Global Health Workforce Alliance – Working Group #1

Economic, Demographic, and Epidemiological Transitions and the Future of Health Labor Markets
Working Group Paper
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1. Objectives

This synthesis paper summarizes the analysis of available data and studies on health sector employment, taking into consideration the macroeconomic, demographic and epidemiological factors, and the greater mobility of health workforce in a globalizing labor market. Specifically, this paper draws on the key findings from the three background studies that have been commissioned to address the following issues.

1. Examine the macroeconomic context and evidence on the extent to which employment in the health sector contributes to overall economic growth and to productive employment and the general trends in the health labor market (Arcand et al forthcoming).

2. Forecast the health workforce supply and demand to 2030, based on the estimation of HRH needed to provide essential health services to the population (assuming no change in technology or service delivery model), and the size of health workforce that countries can feasibly produce and employ based on their economic capacities and outlook (Scheffler et al, forthcoming).

3. Review the trends and impact of globalization and mobility of health workers on national policies on health workforce (Buchan, forthcoming).

Taken together, these papers highlight the trends in health sector employment from a broader labor market perspective, and are intended to stimulate debate and further research on the underlying factors and policies that influence the health workforce, and to contribute to the broader global HRH strategy to help countries achieve a more equitable and sustainable health system.

2. Overview

Efforts to scale-up essential interventions to achieve the health-related Millennium Development Goals (MDGs) and Universal Health Coverage (UHC) have revealed a massive shortage of skilled health professionals as a binding constraint to achieving these goals in many low and middle income countries, especially in areas of greatest health need such as Sub-Saharan Africa and South Asia (Travis et al 2004, WHO 2006).

The demand for and the size of the global health workforce are expected to grow substantially as a consequence of population and economic growth, combined with demographic and epidemiologic transitions including ageing. Overall, these trends are accelerating the need and demand for health workers across the globe, although the magnitude and rate of increase in demand and need for health workers vary from country to country.

Demographic factors are also affecting the health workforce. Recent reports point to increasing gaps between projected supply and demand for nurses in high income countries, primarily because of ageing and increased retirements (The Nursing Council of New Zealand, 2013; Ono et al, 2013; Buchan and Campbell, 2013). Ageing is also a feature of the medical workforce in high income countries. In 2009, about 30 percent of all doctors in the countries of the European Union (EU) were aged over 55 ((European Commission, 2012).

Health workers – like all workers – are sensitive to differences in remuneration, working conditions and career prospects. Substantive disparities in these factors both within and across countries create powerful market forces for migration, both within and outside of national borders, often with negative impact on the availability of health services for the under-served communities. Understanding the underlying market forces, and developing greater awareness
and competency in managing health workforce labor markets and devising effective policies, will be an essential feature of an effective UHC strategy.

Globally, there are substantial mismatches in the needs, demand for, and supply of health workers, leading to inequitable distribution and deployment of health workers. Efforts to address health workforce issues have tended to focus narrowly on the needs-based projections of health workforce requirements, and on addressing the production capacity to increase the supply of health workers to meet these projected needs. But effective solutions will need to align these interventions with the individual worker preferences and expectations, as well as with the broader labor market and economic conditions of the country.

2. Health Workforce Forecasts to 2030

National policy makers will need to address multiple factors in developing an effective health workforce plan. These factors can be broadly grouped into following categories: (i) estimation of number and category of health workers required to provide essential health services to meet national public health goals and population needs; (ii) capacity to produce sufficient qualified workers (education policies and labor market conditions); and (iii) labor market capacity to employ and retain health workers (economic and fiscal capacity, labor market conditions).

This section highlights some of the results of the health workforce forecasts undertaken by Scheffler et al (forthcoming), using both economic and needs-based forecasting model to estimate health worker shortages (or surplus) to 2030. Additional details on the methodology are provided in Annex 1.

If no changes are made to the current trends in health worker production, the forecasts estimate significant shortages in health workforce across the globe, with low income countries facing even more severe and increasing shortages by 2030. Further, the forecast highlights significantly divergent trends between low and middle income countries in the nature of health workforce “shortages”.

At the current rate of health worker production and projected population and economic growth, by 2030 low income countries are expected to face a substantial and widening gap between the number of health workers needed to provide essential services (need) on the one hand, and the availability of health professionals (supply) and the country capacity to employ them (demand). There is a modest growth in the relative capacity to employ workers, leading to a shortage of workers based on economic demand. This signifies that the overall supply of health workers will remain below the overall capacity of the countries to employ. For example, in 2030, there will be an estimated shortage of one million health workers based on “need”, but these countries will only be able to employ about one tenth (or 106,399 workers) of the needed numbers even if the production could be increased to fill the “needed” supply of workers (see Table 1, below).

By contrast, upper middle income countries show a significant narrowing of gap between the supply of health workers and the numbers needed to provide essential health services. However, the economic growth in these countries are expected to boost the demand for health care beyond the essential services, and the current pace of health worker production will need to be significantly accelerated to meet the demand. This tight labor market condition could potentially raise the cost of health workers as employers compete to recruit and retain skilled health workforce through higher wages and to meet the growing demands of the emerging middle class. These dynamics may likely stimulate labor movements across borders and fuel further cost escalation in the health sector in these countries.
It should be noted that the model assumes constant technology, and may not adequately take into account the growing demand for additional workers to serve the ageing population, including the expansion in long-term care that is beginning to accelerate demand for nurses and other health workers. Thus, the demand-based shortages of health workers in high income countries would be expected to be higher in the upper income countries. For example, EU is already estimating a health workforce shortage on the order of one million workers by 2020 (European Commission 2012), compared with the estimate of 309,000 worker in the Scheffler forecast model.

Table 1. Estimated health worker\(^1\) shortages\(^2\) by region and income

<table>
<thead>
<tr>
<th>Region</th>
<th>Demand-based shortages</th>
<th>Needs-based shortages</th>
<th>WHO-no covariates(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012 2020 2030</td>
<td>2012 2020 2030</td>
<td></td>
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<tr>
<td>East Asia &amp; Pacific</td>
<td>2,772,220 4,458,184 8,083,626</td>
<td>206,152 110,631 114,230</td>
<td></td>
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<tr>
<td>Europe &amp; Central Asia</td>
<td>324,107 373,989 626,891</td>
<td>5,389 0 0</td>
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<td>Latin America &amp; Caribbean</td>
<td>46,224 24,581 51,880</td>
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<td>Middle East &amp; North Africa</td>
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<tr>
<td>North America</td>
<td>9,317 9,537 24,186</td>
<td>0 0 0</td>
<td></td>
</tr>
<tr>
<td>South Asia</td>
<td>50 96 194</td>
<td>307,762 312,219 312,901</td>
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<tr>
<td>Sub-Saharan Africa</td>
<td>26,276 41,281 74,168</td>
<td>694,138 780,657 910,900</td>
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<tr>
<td>Low</td>
<td>45,408 79,534 106,399</td>
<td>906,017 972,732 1,098,085</td>
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<tr>
<td>Lower-middle</td>
<td>129,999 225,130 463,348</td>
<td>313,886 240,817 243,412</td>
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<tr>
<td>Upper-middle</td>
<td>2,813,503 4,433,655 8,035,954</td>
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<td>High</td>
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<td></td>
</tr>
<tr>
<td>World</td>
<td>3,182,885 4,923,095 8,914,770</td>
<td>1,247,213 1,228,242 1,355,002</td>
<td></td>
</tr>
</tbody>
</table>

1. Health worker refers to physicians and nurses/midwives (excluding other types of health personnel, such as dentists, pharmacists, and administrators). Needs-based estimated are generated from a single model of combined physicians and nurse/midwife data rather than aggregated from separate models for physicians and nurses/midwives.

2. Totals reflect only countries with estimated shortages; surpluses are not counted toward the accumulation of totals. This follows the methodology in Working Together for Health: The World Health Report 2006.

3. Based on WHO Report Working Together for Health: The World Health Report 2006. WHO estimated the number of health workers needed to attain an 80 percent coverage rate of births by a skilled birth attendant. We applied their strategy to updated health worker data to yield an expected need of 2.18 health workers per 1,000 population.

Source: Scheffler et al. forthcoming.

3. Health Sector Employment and Economic Growth

This section summarizes the findings from the paper by Arcand et al. (forthcoming), which investigated the associations between healthcare employment, health care expenditures and
economic growth. Recent evidence suggests that if the value of the change in mortality or life expectancy is added to the national income accounts (full income approach), the economic benefits of improved health are significantly larger than if health is valued only by its impact on national income accounts. During the period 2000-2011, 24 percent of the growth in full income in low and middle income countries was due to increase in life expectancy. A boost in health care investments to improve health care technology and systems, would dramatically reduce child, maternal and infectious mortality rates in low and middle income countries, to achieve so low levels universally by 2035. Moreover, if economic benefits of health care investments were calculated using the full income approach, they would be 9-20 times larger than costs. As a result, increase in health care expenditure would have a tremendous payoff in the future (Summers et al, 2013).

However, there is yet a need to establish the relationship between health expenditure, health sector employment, and economic growth, using theoretical models that can be tested empirically. To date, all of the analytical work on this topic has been conducted exclusively on high income countries due to lack of data in low and middle income countries.

In the high income countries, the rise in health sector employment has been accompanied by a simultaneous increase in wages levels which has raised concerns in terms of the impact on the economy as a whole. Technological development has been a major factor in explaining changes in health care expenditures, and, consequently, health sector employment patterns. As noted above, the evidence suggests that technological development has resulted in an increase in the demand for higher skilled workers, leading to higher returns to schooling for these categories of health workers, and producing a skilled-bias movement in the health care sector employment (Schumacher, 2002; Sales and Schlaff, 2010).

This continuous rise in employment and wages in the health sector has raised deep concerns among policy makers in terms of its potentially negative impact on the economy as a whole. The so-called ‘cost disease’ argument, or Baumol’s model of unbalanced growth (Baumol 1967), identified nominal wages growth in excess to productivity growth as the main driver of health expenditures in the United States. His findings suggested that the growth in health sector employment without commensurate increase in productivity could, in the long run, act as a drag on overall economic growth. A more recent study by Hartwig (2008 and 2011) obtained similar results for the OECD countries.

The paper by Arcand et al (forthcoming) provides new evidence on the relationship between health sector employment and economic growth by applying two empirical strategies. The first one applied the Baumol’s model of unbalanced growth to a broader set of health workforce data including those from selected low and middle income countries.

Baumol’s proposition posits that nominal wage increases in excess of productivity are the main drivers of the rise in health care expenditure, and therefore negatively influence economic growth by expanding expenditures in the sector that has lower rates of return. However, by including new data from selected low and middle income countries, Arcand et al find that the Baumol specification applied to these new data yield results that are contrary to what has been found for OECD countries by Hartwig (2008). The authors do not find significant the correlation using the new data set that includes low and middle income countries, and conclude that the growth in healthcare expenditures in a broad sample of countries is not driven by increases in wages and salaries in excess of productivity growth.

The second analytical approach followed the empirical strategy proposed by Rajan and Zingales (1998), which uses disaggregated sectoral data to investigate the impact of health sector
employment on differential growth rates of value added across manufacturing sectors. Arcand et al. (forthcoming) report that the results based on the Rajan and Zingales specification applied to health sector employment data from low and middle income countries reveal quantitatively large effects of healthcare employment on differential growth rates of value added across sectors. This result signifies that the health care employment yields high growth dividends for other economic sectors, in this case applied to the manufacturing sector. In other words, these results demonstrate that health sector employment has a significant growth-inducing effect with multiplier effect on other sectors, possibly with effects larger in magnitude than other, more well-studied sectors, such as the financial sector (Arcand et al., 2012).

These findings are significant in that it is the first time that health sector employment has been shown to have a positive growth-inducing effect, using global data drawn from low, middle and high income countries.

4. Health Workforce Migration

Health worker migration is inevitably and inextricably linked with other aspects of health workforce policy and planning. A comprehensive analysis of health workforce mobility patterns will provide critical information for national level health policy makers. This section draws upon the background paper prepared by James Buchan (forthcoming) on this topic.

While our understanding of health workforce migration patterns and trends has improved, the available data remain highly fragmented and incomplete. At present, the global community do not have the data and analysis needed to be to be fully effective in monitoring and managing domestic and international health workforce mobility. Furthermore, it is difficult to make optimum use of data sets that do exist, since they are fragmented and are held in different entities: government departments, agencies and professional regulators and associations. Furthermore, most of the available analysis on costs, benefits and impact are flawed or descriptive in nature. A longer term research agenda would be required to look at correlations and at causal impacts, and develop a deeper and more considered assessment of costs and benefits in different conditions. Some key points are highlighted below:

- There is now a better understanding that not all migration flows reflect a single direction, long term phenomenon. Some health workers move for short periods of time, or move on to a third country relatively quickly, and some even commute across borders periodically or daily. There is also a greater appreciation that cross national mobility of health workers is just one of several potentially important workforce flows, but there remains a tendency to focus in isolation on migration flow data, without adequate consideration of broader labor market dynamics. A narrow focus only on international flows, but ignoring flows within the national labor market, risks missing the complete picture, may overstate the significance of international migration, and may lead to policy misalignment.

- There is a need to include broader set of actors in the analysis, including employers, education and regulation authorities, recruitment agencies, professional associations, and government agencies in immigration and employment. They may be sources of data on stocks and flows of migrant health workers, may play a part in enabling, directing or constraining the migration flow, they may be the causes of market failure in the migration process, and they may also have differing perspectives on the costs and benefits of migration.
Nearly all the published analysis focuses on health professionals, mainly doctors and nurses, with a smaller evidence base on other health professions such as pharmacists and midwives. Given the recent emphasis on taking a whole of workforce perspective on health workforce policy and planning, this relatively narrow focus runs the risk of missing important aspects of the impact of health workforce migration. Management and professional administration staff (e.g. IT specialists, logistics and supply chain managers), scientific staff who do not have normal patient contact, such as laboratory technicians, and other support staff are critical to effective health systems. Some of these staff will have transferable skills and will be mobile in national or international labour markets, and may be an out-migration risk to health systems.

The global financial crisis was a short term shock, but underlying demographic trends remain a main driver of migration. The global financial crisis has had an impact on patterns of health worker migration, which fell in the three years immediately after the crisis year of 2008. With economic recovery, OECD reports that overall patterns of inflow migration to OECD countries are now increasing, notably in some European Union (EU) countries, despite tightening of immigration policies by some countries attempting to protect domestic labor (OECD, 2013). Within this broader migration pattern, health worker migration trends also appear to be increasing, but with some notable changes in magnitude and direction compared to the pre-crisis situation (Buchan and Campbell, 2013).

Against a backdrop of stagnant expenditure in a labor intensive sector, health systems in many high income OECD countries continue to face a demographic dual challenge: an ageing population generating more demand for healthcare, and an ageing workforce with growing concerns about future levels of supply of health professionals (Crisp and Chen, 2014). Despite increased labor participation rates as a result of the economic crisis in many OECD countries, recent reports point to increasing gaps between projected supply and demand for nurses, primarily because of ageing and increased retirements (The Nursing Council of New Zealand, 2013; Ono et al, 2013; Buchan and Campbell, 2013). Ageing is also a feature of the medical workforce in high income countries. In 2009, about 30 percent of all doctors in the countries of the European Union (EU) were aged over 55 (European Commission, 2012). Overall, the European Commission estimate that there could be a potential shortfall of 1 million healthcare workers in the countries of the EU by 2020 (European Commission, 2012). International recruitment is a policy that has been actively pursued in the past, and will likely remain a policy choice to address projected future shortages in some high income countries.

At the same time there is growing evidence about potential oversupply of some types of doctors, in a few countries, such as Australia and the UK (Health Workforce Australia, 2012; Centre for Workforce Intelligence, 2012), and continuing concerns about geographic maldistribution of those workers that are employed in health systems (Ono et al, 2014). These country-specific trends highlight the complexity of the factors that drive health workforce migration in each country, and underscore the importance of avoiding simplistic interpretation and solutions.

Emerging regional free markets for health workforce present new opportunities and challenges. Countries can no longer remain “isolationist” in their national health policies: health systems and labor markets are increasingly interconnected, and national health workforce policy, planning and regulation will not succeed without considering international linkages and drivers. Moreover, migration and labor mobility issues cannot be addressed successfully as a stand-alone policy issue within the health sector. It will require a broader health workforce
policy action involving multisectoral coordination to align employment, education and immigration policies of the country.

There is a growing movement of regional associations to organize open labor movements across national borders, including the movement of health professionals. These agreements offer important platforms for addressing the issues of health workforce migration in a more systematic and regulated manner. These experiences also highlight the major challenges in achieving an effective governance system to address these labor movements.

The largest free market for health professionals is in the 28 countries of the European Union (EU). Under this umbrella, five health professions - doctors, general care nurses, midwives, dentists and pharmacists - have free mobility across these 28 countries, if they have been trained to EU minimum standards (based on specified minimum requirements of number of hours and theoretical/practical training), or their training has been accepted as meeting these minimum requirements. Once registered to practice in any one EU country, they can move across the EU through the “national competent authority” in each country responsible for assessing the qualifications of individuals on a one-by-one basis.

The EU free market has grown in geographic size as more countries have acceded to the Union in the last fifteen years. Analysis of flows of health professionals across EU borders has highlighted a growth in mobility, including short-term and temporary movements, and a general trend of mobility from lower income countries in the south and east of the EU, to the higher income countries of north and west- Western Europe and Scandinavia (Buchan et al, 2014). There is also evidence that in recent years, EU destination countries have become more reliant on recruitment from within the EU, while flows from non EU countries have declined.

Another multi country free market, more recently enacted, is the mutual recognition agreement on nursing services across the ten countries of ASEAN: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam. Signed in 2006, the objectives of the MRA are to facilitate mobility of nursing professionals within ASEAN; exchange information and expertise on standards and qualifications; promote adoption of best practices on professional nursing services; and provide opportunities for capacity building and training of nurses (ASEAN, 2006). The ASEAN MRA is not yet fully operational but could have significant implications for the level of mobility of nurses across its member countries. ASEAN also has broader intentions for free mobility in relation to the services of other health professionals, including medical and dental professionals, midwives, physiotherapists and paramedical personnel (Arunanondchai and Fink, 2006). A review of human resources and trade in health services in Asia also highlighted the potential for the ASEAN MRA for health service professionals, and concluded that “migration management and retention strategies need to be integrated into ongoing efforts to strengthen health systems in southeast Asia” (Kanchanachitra et al 2011).

With the exception of analysis in the EU, there has been limited assessment of the impact of free mobility patterns on domestic labour markets and on individual opportunities. Evidence from the EU highlights the scope to increased mobility, which, at the overall regional level leads to flows driven by individual perceptions of improved career opportunities. It also points to risks and limitations at national level if the health workforce planning and regulation for health professional education and quality do not take account of the ease of cross-border mobility.

The WHO Code marks a watershed, but remains an unfinished business. The adoption of the WHO Global Code of Practice on the International Recruitment of Health Personnel (WHO 2010), by all member states, at the World Health Assembly in 2010 marked a watershed in policy focus on
the issue of health worker migration. The Code sets out a broad based, voluntary, policy approach to the issue of health worker migration at national and international level. It recognizes the complexities and dynamics of migration, emphasizes the need for more effective monitoring and analysis of trends, and places migration in a broader health workforce policy and planning context. As such, the Code sets out principles for any member state which wishes to develop a more effective approach to health workforce sustainability and migration.

However, WHO Code is not being used to full effect: its application remains limited and is used mainly as a reporting exercise rather than a catalyst for improved health workforce policy dialogue and planning at national level. A renewed effort at examining its application in a broader policy context, highlighting countries or group of countries that are already working to embed the Code in the overall framework of health workforce analysis, would enhance its recognition and uptake as an instrument for setting broad based principles and practices, and where its application is a means to an end of achieving more effective workforce policy and planning in support of universal health coverage goals.

5. A Call for a Paradigm Shift in Health Care Delivery Model?

The large scale of the challenges confronting national health policy makers underscores the critical need to transform health professional education and employment systems if the global goals for Universal Health Coverage are to be achieved. As discussed above, the current trajectory and skills bias toward high-end technology will lead to an ever increasing health care costs that may serve the needs of the few who can afford the care.

It will be imperative to find ways for low and middle income countries to avoid these problems and direct the trajectory of health workforce development toward a more inclusive and sustainable path. While there is a growing number of initiatives that offer new modalities of health care delivery, to date there are very few cost-effectiveness studies in low and middle income countries that demonstrate the returns on investing in community-based health services. For example, despite the considerable attention focused on the role of Community Health Workers (CHWs) in expanding affordable health care, recent literature review finds a general lack of and need for economic studies accompanying these trials in order to demonstrate the cost effectiveness of various types of CHW interventions (Frymus et al., 2014). Studies have shown that CHWs are accessible and acceptable to clients at community level and therefore, capable of improving on access and equity of health services. But more studies are needed to demonstrate cost-effectiveness of CHW interventions compared to similar interventions delivered by health professionals.

One example is the study on midwifery education in Bangladesh (Evans 2013). The study showed that investing in midwifery education, with deployment to community-based services, could yield a 16-fold return on investment in terms of lives saved and costs of caesarean sections avoided, and could be considered a “best buy” in primary health care. The added value also comes from the proposition that investing in midwives frees doctors, nurses and other health cadres to focus on other health needs, thereby increasing the efficiency of the health system, allowing greater coverage with limited skilled workforce. Many more studies of this kind are needed to identify effective approaches to scale up.

Achieving UHC goals will require a paradigm shift in health care delivery system, aligning market forces and population expectations towards primary prevention and community and home-based models of care. Such a system would be supported by a multi-disciplinary primary care team of health workers with broad based skills.
WHO has promoted “task shifting” as a means of delegating well-defined procedures or interventions from more highly skilled to less highly skilled health workers (Mukerjee and Eustace 2007; WHO 2007). However, an effective response will require a much more fundamental and substantial changes in the health care delivery model that will lead to improvements health workforce productivity, and will harness to technological innovations that save costs rather than increase costs. The expansion of health sector employment need not lead to a drag on economy if these productivity gains can be achieved. This calls for a paradigm shift in the service delivery models if the global goals of Universal Health Coverage can be achieved in an affordable and fiscally sustainable manner.

Policy and regulatory responses will be needed to improve utilization and efficiencies in health care, and enable optimization of services, for example, by allowing greater flexibility in determining the appropriate skills mix of health professionals and other types of workers working as a team to address broader population health needs. The potential impact of regulations, agreements and other governance structures in place will also need to be evaluated in terms of the distribution and movement of health workers across national borders.
References


Annex 1: Health Workforce Forecasting to 2030

This Annex describes the health workforce forecast model by Scheffler et al. (forthcoming). Given the data limitations, the forecasts necessarily make a number of assumptions which need to be taken into account in the interpretation of the results. These are summarized below.

- The forecast model limited the analysis only to physicians, nurses and doctors. The model therefore does not take into account the contributions of other health workers (mid-level workers, community health workers, technical and non-technical staff) whose roles may be expanding in the light of “task-shifting” and new team-based care delivery models. The model also assumed no change in technology and care delivery models.

- The supply of physicians in per capita terms is estimated in per capita terms based on historical data on physician numbers for each country (S). These numbers serve as a baseline against which different forecasts are evaluated. To obtain the projected supply of nurses/midwives, the projected physician supply for each country was multiplied by the ratio of nurses/midwives to doctors for each country based on most recent data since 2008. Again, it is assumed production function for healthcare workers stays constant. Country-specific ratios for 146 countries could be assembled from the available data on both physicians and nurse/midwives.

- The needs-based forecast (N) reflects the number of health workers that would be required to reach a desired benchmark of service utilization (WHO 2006, Scheffler et al. 2013). The estimated needs-based worker shortages were further refined according to three approaches:
  - WHO-no covariates: Density needed to achieve 80 percent coverage of lives births by a skilled birth attendant, not controlling for any additional covariates
  - WHO-geographic covariates: Density needed to achieve 80% coverage of lives births by a skilled birth attendant, controlling for geographic covariates (population density and percent urban population).
  - Integrated method with DALY weights: weighted average of births attended by a skilled attendant, DTP vaccination for children, measles vaccination for children, and tetanus vaccination for pregnant women, each with designated target coverage rates, according to distribution of burden of disease measured via DALYs.

- The economic forecast model (D) reflects the number of health workers that will be demanded (i.e., employed) in each country given growth in income and health care spending (Scheffler et al. 2008). This will yield the size of the workforce that a country is likely to be able to afford.

Figure A.1, below, illustrates how to interpret the numbers derived from these different forecast models. As shown, (S) shows the growth in supply of physicians based on the current rate of production and (N) shows the estimated number of physicians required to meet a benchmark utilization level. Figure A.1 shows an example of widening physician shortage with respect to needs (N) (number of physicians needed to provide the essential health services). (D1) shows the example of a country with economic capacity that generates demand for physicians above the actual supply of physicians, thus creating a labor market shortage of physicians. Such a situation will likely lead to escalation in wages. (D2) illustrates the situation when the country is producing more physicians than the country can gainfully employ, hence, creating a paradoxical
situation of unemployed health worker even while there is inadequate number to provide the needed essential services. In the latter case, the problem is not one of inadequate production of physicians, but the inability for the country to employ these physicians, who may then choose to migrate or move to another occupation (or remain as unemployed worker).

The surplus or shortage of per capita workers numbers have been calculated as the difference between the projected supply of health workers against what is “demanded” based on economic conditions (i.e., available employment) and what is needed (based on WHO benchmark). The summary of the results is shown in Table 1 (below), by regions and by income groups. This table shows only one of the needs-based model used to forecast health worker shortages. The results of the other two needs-based model are shown in Annex 1.

The estimates of shortages by regions and income groups were based on numbers only from countries where shortages are calculated to exist; countries that are estimated to have surpluses are not counted and shows as 0 (zero) in the table. This follows the approach taken by WHO (2006).
Table A. 1. Estimated health worker\(^1\) shortages\(^2\) by region and income.  Source: Scheffler et al. (forthcoming)

<table>
<thead>
<tr>
<th>Region</th>
<th>Demand-based shortages</th>
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<td>50</td>
<td>96</td>
<td>194</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>45,408</td>
<td>79,534</td>
<td>106,399</td>
</tr>
<tr>
<td>Lower-middle</td>
<td>129,999</td>
<td>225,130</td>
<td>463,348</td>
</tr>
<tr>
<td>Upper-middle</td>
<td>2,813,503</td>
<td>4,433,655</td>
<td>8,035,954</td>
</tr>
<tr>
<td>High</td>
<td>193,975</td>
<td>184,777</td>
<td>309,069</td>
</tr>
<tr>
<td>World</td>
<td>3,182,885</td>
<td>4,923,095</td>
<td>8,914,770</td>
</tr>
</tbody>
</table>

\(^1\) Health worker refers to physicians and nurses/midwives (excluding other types of health personnel, such as dentists, pharmacists, and administrators). Needs-based estimated are generated from a single model of combined physicians and nurse/midwife data rather than aggregated from separate models for physicians and nurses/midwives.

\(^2\) Totals reflect only countries with estimated shortages; surpluses are not counted toward the accumulation of totals. This follows the methodology in *Working Together for Health: The World Health Report 2006*. 

\(^3\) WHO-no covariates

\(^4\) WHO-geographic covariates

\(^5\) Integrated DALYs

\(^6\) DALYs = disability-adjusted life years
Based on WHO Report *Working Together for Health: The World Health Report 2006*. WHO estimated the number of health workers needed to attain an 80 percent coverage rate of births by a skilled birth attendant. We applied their strategy to updated health worker data to yield an expected need of 2.18 health workers per 1,000 population.

This approach builds on the WHO approach from *The World Health Report 2006* and inserts two covariates to the regression model: percent of population living in an urban area and the persons per km² in that country. This adjustment yields an expected need of 1.96 health workers per 1,000 population.

Integrated DALY approach uses a weighted average of health workers needed to achieve various health system outcomes—each with designated target coverage rates. We used information from disability adjusted life years (DALYs) for each country to derive analytic weights. We specified the following conditions and threshold coverage levels: DTP, measles, and tetanus toxoid vaccines (all 90% coverage), and births by a skilled birth attendant (80% coverage). We based the vaccine target coverage levels on the *WHO Global Vaccine Action Report* and the skilled birth attendant coverage on the *World Health Report 2006*. The Integrated DALY method shows a country’s health worker need that ranges from 1.96 to 2.79 per 1,000 population (mean= 2.21).

Countries additionally excluded due to a lack of data for DALYs: DR Congo, Romania, Timor-Leste.