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**Towards a comprehensive economic methodology for
estimating the cost of human resources for health
under alternative scenarios**

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Abstract

This paper gives guidance to the research agenda on how to cost human resources for health. While health workforce planning and management increasingly takes into account the dynamics of the health labour market and its external environment, the costing of human resources for health, on the basis of which human resource planning should be carried out (among other factors) is relatively underdeveloped. Given the currently fragmented and inefficient spending patterns on human resources for health, a comprehensive methodology for estimating the cost of human resources for health is urgently needed. One promising avenue for future research is to develop and use applied partial and economy-wide models. Such models can be adapted to the specificities of the country in question, be put to use in devising alternative strategies for human resource management and planning using alternative financing options and alternative goals, and can give insight into their respective costs.¹

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1 Introduction

This paper considers the issue of how to cost human resources for health primarily using existing surveys and overview literature on (human) resources for health costings. By doing so, the paper aims to give direction to the research agenda in the area of costing human resources for health. The topic is relevant because, while health workers are crucial for a well-performing health system, the lack of health workers forms the single most important constraint to scaling up in the health sector in developing countries.² In order to scale-up human resources for health in a sustainable way, policy-makers as well as human resource managers and planners should have a clear picture of the financial and economic implications.

Human resources for health are defined as 'all people primarily engaged in actions with the primary intent of enhancing health', consistent with the WHO definition of health systems as 'comprising all activities with the primary goal of improving health – inclusive of family caregivers, patient-provider partners, part-time workers (especially women), health volunteers and community workers'.³ Within this broad spectrum of health workers, particular attention is given to professional health workers in the public sector because these are under direct influence of policy-makers. Given that human resource requirements and costs differ per country, the paper focuses on costing analyses carried out at the country level and below (e.g. district level).

The main finding of the paper is that, while human resource policies in the health sector are increasingly being refined, taking into account the complexities of the health labour market and the environment in which it operates, the costing of human resources for health on the basis of which health human resource planning, amongst others, should be carried out, is still very much in its infancy. This contributes to current spending patterns on human resources for health that are fragmented and inefficient.⁴ A comprehensive methodology for estimating the cost of human resources for health under alternative scenarios – which is currently lacking – is therefore urgently needed.

The paper makes a case for borrowing knowledge from applied partial and economy-wide models that are commonplace in, for example, trade policy analysis. Such models can be adapted to the specificities of the country in question, put to use in devising alternative strategies for human resource management and planning using alternative financing options and alternative scenarios of objectives that one wants to achieve, and can give insight into their respective costs.

² Chen et al. (2004), Joint Learning Initiative (2004), Narasimhan et al. (2004), WHO (2006).

³ Definition taken from WHO (2006). The terms 'health system' and 'health sector' are used interchangeably. The term 'health care' is considered to cover prevention, promotion, diagnosis, treatment and care.

⁴ See Chen et al. (2004).

2 Costing human resources for health

The World Health Organization in its 2006 World Health Report puts a rough figure to the number of health workers required for supplying sufficient health care to the population in developing countries and the cost of doing so. Approximately 3.5 million additional health workers are needed to eliminate the gap that exists between the current availability of health workers and the required health workers in the year 2015. This would require USD 77.7 billion in terms of education costs (spread over a 10 year period) and an incremental annual salary cost of USD 17.8 billion.⁵ As one would expect with such aggregate estimations, rather stringent assumptions had to be adopted to arrive at a figure at all, making it useful in terms of advocacy but not very useful for policy makers for more detailed human resource management and planning.⁶

A few excellent overview studies have appeared on the issue of planning and costing (human) resources for health at the country level.⁷ The following patterns emerge from the literature. Firstly, strategic planning exercises to estimate human resources for health needs neglect the issue of costing and alternative financing and payment structures which will impact differently on the economy and on the health system, while human resource planning can only be carried out properly on the basis of (among other things) an analysis of costs.

Secondly, it appears that the issue of human resources for health is a relatively neglected area in costings of health interventions. Costs are often assessed per disease programme rather than as part of the broader health system, while these costs (and their components) are in reality very much intertwined. Moreover, human resources are most often submerged in the unit costs of interventions, so that it is unclear what the true requirements for human resources for health are.

Thirdly, when a costing of human resources for health is carried out, it is usually based on crude estimates of staff needs valued at current public-sector salaries (and allowances) or some assumed salary increase. There are traditionally four methods to assess staff needs: based on health workforce to population ratios, health needs, utilization or demand, and target setting.⁸ Shortfalls are then determined by comparing the outcome with current and planned health sector budgets. There are several problems with this approach.

Firstly, there is a tendency to focus on the number of medical staff in standard categories (doctors, nurses and sometimes also midwives). However, human resource requirements also include other types of health professionals (e.g. managers, administrative staff, other support staff, counsellors, medical clerks,

⁵ See Verboom et al. (2006) for more detail on the underlying calculations and assumptions.

⁶ Specifically, the paper only takes into account costs of educating health workers and salaries, assumes that there are no changes in technology or service delivery, uses regional averages for countries fulfilling the default target in the absence of data on the different categories of health workers – medical doctors, midwives and nurses, extrapolates data on education and salary costs using information from countries for which data were available, ignores migration out of the health sector or out of the country and ignores capital investments in training facilities.

⁷ The following analysis is based on O'Brien-Pallas (2001), Bloor et al. (2003), Dreesch et al. (2005), Johns and Tan Torres (2005) and Glassman et al. (2008).

⁸ For more detail on the needs-based approach, the utilisation or demand-based approach, health workforce to population ratios and the target-setting approach see Dreesch et al. (2005). Further refinements of these methods have taken place over time, including the adjusted service target approach by Dreesch et al. (2005), which seeks to identify skills and time requirements, as well as potential efficiency gains across priority health programmes. Another approach is the QTP approach which estimates current and future human resources for health requirements using information on service quantity, tasks and productivity (Kurowski et al., 2007).

community workers, volunteers, etc.). Also, next to salaries, costs include training costs (pre-service and in-service).

Human resource requirements and so costs will further be affected by alternative human resource management strategies. One can for example think of a technological change or improvement in working practice by which less health workers are needed to carry out a task (i.e. productivity increases/inefficiencies are being reduced), task shifting (e.g. from doctors to nurses) to free up specialists' time and financial and non-financial incentives addressing productivity and motivation of health workers and the maldistribution of health workers within a country (rural/urban, public/private, or across services) and externally (outmigration).

More generally, carrying out a costing of human resources for health on the basis of staff needs neglects the economics of the labour market for health personnel (factors determining the supply and demand for health workers) and its interactions with the wider economy (e.g. spill-over effects and competition between health labour and other labour markets; civil service payroll constraints, other fiscal constraints and implications, macroeconomic impacts of different financing mechanisms).⁹

Figure 1 provides an insight into the required components of a comprehensive human resources for health costing, focussing on professional health workers.¹⁰ The supply of human resources for health starts with the number of school leavers deciding to take up an education in health or other sectors. This decision depends on the career opportunities present in the health sector versus other sectors and personal and family characteristics. Those graduating successfully from a professional health training together with qualified health workers from abroad minus the number of qualified health workers who decide to emigrate form the pool of qualified health workers.¹¹ Some of these individuals will decide to enter the labour market depending on wages and other working conditions, as well as personal and household attributes such as age, gender and the household structure (e.g. the presence of an income earner).

The choice of which sector to enter primarily depends on wage and non-wage working conditions in the health versus other sectors. Next to these, personal attributes will play a role (e.g. the propensity to care for sick people). The aforementioned factors also influence other aspects of health labour supply, including the number of hours worked, productivity, quality of care provided and the distribution of health workers within the health sector (rural vs. urban; public vs. private; and across services, e.g. primary, secondary or tertiary care, or preventive vs. curative care).

Naturally, not all those who are willing to work will necessarily secure employment, i.e. there may be a pool of unemployed. Furthermore, each year a certain number of (health) workers will leave the labour force due to retirement, death or illness. Especially in Sub Saharan Africa a major cause of illness and death amongst health workers is the HIV/AIDS pandemic.¹²

The demand for human resources for health is ultimately a derived demand for health. In general terms, the health status of the population determines

⁹ For more detail see Vujicic and Zurn (2006) and Vujicic (2005) respectively.

¹⁰ The following analysis builds on Vujicic and Zurn (2006).

¹¹ See Rutten (2009a) for an overview of the (economic) causes and consequences of international migration of health workers.

¹² See for example Marchal et al. (2005) and Tawfik and Kinoti (2003). Note that this also influences the decision to work in the health sector.

population health needs, which in turn influences the demand for health care. Other factors also play a role, including demographic, socio-cultural and economic variables, such as income, price and the opportunity costs of a patient's time (travel time, waiting time). Furthermore, due to the existence of information asymmetries, suppliers may be able to positively influence the demand for health care beyond what is actually needed, causing a wedge between health needs and the actual demand for care.

The different institutions operating in the health sector supply health care in response to the demand for health care (and ultimately health needs). This is not a one-to-one correspondence since political and social factors play an important role. Moreover, the health sector, and within the health sector the different institutions providing care, have to compete for scarce resources. The level of care that is ultimately provided determines the demand for human resources for health and other inputs via the budgets that are available. The (relative) demands are influenced by the (relative) input prices (wages, prices of pharmaceutical inputs, etc.), the level of technology, and the productivity and level of training of the workforce. The demand for human resources for health will also be affected by alternative payment and practice patterns, the type of health care organisations operating in a country and the organisation of the health system in general.

In a perfectly functioning health labour market, wages would adjust so as to equate the demand for and the supply of human resources for health. However, entry into the health labour market is subject to regulation and licensing. Wages are often negotiated in collective bargaining rounds, making wages irresponsive to changes in demand and/or supply for several years. Moreover, wages in the health sector strongly relate to the broader public sector wage structure. Given that the price mechanism does not create equilibrium, countries have to resort to human resource planning to match the supply and the demand for health workers.

The grey areas in Figure 1 indicate a financing need, for which various options exist, including health insurance, out of pocket payments, taxation, foreign aid, borrowing, debt relief, reallocation of budgets between sectors and reducing inefficiencies in revenues and expenditures. Depending on the country context, each of these options will differ in terms of efficiency, effectiveness and macroeconomic impacts, which should be taken into account when costing human resources for health.¹³

The costing framework as presented in Figure 1 is particularly useful in rebutting some simplified perceptions that exist about the causal effects in human resources for health flows. Firstly, increasing training capacity is not sufficient to increase the supply of health workers. This is because, next to choosing an education in health, people also have to decide to stay in the country, must be willing to work and, conditional on being employed, must be willing to work in the health sector. Secondly, the actual level of human resources for health that institutions and governments are willing to hire is unlikely to be equal to the needs-based human resource for health level, since the demand for health workers is influenced by several factors other than health care needs. The size of the budget for human resources for health plays a decisive role. The costing methodology should take such complexities into account.

¹³ For more detail see Vujicic (2005).

3 A methodology for costing human resources for health

While the required components of a human resources for health costing are well recognised in the literature, it is unclear what methodology would be best suited to carry out a proper costing analysis. As Bloor and Maynard (2003) puts it, a more empirical, comprehensive and quantitative-economic approach is needed. This paper intends to go this one step further compared to the existing literature by giving direction in terms of the type of method that could be used to carry out a human resources for health costing.

Given the complexities in human resources for health supply, demand, costing and financing, the methodology ideally should be flexible on at least three accounts. Firstly, it should be possible to vary objectives for which the health workforce is intended to deliver health services. For example, the intention may be to satisfy health needs or to improve the health status of the population. Or the goal may be to improve the access to health services by the poor. Secondly, the model should account for the different strategies with which these goals may be attained. For example increasing health education capacity, retraining health workers, changing wages or non-wage working conditions so as to retain more health workers in the public sector and discourage them from migrating, task shifting, improvements in working practices/technology, etc. Thirdly, some variation in terms of the different financing options should be possible, since they have different implications for the health system and the wider economy.

Given the complex interrelations between the various sources of health worker supply and demand, and the variability that is demanded on the side of objectives, strategies and financing options, it makes sense to use an economic model in which these are incorporated as different scenarios. While this may be complicated and time-consuming, carrying out a costing analysis separately for each of the scenarios (objectives, strategies and financing) is likely to be even more laborious and time-consuming. This dynamic approach would be an improvement compared to current, more static approaches which usually focus on one objective (health needs) and one strategy (e.g. increasing education capacity), ignoring all-together the issue of financing.

What type of economic model would be suitable to use for a human resources for health costing analysis as summarised visually in Figure 1? If the costing framework is intended to take into account all complexities, including within the health labour market as well as its interactions with the remainder of the economy, then one could potentially be looking at an applied computable general equilibrium (CGE) model. If the costing framework is intended to focus primarily on the health labour market, where external factors would feed into as givens (but at least be taken into account), then a partial equilibrium (PE) model will suffice. Both types of models are commonly used in trade-policy analysis,¹⁴ but are gaining more and more importance in other areas as well, including in the area of health care.¹⁵ They are particularly appropriate for analysing problems that involve finding the optimal allocation of scarce resources, in this case human resources for health. Below follows a short description of CGE/PE type models, their usefulness and limitations, and how they could be applied to the issue of costing human resources for health.

A CGE model is a model consisting of a set of interrelated equations, which are derived from micro-economic optimisation behaviour of all agents in the

¹⁴ See for example Francois and Reinert (1997).

¹⁵ See Rutten (2009b) for an overview of CGE models in the area of health (care) and application to the UK.

economy under constraints. For example, households maximise utility subject to a household budget constraint and firms minimise costs given a production technology. The model is calibrated to, i.e. its parameters are estimated using, a comprehensive set of consistent and balanced macroeconomic accounts, the Social Accounting Matrix (SAM), comprising the income and outlays of all actors in the economy at a certain point in time. This procedure ensures that key behavioural identities and accounting constraints are satisfied and serves as a check on the 'reasonability' of the outcomes. A CGE model can be made sufficiently disaggregated, fit to the purpose of the study, and subsequently put to use in simulations of how changes in certain economic conditions are mediated through price and quantity adjustments in markets. Moreover, the CGE technique allows for counterfactual analysis, i.e. answering 'what if' questions, and is not just restricted to 'learning from the past' like econometric studies are. A CGE model thus possesses strong theoretical foundations and mimics the functioning of the economy by capturing the interactions between the various sectors of the economy (something which econometric studies conceal).

A PE model in essence is a component of a CGE model, and is generally used when the research problem requires more detailed modelling of one particular sector, when the interactions with the remainder of the economy are of lesser importance (either from a research perspective, or simply because they are insignificant), the sector under consideration is small compared to the rest of the economy, or because of time constraints.

Naturally, a CGE model (or for that matter, PE model) is not without limitations itself. First and foremost, unlike econometric studies, it is not possible to statistically validate the structure and underlying assumptions of the CGE model. As the SAM only reflects a 'snapshot' in time and does not contain detailed time series such as are used in econometric analyses, the direction of effects are more reliable than the magnitude.¹⁶ The more so since many of the parameters and elasticities are imposed rather than empirically estimated. CGE modellers address this issue by carrying out sensitivity analyses, which goes a long way to assessing the potential errors from using parameters not acquired through econometric methods. Moreover, while it is common practice to impose parameter and elasticity values, if sufficient data are present, it is possible to econometrically estimate a CGE model.

There are roughly three ways in which one could proceed to develop an economic model for a human resources for health costing. The first is to adopt a top-down approach, by developing or – if it already exists – using a CGE model for a specific country, and then elaborating the health sector and health labour market in more detail so as to address issues concerning human resources for health. Alternatively, one could adopt a bottom-up approach by developing a PE model of the health labour market of a specific country and/or a few specific diseases/interventions, and then, if necessary, develop it further into a more comprehensive, economy-wide model. Finally, one could adopt an intermediate approach by developing a CGE model at lower level of the economy, say district level. The advantage of the latter approach is that it shows all complexities involved in human resources for health planning, costing and financing, illustrative for a similar exercise at the national level, but at a decentralised level, requiring less effort in terms of gathering data and modelling. The most favoured approach (or mix of approaches) depends very much on the available data, which in poor countries will be very limited, existing models and time at hand.

¹⁶ Note that if data are lacking, as will be the case in most of the developing world, the fact that CGE modelling requires relatively little data compared to econometric modelling is actually an advantage.

4 Conclusions

The main contribution of this paper lies in giving direction to the future research agenda on how to cost human resources for health. The paper argues that developing and using applied partial and economy-wide models, i.e. computable partial equilibrium and/or general equilibrium models, may be the way to go, since in essence the research problem involves finding the optimal allocation of scarce, in this case human resources. Such models can be adapted to the specificities of the country in question, put to use in devising alternative strategies for human resource management and planning, using alternative financing options and alternative objectives, and give insight into their respective costs. The choice for a partial health labour market model, a more comprehensive economy-wide model, or for that matter a more intermediate approach of a model at district level very much depends on the available data, the presence of existing models and the time at hand.

Given the enormous challenge of incorporating current health labour market and economy-wide realities, constructive collaboration between the various disciplines – including human resources for health planning and management, (health) economics, and epidemiology – and stakeholders – including government, public and private health sector, and health worker representatives – is a prerequisite for making progress in the area of costing human resources for health. This would contribute to better health workforce planning and management, alleviate the health worker constraint to scaling up in the health sector, and bring us closer to achieving the health Millennium Development Goals.

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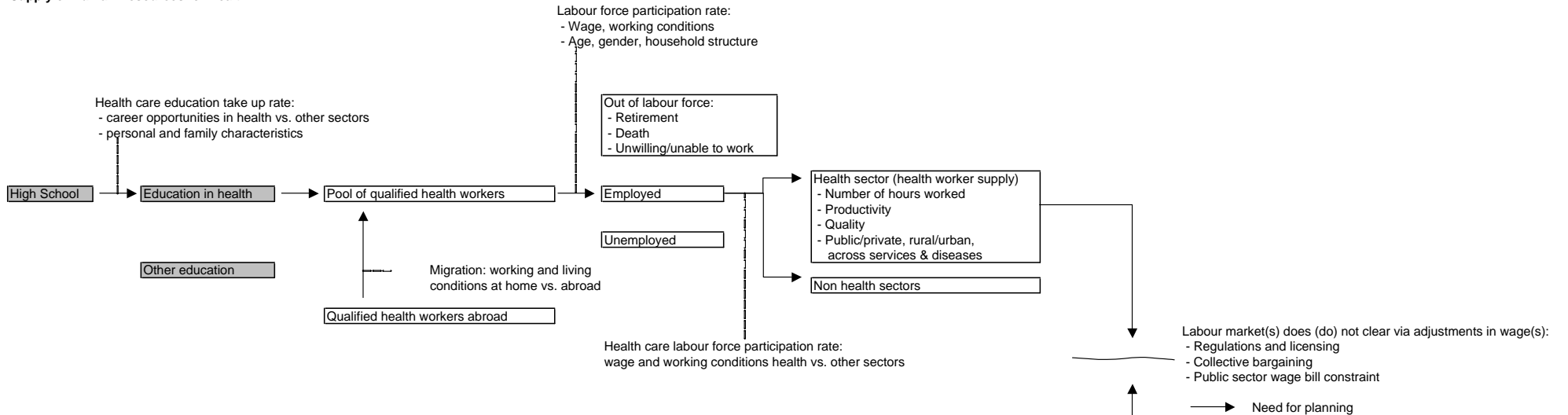
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Figure 1: A framework for a comprehensive human resources for health costing

Source: adapted from Vujicic and Zurn (2006)

Supply of Human Resources for Health



Demand for Human Resources for Health

