a change has many implications. Policies and the legal framework governing the authority for certain categories of staff to provide specific interventions may need to be reviewed and amended. This is not an easy process, since it implies dealing with social values and professional boundaries, as well as negotiating to define and agree upon new roles. Moreover, these new roles, authorities and functions must be negotiated in such a way as to gain social acceptance. Inevitably, this will require public debate and discourse, and often considerable advocacy for society to accept such change.

While concentration of effort leads to relatively rapid results during the first phases, the final coverage goals of a priority programme can often only be achieved by combining forces with other supportive programme interventions and use of multi-skilled health workers. Therefore, combining and/or expanding skills throughout a sub-set of purpose trained health workers may be a solution to increase effectiveness of the programme implementation. The engagement of the private sector, both for-profit and not-for-profit (faith-based or charitable NGOs), is another issue that needs to be considered in the attempt to integrate human resources for priority health problems.

At country level, specific aspects of the organization and management of health systems will need to be considered when implementing such an approach. The planning of HRH for priority health interventions should not be performed at the expense of other health sector needs. A thorough investigation of the available resources for the planned human resources, as well as for the services they need to provide, will be the first and most important step of this approach. A sequence of proposed steps to follow is depicted in Figure 3.

One of the major limitations in applying this approach consistently is the lack of detailed data about the health workforce at country level. Countries that have the most need of resources in order to achieve the MDGs are also the ones which usually lack the information/data on the current level and distribution of their health workforce, and have a limited capacity to analyze and plan for future HRH. Also, for some countries, it may be the case that the current level of HRH is simply not enough to achieve the targets, despite increased investment in education (absolute shortage, or gap). For other countries, targets can be achieved through a combination of increasing investment in education for health professions and a more efficient use of existing HRH (relative shortage, or need). Therefore, a simple methodology for assessing the current HRH availability and for estimating the future requirements of HRH, based on health needs and targets of the MDGs, would be a helpful tool for developing countries to plan their health workforce.

Conclusions

Traditionally, several methods for HRH planning have been used, ranging from health workforce to population ratios to standard staffing norms for individual health facilities. Different methods have addressed the supply side of the health workforce, the demand side, or both. These methods have largely failed to recognize the effects of shared competencies, the potential of substitution between health professions and the multiple tasks performed by a particular category of provider (Birch et al. 2003). These approaches to addressing workforce imbalances, attrition rates and population changes may still be useful for country-level planning. However, new thinking is required for the emerging context of health care. HRH planning must adopt a more integrated approach and consider the potential of redistributing tasks between health professions, mobilizing the community and integrating external resources into national HRH planning.

The method proposed here can be used as an alternative approach to the traditional health workforce planning methods. It builds and expands on existing tools, and responds to the ever greater need for reaching higher degrees of efficiencies in staff utilization, which is of prime importance to reach the MDGs. The approach adopted is to first conduct a gap analysis between what is required to achieve the tasks of each programme, in terms of health workforce, and what is actually available at country level. The results of this analysis could then be used, in particular in the developing countries’ context, for the elaboration of integrated sector-wide strategies. This would better respond to priority health problems and to human resources constraints resulting from competing programme objectives. It is expected that this will lead to a more balanced distribution of staff between priority programmes. This response will require changes in how elements of the workforce are trained and expected to work together to meet the changing needs of the health system.

References


Biographies

Norbert Dreesch, BA, MSc, started at the World Health Organization (WHO) in Geneva in 1980. He has undertaken various roles in WHO, including 3 years in WHO Vanuatu Country Office and participation in WHO missions related to health sector analysis and planning in other Pacific island countries. He is currently a Technical Officer in the Department of Human Resources for Health, responsible for development of country assessments of the impact of HIV/AIDS on the health workforce in collaboration with the HIV/AIDS Department, responsible for collaboration with HIV task groups on scaling up access to antiretroviral therapy and country support for scaling up access to human resources for ART.

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