Regional Network for Equity in Health in east and southern Africa

DISCUSSION Paper NO. 49

The costs and benefits of health worker migration from East and Southern Africa: A literature review

Rudi Robinson
The North-South Institute

Regional Network for Equity in Health in east and southern Africa (EQUINET) in co-operation with Health Systems Trust (HST) and the East, Central and Southern African Health Community (ECSA-HC)

EQUINET DISCUSSION PAPER 49

August 2007

with support from SIDA Sweden

Valuing and Retaining our Health Workers

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EXECUTIVE SUMMARY

The view put forward by a number of influential sources is that sub-Saharan Africa is experiencing a health crisis in human resources and that this crisis is defeating efforts at international, regional and country levels to control and stem the HIV/AIDS epidemic on the African continent. The migration of health professionals from developing countries in general, and sub-Saharan African countries in particular, has become the subject of considerable theoretical and case study research attention in international migration and human resources for health (HRH) literature.

This report is a review of all available literature on the costs and benefits of the migration of health workers from East and Southern African (ESA) countries to developed nations. Its findings are as follows:

- Four economic models are used by researchers to conceptualise and analyse the costs and benefits of the migration of health professionals from the perspective of developing countries:
  - the internationalist model, which prioritises benefits over costs;
  - the nationalist model, which differs from the internationalist model because it puts greater emphasis on costs rather than on benefits;
  - the beneficial brain drain model, which investigates the impact of the international migration of highly-skilled individuals on investment and growth in their home countries; and
  - the diaspora knowledge network model, which sees the 'brain drain' as a 'brain gain'.
- Many researchers identify the medical brain drain as a serious problem because it impacts negatively on healthcare systems, not only in terms of loss of skilled labour, but also because the governments of developing countries subsidise the education of health workers, only to lose this 'investment' when the workers emigrate. Unfortunately, the theoretical and case study research literature is mostly qualitative in nature when analysing costs. Only two published case studies used the quantitative approach to analyse costs, but they lack technical and analytical merit.
- The demand and supply factors affecting the migration of ESA health professionals to developed countries have not yet been brought together into a framework that contextually relates, analyses, and explains how they are 'drivers' of the migration process.

- Existing literature largely ignores the benefits that developing countries enjoy when their health workers migrate. For example, there are financial and non-financial flows from developed to developing countries that are associated with this pattern of international migration, either through circular migration, return migration, the diaspora or transnational migrant communities.

The gaps in the existing literature regarding supply and demand, as well as the benefits to ESA countries of outward migration, appear to have three principal causes:

- The nationalist model is used by researchers more often than any of the other three economic models.
- The HRH literature focuses almost exclusively on costs, in other words, on the *gross* impacts on ESA countries of the international migration of their health professionals instead of the *net* impacts.
- Perhaps the most critical information gap is that there is currently a lack of reasonably sound data to empirically validate, analyse and evaluate the costs identified and discussed in this literature.

In conclusion, the existing HRH literature can provide a foundation for building a future programme of evidence-based policy research, with studies that use 'hard' economic and non-economic time-series and panel data on costs and benefits, a more balanced conceptual framework and sounder analytical research techniques. The objective should be to manage the migration of health professionals from ESA countries in such a way that it minimises the costs while allowing these countries to enjoy the benefits. Above all, what needs to be established is a well-resourced comprehensive and demand-driven database on the economic, social and demographic aspects of the migration of health professionals from sub-Saharan African countries

1. INTRODUCTION

Sub-Saharan Africa is currently experiencing a health crisis in human resources and this crisis is defeating efforts at international, regional and country levels to control and stem the HIV/AIDS epidemic on the African continent (WHO, 2006; World Bank, 2004; USAID, 2003; Global Health Watch, 2006).

This health crisis has the following dimensions:

- Severe shortages of health professionals have seriously eroded the capacity of local health systems to function effectively, efficiently and equitably in the production and delivery of health services to the poorest members of African societies.
- HIV/AIDS has impacted on health workers by increasing their workloads and exposing them to the risk of contracting HIV.
- The migration of health professionals from sub-Sahara Africa to OECD countries, from one African country to another, from the rural to the urban health sector, and from public to private health systems in the same country has caused staff shortages in various areas.
- Chronic under-investment in public sector healthcare systems is another major contributing factor to the health crisis. (Global Health Trust, 2004; Lyons, 2004).

The migration of skilled workers from developing countries to industrial countries is a major development issue in sub-Saharan Africa. But it is simply part of the trend towards the global integration of labour markets at the high-skill end, and the international standardisation of medical education and training inevitably makes the health labour market more easily global in nature and scope than some of the other markets for professionals (Hagopian, Fordyce, Thompson, Johnson and Hart, 2004). Some economic models, which analyse this type labour supply shift within the standard neo-classical free trade framework, conclude that this 'redistribution' of health professionals improves global welfare, in net terms. Other models, which analyse and assess this shift in labour supply within a developing country's labour market framework, disagree. They argue that this form of migration has very serious consequences for health systems in developing countries. In between these two extremes, there are newer economic models, which analyse and assess skilled migration according to endogenous growth and social network theories. They believe that the loss of health professionals can be beneficial to developing countries.

For developing countries, the international mobility of health professionals is absolutely necessary if their health systems want to benefit from cutting-edge medical knowledge in developed countries. But this mobility comes at a cost: it has resulted in a medical 'brain drain' for poor countries and 'brain gain' for rich countries.

This paper focuses on the migration of health professionals from East and Southern African (ESA) countries to OECD countries. It was commissioned by the Regional Network for Equity in Health in East and Southern Africa (EQUINET) in co-operation with ECSA Health Community, to present a critical review and analysis of the secondary literature on the costs and benefits of the international migration of health professionals. The paper is structured as follows:

- *Section 2* provides background information and the theoretical issues addressed in this paper are briefly discussed.
- *Section 3* is a literature review, outlining the methodology that was employed to conduct the review, as well as the conceptual approach of the paper.
- *Section 4* presents the findings of the review. Here the factors that influence the costs and benefits of the migration of health professionals, the economic models that are used to describe the impact of skilled migration on developing countries, and the qualitative and quantitative costs and benefits of migration are discussed.
- *Section 5* is a general discussion of the findings, in terms of cost-benefit analyses of the migration of health professionals, methodological and conceptual issues regarding costs and benefits, and information gaps and biases.
- *Section 6* offers ideas for a future programme of CBA research, including a demanddriven database on ESA the migration of health professionals; ideas which will allow ESA countries to benefit as much as possible from the emigration of their skilled health workers, with minimal cost.

2. BACKGROUND INFORMATION

The WHO 2006 report, *The World Health Report – Working Together for Health*, defines health workers as "all people engaged in actions whose primary intent is to enhance health" (page 1). This definition includes all health workers, but the HRH literature reviewed here focuses mainly on the migration of physicians and nurses, which are the most internationally mobile health workers. Specifically, then, this paper deals with the international migration of physicians and nurses only.

A major theme in the HRH literature is that the relative distribution of costs and benefits associated with the international demand and supply of these health professionals has made developed countries clear winners in terms of welfare benefits and ESA countries clear losers in terms of welfare costs (Labonte and Packer, 2006; Cervantes and Guellec, 2002; Martineau, Decker and Bundred, 2002). ESA governments invest scarce public resources in the medical education and training of their physicians and nurses, so when they leave for developed countries, these governments lose the social returns they were expecting for their public investment in these staff's education and training. Instead, the developed countries reap the social benefit. Since beneficiary developed countries do not compensate ESA countries for their losses, this outflow of medical staff is effectively a special kind of taxpayerfinanced foreign aid from poor to rich countries (Hagopian et al, 2004).

The loss of skilled staff has led not only to healthcare inequities on a global scale, but on a domestic one as well. There is an urgent need for evidence-based research on the costs and benefits of the international migration of health workers with the objective of devising policies and programmes to mitigate or reverse its negative impact on developing countries, particularly in sub-Saharan Africa (ILO, 2002; and Padarath, Chamberlain, McCoy, Ntuli, Rowson and Loewenson, 2003).

2.1 Theoretical issues addressed in this paper

Health worker migration in sixteen ESA countries is analysed in this paper: Angola, Botswana, Democratic Republic of Congo (DRC), Kenya, Lesotho, Madagascar, Malawi, Mauritius, Namibia, South Africa, Swaziland, Tanzania, Uganda, Zambia, and Zimbabwe. The literature review focuses on the following issues:

- theoretical frameworks used in the literature for conceptualising, analysing and assessing the costs and benefits of health personnel migration;
- whether or not the HRH literature identifies, quantifies, analyses and assesses the costs and benefits of the migration of health professionals from ESA countries and the methods of analysis and assessment of these costs and benefits used;
- the technical and methodological soundness of the analysis and assessment and how any weaknesses in the analysis might be overcome in a future programme of research;
- any institutional or policy issues that should be taken into account in the analysis of the costs and benefits of health worker migration; and
- the identification and description of the cost/benefit research gaps relevant to policies for managing health personnel migration within and from the ESA, and for evaluating such policies.

3. LITERATURE REVIEW

3.1 Methodology

This paper reviews both published and unpublished literature on the migration of physicians and nurses from developing countries, specifically ESA countries, to North America and Europe. A four-part strategy was used in order to identify and select which literature would be relevant to this paper:

- Economic literature that takes a welfare approach to the subject of migration from developing to developed countries was selected.
- Theoretical, empirical and policy research literature that directly or explicitly addresses the cost and benefit dimensions of migration from sub-Saharan Africa was also selected.
- ESA country-specific case studies were also targeted if they were concerned with identifying, quantifying and assessing the cost and benefits of health personnel migration.
- The last type of literature that was selected was that which discusses different approaches to measuring the 'brain drain', medical or otherwise.

This approach resulted in a review of five different, but interrelated, strands of theoretical and research literature:

1. The first strand of literature consists of published journal articles on the economic aspects of the migration of human capital from developing to developed countries. This strand of literature presents the theoretical models for identifying, quantifying and assessing the welfare gains (benefits) and losses (costs) associated with the international migration of human capital, and provides empirical evidence in support of or against the assumptions of the theoretical models.
2. The second strand – the largest – consists of both specialist HRH literature and nonspecialist literature on skilled migration from Africa. This strand includes the literature resources in the electronic databases of the WHO, the Institute of Population Health at the University of Ottawa, Southern Migration Project (SAMP) at Queens University, Canada, Southern African Regional Poverty Network (SARPN), ILO, Centre for Global Development, United Nations University-WIDER, World Bank, IOM and EQUINET.

3. The third strand consists of ESA-specific case studies that attempted to quantify and evaluate the costs of health personnel migration.
4. The fourth stand consists of the literature that attempts to measure the brain drain (including the medical brain drain) and to gauge its impacts on both source and receiving countries.
5. Finally, the fifth strand consists of time-series data (of at least two years) on the migration of health professionals from sub-Sahara Africa to OECD countries.

The following search methods were used:

- The first search method included general web-based searches using key words and phrases (e.g. 'costs', 'physician brain drain', 'health professionals' brain drain', 'brain drain costs', 'benefits of the brain drain', 'benefits', 'impacts', 'externalities', 'positive externalities' and 'negative externalities').
- A second method was the mining of specialised electronic database (e.g. WHO), again using various key words and phrases to structure the search process.
- A third method involved the follow-up of bibliographical entries and references in journal articles and web-based publications downloaded or retrieved. This was the most successful search method.
- The final method involved accessing the hardcopy literature resources on African health systems in the libraries of the University of Ottawa and Carleton University, respectively. A few of the online literature resources (e.g. journal articles on the economic aspects of the brain drain) downloaded and reviewed date back to the 1970s, but the vast majority of the literature sources reviewed date from the 1990s to 2006.

3.2 Conceptual approach

Economic theory and principles of cost-benefit analysis (CBA) inform the conceptual approach adopted in the review of the literature here. The migration of health professionals is an issue of medical human resource allocation or re-allocation both internationally and within countries. The allocation or re-allocation takes place internationally when the health professional migrates to another country to work in his field of training. At the individual country level, it takes place internally when the health worker moves from the rural health system to the urban health system or vice versa, or from the public sector health system to the private sector health system or vice versa.

There are two key differences between international and internal migration:

- international migration involves the transfer of human resources across national borders, typically from a developing to a developed country which could imply a reduction (net loss) in aggregate welfare for the 'donor' country and an addition or improvement (net gain) in the social welfare of the 'recipient' country; whereas
- internal migration merely involves a re-allocation of existing human resources in the same country and implies no welfare loss in the aggregate, to that country, although at the micro-level, some groups may be made better off at the expense of others.

Under the Kaldor-Hicks efficiency standard, a human resource transfer from a developing country to a developed country that improves the social welfare of the population of the developed country while imposing a welfare loss on the population of the developing country would be potentially Pareto efficient, so long as the developed country compensates the developing country for its loss.

A cost-benefit analysis suggests that one conceptual approach to the literature review should be an examination of the design of the const-benefit analysis (if any) that is undertaken in the HRH literature. One key design element is the *theoretical framework* (if any) that the HRH literature uses to inform the analysis of the costs and benefits of health worker migration. An analysis of the costs and benefits of health worker migration might be undertaken within one of the following theoretical framework models:

- the internationalist model, which places greater emphasis on the global welfare improvement associated with skilled migration;
- the traditional (nationalist) model, which, in contrast to the internationalist model, places grater emphasis on the welfare losses than on the welfare gains of skilled migration;
- the beneficial brain drain model, which emphasises the induced investment and growth effects of the brain drain on developing countries; and
- the social network model, which emphasises the development role of the various types of transnational networks that immigrants construct and actively maintain as non-market vehicles for transferring resources from developed to developing countries.

The groups whose social welfare (broadly defined) is affected by the migration of physicians and nurses from ESA countries to OECD countries is a key design consideration. The following groups can be postulated:

- immigrant health professionals, the population of the *emigration* country and the population of the *immigration* country;
- migrant health professionals and the population of the emigration country;
- the population of the emigration country only, including health workers remaining at home;
- the population of the immigration country only;
- the populations of both the emigration and immigration countries; and
- migrant health professionals only, including their families.

It is crucially important to identify the appropriate group or groups whose welfare is reduced or increased as a result of the migration of health professionals, both conceptually and analytically. Costs and benefits can be identified and analysed from either the social or private point of view, or both. So, determining which groups are affected depends on the point of view of the researchers who write the papers. The conceptual and analytical difference between the social and private approaches is not trivial. If governments pay for the training of physicians and nurses, then the social point of view takes precedence over the private point of view. If physicians and nurses pay for their own medical training, then the private point of view takes precedence over the social point of view. The distinction between the social and the private points of view determines the unit of analysis, the level of analysis and the policy implications of the analysis.

This paper is also concerned with the conceptualisation, identification and measurement of all costs and benefits applicable to migration. Costs and benefits can be divided into the following categories:

- **Tangible costs** are those costs to which a monetary value can be assigned relatively easily. They include the cost of educating and training physicians and nurses, the deterioration in the ratios of physician-to-patient and nurse-to-patient, and the income an ESA country loses as a direct result of the emigration of these health professionals.
- **Tangible benefits**, like tangible costs, can relatively easily be assigned a monetary value. They typically include the financial remittances that health professionals send back home and the investments they may make in medical education and training at home.

- In contrast, **intangible costs** are those costs to which it is difficult to assign a monetary value, such as the loss of research or supervisory capacity or costs that cannot be measured (ethically), such as the lives of patients who die because skilled professionals are not available to treat them.
- Similarly, **intangible benefits** are those benefits to which it may be difficult to assign a monetary value, such as improvements in healthcare management, administrative capacity and technology transfers.

The quantitative measurement and analysis of tangible costs and benefits depends more on the right quality and quantity of data than on qualitative description and subject judgment. In contrast, the measurement of intangible costs and benefits depends more on qualitative description and subjective judgment than on hard data. In addition, some types of costs are carried directly by the health system, some are carried by general society and others by both. For example, deterioration in the physician-to-patient ratio negatively impacts on both the health system (overworked hospital staff) and general society (reduction in labour productivity). Similar reasoning applies to the benefits mentioned above.

Cost and benefit comparison and evaluation are a fourth design element. Application of costbenefit analysis in its pure form assumes that all relevant tangible costs and benefits have been identified and expressed in money terms, all money costs are opportunity costs and all costs and benefits expressed in dollars are discounted, using an appropriate discount rate. One implication of these assumptions is that the cost-benefit analysis should contrast all the costs associated with the migration of health professionals with all the benefits before any conclusions can be drawn about social welfare losses or gains. However, the HRH literature focuses almost exclusively on costs, in other words, on the *gross* impacts on ESA countries of the international migration of their health professionals, instead of the *net* impacts (total benefits minus total costs).

Because costs and benefits typically occur over different time periods, they must be discounted and compared along a single time dimension. Several strategies are used in costbenefit analysis for comparing and evaluating costs and benefits, the most relevant being the net present value (NPV) and the benefit-cost ratio (BCR) strategies. When calculating NPV, the total discounted value of the tangible and intangible costs associated with the international migration of health professionals is subtracted from the total discounted value of the tangible and intangible benefits. When calculating BCR, the total discounted value of tangible and intangible benefits is divided

by the total discounted value of tangible and intangible costs. A critical input in this comparison and valuation process is the discount rate. Although there is no universal consensus among economists on the 'appropriate' discount rate, the rate typically used in social cost-benefit analysis is different from the market-related interest rate used in financial analysis because society and the private market weigh costs and benefits differently. Ideally, the discount rate used in the NPV and or the BCR should reflect the welfare of the group or groups from whose standpoint the costs and benefits are being identified and analysed.

One of the points on which economists generally agree is that sensitivity analysis is a good thing. This is because, in cost-benefit analysis (as in any other quantitative endeavour), we always have to impute values for some input variables. Moreover, due to data limitations, judgments have to be made about unknown quantities. In addition, there are those intangible costs and benefits to which, as indicated earlier, it is difficult to assign money values or it may not be advisable to assign money values due to ethical sensibilities. These considerations suggest that there will be a degree of uncertainty, as well as error, embedded in the analysis and evaluation of costs and benefits. A carefully designed and implemented sensitivity analysis will help to counter these problems.

The conceptual approach outlined above generates the following core literature review questions:

- Several factors influence the cost and benefit structures of the migration of health professionals from developing to developed countries. The influence of these factors may be joint or separate, direct or indirect and vary spatially and inter-temporally. What are some of these factors? What is the influence of these factors on the cost and benefits structures of the migration of health professionals?
- What theoretical models or frameworks are used in the HRH literature for discerning and assessing the costs and benefits of skilled migration on source countries and how empirically adequate are these models for describing these costs and benefits?
- Has the HRH literature identified all the tangible and intangible costs and benefits that are directly and indirectly associated with the migration of health professionals?
- Are all the tangible costs and benefits identified appropriately quantified, compared and evaluated in the HRH literature?
- Has the HRH literature identified and qualitatively discussed all intangible costs and benefits?

4. FINDINGS

The findings of this literature review will be discussed under the following headings:

- What factors influence the costs and benefits of the migration of health professionals?
- Economic models that describe the impact of skilled migration on developing countries.
- Qualitative and quantitative costs and benefits of migration.

4.1 What factors influence the costs and benefits of the migration of health professionals?

Box 1 lists the factors that influence the costs and benefits of the migration of health professionals from ESA countries. Please note that, for descriptive and analytical convenience, these factors are divided into three categories, but there might be some overlapping of items.

Box 1: What factors influence the costs and benefits of the migration of health professionals from ESA?

1. ESA domestic macro-economic dynamics include the following:
- GDP and GDP growth rate;
- GDP per capita and per capital growth rate;
- level of employment and/or underemployment;
- public expenditure on health;
- economic stability;
- political and social stability; and
- political/administrative, judicial and security governance.

2. ESA–global/international dynamics include the following:
- globalisation and the international mobility of medical human capital;
- the international standardisation of medical education;
- demographic aging, pension and labour market changes in industrial countries;
- healthcare manpower education and training in industrial countries;

- demand and supply imbalances in industrial countries' health worker labour markets;
- changes in immigration regulations and policy in industrial countries;
- the extent of health worker integration in their immigration country of settlement; and
- health workers' optimal migration duration in their host country.

3. ESA domestic micro-economic (sectoral) dynamics include the following:

- the volume and compositional structure of the health worker migration streams;
- the characteristics and state of the health workforce;
- institutional and structural characteristics of the health sector;
- employment and compensation structure in health workers' labour markets;
- the characteristics of the system of medical education and training;
- determinants affecting the decision by health professionals to emigrate;
- the immigration country of choice of health workers; and
- social and economic ties of emigrant health workers' with their homelands.

Sources: Forcier et al, 2004; Stilwellet al, 2003; Martineau et al, 2002; Ntuli, 2003; Dovlo, 2004; Commander, Kangasniemi and Winters, 2003.

Some researchers hypothesise that the above-mentioned factors are supply and demand side factors that influence the structure of the costs and benefit of migration. On the supply side, the domestic economic context within which health systems operate plays a key role in the migration of health professionals, particularly in terms of the so-called 'push factors' that are widely discussed in the HRH literature. One underlying cost and benefit factor is the level of public investment in health systems of ESA countries and the role of that investment in influencing individuals to stay or to emigrate, as well as determining whether or not they will re-engage with the sector via transnational networks if they emigrated.

Table A1, which can be found in the appendix at the end of this paper, employs World Bank and WHO 2004 statistical data in an attempt to shed some light on this issue. The tabled findings present a mixed picture: ESA

countries with higher rates of economic growth (e.g. Angola, Tanzania, Mozambique, DRC, and Madagascar) appear to be investing relatively less (as a percentage of their growth) on their health sectors than countries with lower rates of economic growth (e.g. Botswana, Lesotho, Malawi, Swaziland, Uganda and South Africa). In some of those countries with a low economic rate of growth, investments in the health sector, when measured as a percentage of GDP, are relatively higher than the rate of growth in the economy. It would be useful to examine the long-term trend in actual health sector expenditures as a percentage of GDP for a period of at least 15 years. Such an examination would require sound time-series data – which are difficult to obtain – and statistical estimations and analyses of secular trends in healthcare financing.

Another cost and benefit-related issue is the general employment situation in ESA countries and the degree to which health professionals who emigrated would have been productively employed (fully employed) in their home countries. The HRH literature seems to assume that, in the absence of migration, all economically active health professionals would be 100% productively employed in their own countries. This assumption implies large ESA opportunity costs associated with the migration of these professionals (Ndulu, 2004; Bach, 2003). However, other researchers disagree. For example, Hamilton and Yau report that "South Africa has 35,000 registered nurses documented as being in the country who are inactive or unemployed, despite 32,000 vacancies in the public sector" (page 2, 2004). Other related issues include the levels of experience of different health professionals, their ages and their status of employment at the time of emigration. Therefore, some of the important factors that can be assumed to influence migration are low levels of investment in the public health sector, the desire of health professionals to enjoy professional fulfilment, their employment status, their experience and their age upon employment.

A third issue widely highlighted in the HRH is the investment that is lost by ESA countries when their health professionals emigrate. These countries subsidise the education of these professionals as part of public expenditure, but lose this 'investment' when these professionals emigrate. See *Table 1* for details of this form of public expenditure for some ESA countries.

Kirigia, Gbary, Muthuri, Nyoni and Seddo (2006) and Muula, Panulo and Maseko (2006) seem to conflate the private and public costs of physicians' and nurses' education in their analysis of the educational investments that Kenya and Malawi, respectively, lose when their health professionals migrate to rich countries. In considering the social costs and benefits function of this migration, the key issue is whether the medical education and training of those who left was publicly or privately funded, either fully or in part.

In most developing countries, the government pays at least part of the cost of tertiary education, partly because the social return is perceived in public policy to be higher than the private return. However, under World Bank/IMF-imposed policies, there has been an increase in the private provision of tertiary education in some developing countries (Commander et al, 2003). In ESA countries where governments fully or partially finance medical education and training, all the economic and social services that emigrating health professionals would have given their countries of origin are transferred to the country to which they are emigrating (Forcier et al, 2004).

Table 1: Public expenditure per university student as a % of GDP per capita, 2001–2004

Country	2001	2002	2004
Kenya	266.1	-	274.7
Lesotho	617.9	692.4	602.0
Madagascar	191.6	181.7	184.2
Mauritius	48.7	48.7	44.9
Namibia	-	90.6	111.1
South Africa	-	53.2	46.8
Swaziland	253.2	244.5	-
Uganda	-	-	187.5

Source: UNESCO, 2004, 2005 and 2006.

Estimating the exact public cost for the professional education of health personnel is a difficult task, as the HRH literature repeatedly points out, because of a fourth-best data environment for doing research in sub-Saharan African countries. Although one may assume that the majority of health professionals in ESA countries receive their education and training at taxpayers' expense, *Table 1* shows considerable variation in the sizes of public subsidies. Nevertheless, emigration of health professionals implies that the entire subsidy of their education may be treated as a social cost (Mishra, 2006).

The state of the health sector workforce is a key issue because it directly relates the costs and benefits of migration to the performance and motivation of those colleagues who remain behind. The HRH literature uses several indicators to measure the level of human resources employed in a country's health sector, and to gauge the effects and impacts of out-migration. *Table A2* (in the appendix at the end of this paper) presents 2004 statistical

information on one such measure, the size of the health workforce by country. One cost and benefit implication of *Table A2* is that, the smaller the size of the health workforce, the larger the human resource cost impacts of the migration of health professionals from that country (Bach, 2006). Changes over time in physician-to-patient and nurse-to-patient ratios that are directly related to emigration of health professionals are one objective measure of this outcome.

The HRH literature asserts that physicians and nurses are the core human resource building blocks of the healthcare system (Perrin and Valvona, 1986). Therefore, one would expect that changes in physician density and nurse density or in the physician-to-population and nurse-topopulation ratios (discussed in detail below) are key sources of the cost pressures that emigration imposes on the healthcare workforce remaining at home. Consequently, the emigration of physicians and nurses implies major social and health system costs (WHO, 2006) and benefits in terms of remittances (Connell and Brown, 2004; Goldfarb, Havrylyshyn and Mangum, 1984) technology transfers (Papageorgiou, Savvides, Zachariadis, 2006) and bilateral trade and investments (Docquier and Lodigiani, 2006; Kugler and Rapoport, 2005; Rauch, 1999; Rauch, 2003; Kuznetsov, 2006).

A key dimension to the cost function of the migration of physicians and nurses from the ESA to OECD countries are the ratios of physician-to-population nurse-to-population. *Tables A3* and *A4* (in the appendix) present information on the stock of physicians and nurses by country. These tables also show changes in the respective stocks between 2000 and 2004 while *Table A5* presents estimates for physicians' and nurses' density per 1,000 population for 2004. Examining the information in these tables together, in 2004, the stock of physicians varies from 89 for Lesotho to 34,829 for South Africa (*Table A3*) corresponding to physicianto-population ratios of .05 and .77 per 1,000 people, respectively. The far lower physicians-topopulation ratio for Lesotho may be due primarily to a decline (21.9%) in the physician labour force, which may or may not be due to the effect of international migration, and correspondingly, high replacement (frictional) costs.

A similar contrasting pattern is observed in the data on the nurses' workforce for Lesotho and South Africa (*Table A4*). The stock of nurses ranges in number from 1,123 for Lesotho to 184,459 for South Africa in 2004, corresponding to nurse-to-population ratios of 0.62 and 4.08, respectively (*Table A5*). Again, there was a marked decline (11.3%) in the stock of nurses in Lesotho between 2000 and 2004. The apparent growth – and in some cases apparent dramatic growth – in the stock of physicians in some ESA countries shown in *Table A3*, does not necessarily imply significant improvements in physician-to-population and nurse-to-population ratios,

respectively, however. In their study of physicians' emigration rates over the period 1991 to 1994, Docquier and Bhargava (2006) found that there was an overall physician-to-population ratio of 0.15 per 1,000 people in sub-Saharan Africa and, at the ESA country level, the physician-to-population ratios for Uganda, Mozambique, Tanzania and Malawi were less than 0.05 physicians per 1,000 persons, two of which (Mozambique and Malawi) showed growth in the physicians' workforce between 2000 and 2004. However, when assessed against the WHO minimum standard of 2.28 health personnel to population, none of the 16 ESA countries met this standard in the case of physicians, and only five (Botswana, Mauritius, Namibia, South Africa and Swaziland) appear to meet the WHO standard in the case of nurses. Caution is encouraged in attributing declines in health professionals-topopulation ratios to migration alone, however, since in some countries, (e.g. Malawi) the main cause of health worker shortages is not migration but deaths, mainly from HIV/AIDS (Hamilton and Yau, 2004).

Costs and benefits are also affected by the rate of migration according to occupational category (either physicians or nurses). No data exists currently on this subject. It's also not clear whether the migration is permanent or temporary, and how long it will be. However, *Table A6* presents some data on the annual emigration level of nurses from eight ESA countries to the UK between 1998 and 2005 (the literature search did not find a similar series for physicians). The migration of nurses from South Africa to the UK overwhelmingly dominates migration form ESA in this professional category. Labonte, Packer and Klassen (2005) present similar findings for South African nurse migration to Canada. They also found that South African nurses migrated to Canada at a faster annual average rate than South African physicians – 78.9% versus 58.4% between 1993 and 2003. The level of South African nurse migration to the UK seems to have peaked in 2001/2002 and fell off dramatically between 2001/2002 and 2004/2005. A similar pattern is observable for Zimbabwe, Zambia and Kenya, whereas an upward movement seems to hold for Botswana, Mauritius and Swaziland. Levels of emigration tell us nothing about underlying migration trends or the occupational impacts of these trends on the health workforce that remains behind, however.

Statistical evidence of the occupational skill mix of the health sector workforce in ESA countries for the year 2004 is presented in *Table A7* (in the appendix). The tabled information supports the assertion in the HRH literature that physicians and nurses constitute the core human resources of health systems, but nurses are the single largest occupation in the healthcare industry. The proportion of nurses (including midwives) in the healthcare workforce of ESA countries ranges from a high of 94% in Angola to a low of 30.3% in Madagascar and the proportion of physicians range from a high of

28% in Madagascar to a low of 1.3% in Swaziland. These estimates suggest that the occupational skill mix of the health sector workforce is sensitive to variations in the human resource costs and benefits of migration.

The HRH literature assumes that, if nurse or physician migration is temporary, it provides opportunities for those whose migration is of a temporary nature to develop new skills, knowledge, experience and specialised expertise that may benefit the health systems of their home countries when they return (health system gains). However, if they migrate permanently, the health systems will suffer a permanent loss of medical human capital (Bach, 2003; WHO, 2006). While the first assumption may be correct, the second may not be. The empirical research literature on transnational migration provides abundant evidence that modern communication technologies provide highly skilled immigrants such as doctors and nurses with the technological tools to circulate and to exchange information in various professional fields such as health, education, IT, science and technology, research, business and trade (Glick-Schiller, Basch and Blanc-Szanton, 1992; Saxenian, 2001; Biao, 2005; Kapur, 2001). The participation of skilled immigrants in their homeland through these strategies implies that the migration of health professionals from ESA countries needs not be interpreted as a permanent loss of medical human capital to developed countries.

4.2 Economic models describing the impact of skilled migration on developing countries

Economic models that underpin theoretical and empirical research on the social welfare impacts of skilled migration on source countries address two basic questions:

- What is the relevant group or groups whose welfare should be maximised in assessing the costs and benefits of skilled migration? Should it be the world as a whole (including migrants and those left behind in emigration countries), only those left behind in emigration countries, or migrants and the population remaining in emigration countries?
- Having settled that question, the second question is whether the free international flow of human capital increases or reduces the social welfare of the relevant group or groups whose welfare is being considered. There are at least four classes of economic models, each of which seeks to address this issue within a welfare-maximising theoretic framework; some provide opposing conceptual and analytical perspectives, which other provide complementary ones.

The first class of models that will be reviewed here are internationalist models, which take the whole global economy as the basic unit of analysis and argues that the free international flow of human capital is global welfare improving. The second class of models are the nationalist or traditional models, which take the population of an emigration country as the basic unit of analysis and argue that the international migration of human capital imposes large negative externalities on the population remaining in emigration countries. The third class of models proposes that the brain drain is more beneficial than non-beneficial to poor countries in that it is investment and growth inducing, while the fourth class proposes a strategy of brain circulation and exchange for harvesting the economic and social benefits of the brain drain.

4.2.1 Internationalist models

Johnson (1965, 1967 and 1979), Grubel and Scott (1966, 1977) and Berry and Soligo (1969) offered the earliest internationalist models, which attempted to explain the welfare impacts of skilled migration within the standard neoclassical theoretical framework of free international trade. Johnson, for example, begins with the policy question: If the international migration of human capital is welfare improving, welfare improving for whom? Is the relevant group the population of the source country, the people who emigrated from their home country, or the world as a whole? Johnson starts with the proposition that the world is a single aggregate from the welfare viewpoint and takes the position that the world should be taken as the unit of analysis in assessing the welfare impacts of the international flow of human capital.

His analysis rests on two sets of assumptions. The first assumption is that the free international flow of human capital reflects resource allocation efficiency globally, which benefits everybody – developing and developed countries. The second is that the free international flow of human capital generates technological and pecuniary externalities that also improve global welfare. In terms of the resource-allocation efficiency argument, if labour skills that can command incomes equal to their marginal products are free to move internationally and can pay their own costs for the move, then unimpeded movement of such labour skills from countries where their productivity is low to countries where it is high will maximise world income. Second, the free flow of human capital is a beneficial process for global economic welfare because it reflects the free choice of the individuals who choose to migrate and the efficient allocation of resources from low-income countries to high-income countries. Therefore, a process that increases the efficiency of resource allocation globally will increase global economic welfare.

The free flow of international human capital generates both positive (welfare gains) and negative externalities (welfare reduction), but positive externalities offset negative ones.
Positive externalities include:

- technological innovations and discoveries by highly talented immigrant scientists and researchers working in a developed country and which benefit developing countries as well (technological externalities);
- skills, knowledge and expertise that highly skilled immigrants acquire in developed countries and transfer to their home countries through their transnational knowledge networks linking their home countries with their host countries; and
- immigrant remittances, trade and investment flows from developed to developing countries (network externalities).

Negative externalities include:

- the transfer of tax capacity from the emigration country to the immigration country;
- the loss of employee's earnings contribution to future income and economic growth; and
- collaborative disadvantage, in other words, the loss of the positive effects that the presence of large numbers of professionals would have on raising the average level of productivity of their colleagues who choose not to emigrate.

Although Johnson (1979) recognises the possibility that the free international flow of human capital could reduce the welfare of developing countries, he rules out control of international migration of educated manpower, since this cannot be justified under potential Pareto condition. Instead, he proposes that winners (rich countries) may use foreign aid to compensate losers (poor countries).

Grubel and Scott (1966) point out that the net welfare effects of the international flow of human capital must be assessed not in terms of changes in global welfare, but in terms of changes in the welfare of the population remaining in source countries. Starting with the postulate that each emigration country is "an association of individuals whose collective welfare its leaders seek to maximise" (p. 269). Grubel and Scott argue that the emigration of highly skilled persons is likely to have positive welfare effects on those who remain behind only if immigrants improve their income in their host country, and if their emigration does not reduce the income of those remaining behind. Regarding the first condition mentioned

above, immigrants improve their income only if they emigrate and settle successfully in their host countries. Workers who remain behind are left with short-term labour market adjustment costs (i.e. a rise in salaries in the relevant market associated with the fall in supply relative to demand, resulting in the emigration of some professionals) or there may even be market failures (i.e. cases, as in the public sector, where the salary formerly earned by the emigrant understates the market value of his or her skills to the society they left). In the short-term, the size of the adjustment costs will depend on the substitutability of other factors or skills for those who have emigrated, or the rapidity versus the flexibility with which replacements for the emigrants can be fully trained and deployed or recruited from abroad.

The Grubel-Scott model makes two policy conclusions:

- Any form of government incentive (financial or non-financial) to induce immigrants to stay home goes against the idea of the free international flow of human capital.
- The emigration of highly skilled persons reduces the welfare of the population remaining behind only in the short-term and only under rare circumstances. In the long-term, skilled emigration brings about net increases in the welfare of the non-migrant population in several important ways including the transfer of technology from developed to developing countries, remittances and through information and knowledge exchange.

How adequate is the 'internationalist' model for assessing the welfare impacts of the migration of health professionals from ESA countries? In the Johnson model, the liberalisation of skilled migration improves global economic welfare. A simulation by Alan Winters (2003) and his World Bank colleagues provides some indication of the scale of such improvements. According to their model, the liberalisation of international migration would improve global welfare by $300 billion, dwarfing foreign aid and FDI. However, it can be argued that such aggregate benefits mask the distribution of costs and benefits, or raise equity issues. In the same Winters model, migrants themselves and their host countries receive the bulk of these benefits, whereas migrant sending countries lose $21b in the model that includes skilled and unskilled migration labour and $34b in the model that includes only skilled migration.

The validity of the Johnson's model as a framework for analysis of the welfare effects of the migration of health professionals can be challenged on three other grounds as well. First, the model assumes that tacit and explicit knowledge from medical R&D in developed countries is easily transferable to developing countries. This is not quite the case, since the movement of

medical knowledge from a developed to a developing country requires medical capability and capacity that is often not present in the recipient country. Second, as Ogilvie et al (2007) demonstrate, it can be argued that at the micro (sectoral and community) levels, the free international movement of health professionals from a developing to OECD countries can cripple the health systems of countries with already existing human resources shortages. Health care is a labour-intensive industry, so the production and delivery of health care services requires a balanced mix of skills from doctors, nurses and midwives (see *Table A7*) (Commander et al, 2003). At the macro-level, the emigration of a large number of health professionals will generate welfare losses for the population as a whole. The welfare losses would arise from the direct negative impacts on the population's health status and reduced productivity. A fourth challenge to the Johnson model is that health professionals in a developing country are perceived to be much more than producers and distributors of health services, particularly when they practice their profession in rural areas (Kirigia et al, 2006).

According to the Grubel-Scott model, the international migration of physicians and nurses imposes only short-term health and economic welfare costs on developing countries. These short-term costs are due to negative fiscal externalities, collaborative disadvantage, imperfect skill substitutability and health sector labour market adjustment costs associated with the emigration of core human capital. In the long-term, these costs are offset through the feedback mechanisms of pecuniary externalities, in the form of remittances, and network externalities in the form of medical technology transfer and innovations that may spill over from the immigrant's host country to his or her home country.

Brimley's (1967) and Aitken's (1968) criticisms of the Grubel-Scott model challenge its theoretical adequacy and empirical validity to investigate costs and benefits. First, its treatment of short-term health sector labour market adjustment costs is not very convincing, since in the health sector, the emigration of a specialist physician, for example, can be a source of significant adjustment costs. In such cases, training a replacement locally entails a long investment period (at least three to six years of university education plus two years of specialist training). The immediate adaptation of resources to the emigration of a specialist physician (e.g. training, retraining or overseas recruitment) can entail considerable frictional losses. A similar argument can be made if the physicians or nurses who emigrate are those who have been employed for a long time because the loss of experienced professionals will cause greater frictional losses than the loss of inexperienced ones, even if replacements could be rapidly trained and deployed. A third challenge to the Grubel-Scott model is that many public health professionals in developing countries perform social functions for

which they do not get paid. If doctors or nurses migrated from the public sector to the private sector, the social externalities contained in their work do not get lost to society, even in the short-term, since their labour is simply reallocated from one labour market to another, where health professionals are assumed to be paid their marginal product. Stated another way, the internal mobility of health professionals from public to private sector in an ESA country merely involves a shift of resources from one group to another that does not, in the aggregate, involve a net change in the value of the resources available to that ESA country as a whole.

4.2.2 Nationalist models

Unfortunately, the Johnson and the Grubel-Scott models ignore negative externalities and market imperfections, or at least downplay the unfavourable welfare consequences of the migration of professionals from developing countries for those left behind by focusing on the positive welfare impacts at global and country level instead. The nationalist models, which emerged in the 1970s and 1980s, represent a departure from the neo-classical competitive framework of the internationalist approach. As in the Grubel-Scott framework, nationalist models take the non-migrant population in a developing country as the basic unit of analysis but, in contrast, assert that the migration of highly skilled persons in large numbers from poor to rich countries leads to a permanent reduction in income and growth in poor countries. In other words, the international migration of health professionals is beneficial for the host countries and detrimental for the country left behind.

Bhagwati and Hamada (1974), and later Bhagwati and Rodriquez (1975), have provided a theoretical analysis that is widely credited as germane to the development of the nationalist approach. Bhagwati and Hamada use a general equilibrium framework to model a developing country's labour market and to analyse the distortions that a substantial migration of educated labour would have on the population left behind. Due to the imperfect substitution of skilled for unskilled labour, they noted that, "even without invoking the presence of [positive] externalities leading to differences between the private and social marginal product of the emigrants, we see that emigration of educated labour can easily lead to unfavourable effects on national income, [and] per capita income" (Bhagwati and Hamada 1974, p. 40). The unfavourable effects include three types of transfers from poor to rich countries:

- the returns on the investment the home government made in the education and training of the emigrated professional (e.g. income tax revenues that the emigrated professional would have paid if working in his or her home country);

- the additional jobs that the saving and spending from the employment incomes of emigrated professionals would have generated in the economy; and
- the scale economies arising from the positive impacts that the emigrated professionals would have had on raising the average quality of the productivity of their colleagues remaining at home through increased knowledge stimulus, professional competition and greater specialisation through division of labour.

The main theoretical conclusion of the Bhagwati and Hamada perspective is that, while international migration of skilled persons is net welfare improving for rich countries, the net welfare consequences for developing countries are slower economic growth and lower standard of living for the poor. To compensate poor countries for these losses, Bhagwati and Hamada recommended that rich countries should pay poor countries a 'brain drain tax' to be collected by the international community – probably the UN – and redistributed internationally. This policy proposal did not get much traction in the policy literature due to its overall impracticality. However, Desai, Kapur and McHale (2002) have resurrected academic interest in the idea of the tax as a strategy for developing countries to 'recapture' the fiscal revenue they have lost. One could also question the Bhagwati-Hamada model because it assumes that, in developing countries, all healthcare professionals are fully employed in their profession, so that emigration raises the social opportunity costs of their loss to the health system and to the economy as a whole. Nevertheless, it is the nationalist perspective to which the HRH literature appeals in framing the discussion on the issue of the costs and benefits of the migration of health professionals from developing to developed countries.

4.2.3 Models that argue that the brain drain is positive

The endogenous growth literature locates the brain drain in dynamic economic models that produce significantly optimistic conclusions to challenge the pessimistic conclusions of nationalist models, while providing general support for the internationalist model. The hypothesis of the 'beneficial brain drain' model is that prospects of migrating to a developed country to pursue greater employment, income and professional career opportunities create incentives for the population remaining at home to increase their investments in human capital to the level at which the human capital supply losses to emigration are offset by the gains in migration-induced investments at home (Stark, 2004; Stark et al, 1997, 1998; Vidal, 1998; Mountford, 1997; Beine et al, 2001, 2003; Khwaja and Scaramozzino, 2003; Kuhn and McAusland, 2006) Historically, only a fraction of the educated population in a developing country will choose to emigrate, so the additional investments in education induced by migration raises the average

level of human capital in the remaining population. This, in turn, raises the supply of educated skills, which spurs economic growth. Jackson (2005) summarises the theoretical predictions of the beneficial brain drain model as follows:

- The brain drain raises the expected return on education in source countries since it implies that a proportion of the educated residents in these countries would emigrate and earn higher wages in a developed country
- The prospects of higher expected earnings overseas induces ddditional investment in education and training (a brain gain) in emigration countries.
- The additional investment in education and training results in a 'beneficial brain drain' or 'net brain gain' larger than the brain drain.
- A net brain gain raises welfare and growth in source countries.

There is growing empirical evidence in support of these theoretical predictions. Beine et al (2001) use cross-sectional data on gross migration rates for 37 countries and, after controlling for remittances, found that emigration appears to boost additional human capital investments in developing countries, and the increase in the stock of human capital due to the brain drain does appear to influence growth positively – two of the necessary conditions for establishing the empirical validity of the beneficial brain drain model, particularly those with low initial GDP per capita. In a later study, Beine et al (2003) use the Carrington-Detragiache (1998) estimates of emigration rates for university and college students of a sample of 50 developing countries as proxy measures of the brain drain. Their 2003 findings confirm their 2001 findings that emigration of educated persons positively and significantly induces additional investment in human capital, and this in turn has a positive impact on economic growth.

By contrast, Faini (2003) finds little evidence to support Beine et al's conclusions. Other researchers disagree. Boucher, Stark, and Taylor (2005) investigated the effects of internal migration on human capital formation in Mexico, and conclude empirically that migrating from a country where the average returns on human capital investment is low to a country where the average returns are high creates incentives in the first country to invest more in education and training, which boosts economic growth. Beine et al (2006) used Docquier and Marfouk's research (2004) to generate more comprehensive estimates of emigration rates for 190 countries in 2000 and 170 countries in 1990. Again, they found that migration of persons with high levels of human capital caused an increase in investment in human capital in 127 of the countries. More precisely, they found that a 10% increase in

the migration of the highly skilled induced a 5% increase in the proportion of the highly skilled within the non-migrant population. Clemens (2006) is perhaps the only empirical study to date that tested the effects of the medical brain drain from sub-Saharan African countries in terms of human development. His empirical conclusion is that "the option to emigrate has positively affected Africans' decisions to enter the health field" (Clemens, 2006). The implication of this conclusion is that, contrary to the assumptions of the nationalist model, the emigration of health professionals from sub-Sahara Africa may have more positive than negative effects for the region.

4.2.4 Harvesting the brain drain for economic and social gains

Immigrant knowledge networks (IKN), or diaspora knowledge networks, have led to the development of models that analyse the welfare costs and benefits of skilled migration from a network perspective. These models begin with the assumption that highly skilled immigrants and the population remaining in developing countries are the basic units of analysis. In models of diaspora knowledge networks, the brain drain is conceived and analysed not as a loss to developing countries, but as important non-market channels for trade, investment, project finance, science and technology, and industrial and commercial R&D transfers for growth and development in these countries. The basic proposition of these models is that highly talented and successful immigrants and their various network organisational forms represent the most important development resource associated with international migration. The challenge is to mobilise and deploy the economic, financial, human and social capital resources embedded in these networks for development in immigrants' home countries.

Turner (2003) describes IKNs as the actual and digital infrastructures immigrants create to actively take part in developing their countries of origin. These networks are organisational strategies immigrants use for converting the loss in human resources through emigration into remote though accessible development assets of expanded networks, where networks are defined as dense social, economic, professional, and business relations among immigrants or among immigrant groups and between immigrants and their homeland counterparts. Kuznetsov (2006) has identified and described the main functions of some of these immigrantbased networks as search and bridge-building, S&T, IT, trade, investment, educational, healthcare, venture capital and R&D transfer from industrial countries to developing countries. The main feature of the immigrant network model is that unlike restrictive policies (designed to make migration more difficult e.g. bonding) incentive policies (designed to make emigration less attractive) and punitive measures (such as the Bhagwati 'head' tax) "it tries to set up connections/ linkages between highly skilled expatriates and between them and their

country of origin. This allows for information and knowledge exchange between expatriates and between them and their country of origin, it allows expatriates the opportunity to transfer their expertise and skills to the country of origin, without necessarily returning home permanently. In this way, the country of origin has access to the knowledge and expertise of the expatriate, but also the knowledge networks that he/she forms part of in the host country" (Meyer and Brown 1999). Several scholars (Kuznetsov 2006, Saxenian and Edulbehram 1998, Saxenian 2000; Biao 2005, Zweig and Fung 2004; Wescot 2006) and international organisations such as UNESCO and the World Bank have numerous documented case studies showing actual development value and therefore the policy and programmatic significance of these networks.

4.2.5 Conceptual and analytical biases of the HRH literature on costs and benefits

As alternative analytical frameworks for discerning the welfare impacts of the migration of health professionals on source countries, the theoretical adequacy, empirical validity, and practical policy significance of the beneficial brain drain and IKN models appear to carry zero weight in HRH literature discourse on the costs and benefits of health worker migration. With the exception of Record and Mohiddin (2006), who alluded to the conceptual and analytical richness of these models in understanding how the international migration of health professionals can be converted into health sector development gains (rather than continue to be understood as only health sector losses) the HRH literature reviewed totally ignores the policy and programmatic implications of either of these sets of models for managing the international migration of health professionals. The main reason is that, from the standpoint of the HRH literature, the economic development assumptions and resulting policy implications of the beneficial brain drain and DKN models are inconsistent with the ethical presuppositions and resulting policy prescriptions of the nationalist model, which is the theoretical compass the HRH literature uses to frame and guide its discourse on developing countries' costs relative to the benefits from the international migration of their health professionals.

In terms of the theoretical adequacy, empirical validity, and policy implications, the beneficial brain drain and IKN models seem promising. Therefore, a conceptual approach that integrates the *internationalist, nationalist, beneficial brain drain,* and IKN models into an analytical framework for identifying, analysing and assessing the net welfare consequences for ESA countries of international health worker migration might be more fruitful than an approach that embraces only the 'nationalist' model, while rejecting others without examining their theoretical adequacy, empirical validity and reliability of their policy implications. Collectively,

the beneficial brain drain and IKN models, in particular, suggest that policies and programmes to convert the health professionals' brain drain into a health sector development resource might be significantly more net welfare improving than policies to:

- tax those who chose to emigrate either at the point of exit from developing countries or at post-entry and settlement in a developed country; or
- policies to prevent out-migration.

Under the beneficial brain drain and DKN models, net welfare improvements are realized not only when health professionals respond to the perceived private gains of migration prospects, but also when those who cannot realize private gains from migration by participating in it stand to gain from those health professionals who participate in it.

4.3 HRH discourse on the costs and benefits health worker migration

The literature review finds that research cupboard on the quantifiable costs and benefits of the migration of health professionals is virtually empty. The literature search was able to find only two ESA case studies (Kirigia et al, 2006 and Muula et al, 2006) that use costing methodologies in an attempt to identify and quantify the costs of the migration of health professionals and they both focused exclusively on the education and training costs of the migration of health professionals, while merely alluding qualitatively to benefits. Similarly, with the possible exception of Mishra (2006) and Desai, Kapur, and McHale (2002) the research cupboard on the costs and benefits on the international migration of high-skilled persons in general appears to be similarly virtually empty. However, there is a robust body of HRH literature that provides a qualitative discourse on some of the tangible and intangible costs and benefits of health personnel migration from African countries.

4.3.1 The welfare costs of migration

Two levels of welfare costs to ESA countries are associated with health worker migration:

- brain drain incurs a range of occupation-specific human resource costs to ESA countries (e.g. loss of productive skills, knowledge, experience, and expertise of physicians and nurses etc.) directly resulting from the emigration of persons endowed with these assets.
- The second level encompasses costs to ESA countries' health systems, non-migrant populations and economies as a whole, implicit in and specific to the medical brain drain.

As indicated earlier, some of these costs fall directly on the health system, whereas others fall directly on the economy. Whether they fall directly on the health system or on the economy as a whole, they are consequences of the medical brain drain.

4.3.2 The medical brain drain: Methodological issues

The most frequently identified and discussed cost in the HRH literature is the medical brain drain (MBD). The MBD is the transfer of specialist and generalist medical staff from a developing country to a developed country. In most developing countries, and certainly in sub-Saharan African countries, the transfer involves direct tangible and intangible losses (costs) of scarce human resource assets as well as indirect tangible and intangible losses. It may also involve subsequent direct and indirect tangible and intangible gains (benefits), which over time may, or may not offset some or all of the tangible and intangible losses. However, transfers are generally assumed in the HRH and general skilled migration literature to be a definite economic gain (benefit) to the developed country receiving these transfers, and a definite loss to source countries, with little or no offsetting gains.

Measurement of the MBD – and the brain drain in general – is not a settled issue in the literature. In the HRH literature, the MBD is typically defined and measured as the absolute numbers of physicians and nurses, respectively, who emigrated from a developing to a developed country. While counting the number of physicians and nurses who migrate from a developing to a developed country gives information on the amount of these professionals moving across national borders as well as the addition to the stock of physicians and nurses from a developing country residing in a developed country, analytically, it falls short of a strategic measure of the MBD. First, absolute measures of the brain drain are not analytically useful since they tell us nothing about the intensity of the human resource cost pressures the MBD puts on the health workforce by occupation remaining at home. By all accounts, India is the top exporter of physicians in absolute terms among developing countries. If the absolute number of Indian physicians residing and working permanently in OECD countries were an indication of the pressures the MBD from India puts on the Indian health workforce remaining in India, then India would seriously suffer from the MBD. Second, absolute numbers of the brain drain do not facilitate comparative analysis of the brain drain internationally, regionally, and sub-regionally, and the intensity of the healthcare workforce pressures of the MBD within and across health occupational categories nationally, regionally, and internationally. Therefore, the starting point of any discussion on the brain drain as the principal ESA human resource cost issue is measurement of the MBD that facilitates comparative analysis of:

- the intensity of the medical brain drain in a source countries;
- the pressures the medical brain drain puts on the health workforce at home; and
- the occupational, regional and international dimensions of the problem.

Docquier and Marfouk (2004) have developed a measure, the emigration rate, which intuitively incorporates the three analytic features described above. They measure the brain drain "as the proportion of working age individuals… with at least a tertiary educational attainment, born in a given country but living in another country, taking into account neither their occupation, nor where their education took place, nor when they arrived". Applied to the migration of health professionals, the MBD is measured by the proportion of health professionals trained in their own country at tax payers' expense and working abroad in the healthcare field of their professional education and training (Mullan 2005; Clemens and Petterson 2006; Docquier and Bhargava 2006). For example, the proportion of South Africans' physician workforce trained in South Africa but practising in the OECD countries gives the physician emigration rate for South Africa. The emigration rate is a relative measure of the MBD. In relation to the workforce remaining at home, it indicates the extent and the human resource cost pressures the migration of health professionals by occupation places on the occupation-specific and total healthcare workforce remaining at home, as well as the intensity of those pressures. One issue associated with the emigration rate as a measure of the MBD, however, is how large the emigration rate should be before it indicates the intensity of the human resource cost pressures it places on the workforce at home. Adams (2003) suggest that an emigration rate of 10% or higher indicates the intensity of the brain drain and the human resource cost pressures it imposes on the workforce remaining at home.

4.3.3 The human resource costs of the medical brain drain

The MBD is a sub-set of the general brain drain (GBD) for the total educated workforce and its extent can be compared with the GBD. *Table 8A-1* gives estimates of the GBD for the total educated workforcefor 1990 and 2000 in each ESA country. The GBD affects Madagascar, Mauritius, Uganda, Kenya, Mozambique, Tanzania, and Zambia respectively, most severely.
However, although the GBD remains severe among these seven countries, it dramatically declined in some cases (e.g. Madagascar and Uganda) between 1990 and 2000, whereas in others (e.g. Mauritius and Mozambique) it dramatically increased. The most dramatic increase in the GBD between 1990 and 2000 occurred in Angola, which, according to the 10% threshold, did not appear to have a brain drain problem in 1990, but faced a brain drain

crisis in 2000. In 1990-2000, *(Table 8A-2*), the extent of the brain drain and the overall human resource cost pressures it placed on Madagascar, Mauritius, Uganda, Kenya and Mozambique was significantly higher than those it placed on all East Africa combined.

Table 2 situates the MBD for physicians and nurses within the context of the GBD for each ESA country as a whole for the year 2000. Overall, the extent of the brain drain of nurses from the nurse workforce relative to the GBD from the total educated workforce of the economy in each country is lower – and in most cases substantially lower. This does not seem to be the case with the brain drain of physicians from the physicians' workforce, which, with the exception of the Democratic Republic of Congo (DRC), is significantly greater than the brain drain from the economy's workforce as a whole in each country. In 2000, the GBD ranged from a low of 2.1% of the workforce in Botswana to a high of 48% of the workforce in Mauritius in 2000, while the physicians' brain drain ranged from a low of 11.4% of the physicians' workforce in Botswana to a high of 75.4% of the physicians' workforce in Mozambique. Relative to the GBD for the entire economy, the extent of the brain drain of nurses from the nurses' workforce seems to be very high in the DRC, Malawi, Mauritius and Zimbabwe in particular. Although the nurses' brain drain from the nurses' workforce in Angola, Madagascar, and Mozambique is below the GBD of the economy as a whole for each of those countries, it is nevertheless substantially above the 10% threshold measure of extent.

Table 3 illustrates the medical brain drain for physicians by comparing emigration rates with the numbers of physicians remaining in the workforce in their ESA countries of origin. The following working hypothesis may be used to examine the data in *Table 3*: *The smaller the physician workforce in any ESA country and the higher the emigration rates for physicians for that country, the greater the intensity of the MBD on that country's physician workforce, and the higher the human resource costs of the brain drain for the health system and the economy as a whole*. For example, in 2000, Namibia had a total of 848 active physicians, with 382 working abroad and 466 employed at home. In contrast, South Africa had a total of 34,914 active physicians, with 7,363 working overseas and 27,551 employed at home (refer to *Table 3*). The loss to Namibia of the 382 physicians working abroad imposed greater human resource costs on the country's physician workforce, its health system and its economy as a whole than in South Africa's loss, which had a higher number of physicians working abroad, but a larger physician workforce remaining at home to absorb the human resource costs.

Table 2: General economy brain drain (GBD) compared with medical brain drain (MBD) for physicians and nurses per ESA country, 2000

ESA countries	Economy (GBD)	Physicians (MBD)	Nurses (MBD)
Angola	25.6	70.5	12.3
Botswana	2.1	11.4	2.2
DRC	7.9	9.0	12.0
Kenya	26.3	51.0	8.3
Lesotho	2.4	33.3	3.0
Madagascar	36.0	39.2	27.5
Malawi	9.4	59.4	17.0
Mauritius	48.0	46.1	63.3
Mozambique	42.0	75.4	19.0
Namibia	3.4	45.0	5.4
South Africa	5.4	21.1	5.1
Swaziland	5.8	29.0	3.0
Tanzania	15.8	52.0	4.0
Uganda	21.6	43.1	10.2
Zambia	10.0	57.0	9.2
Zimbabwe		51.1	24.2

Adapted from: Docquier and Marfouk, 2004; Clemens and Petterson, 2006.

As per *Table 3*, *Table 4* illustrates the medical brain drain for nurses by comparing emigration rates with the numbers of nurses remaining in the workforce in their ESA countries of origin. The same working hypothesis used to interpret the statistics in *Table 3* may be used for *Table 4*. In every ESA country, the nurse workforce at home is numerically much larger than the physician workforce. However, in 2000, Mauritius had an emigration rate of 63.3%, suggesting that the human resource costs pressures of emigration on its nurse workforce remaining at home were the greatest of the 16 ESA countries.

Table 3: Emigration levels and rates for physicians compared with remaining numbers of physicians in their ESA countries of origin, 2000

ESA country	Physicians' workforce at home (1)	Emigration level (2)	Emigration rate (%) [2/(1+2)]
Angola	881	2,102	70.5
Botswana	530	68	11.4
DRC	5,647	552	9.0
Kenya	3,855	3,975	51.0
Lesotho	114	57	33.3
Madagascar	1,428	920	39.2
Malawi	200	293	59.4
Mauritius	960	822	46.1
Mozambique	435	1,334	75.4
Namibia	466	382	45.0
SouthAfrica	27,551	7,363	21.1
Swaziland	133	53	28.0
Tanzania	1,264	1,356	52.0
Uganda	2,429	1,837	43.1
Zambia	670	883	57.0
Zimbabwe	1,530	1,602	51.1
All of Africa	280,808	64,941	19.0
Sub-Saharan Africa	96,405	36,653	28.0

Adapted from: Clemens et al, 2006.

The following points summarise the main findings regarding the medical brain drain as a social cost for ESA countries:

- The principal cost of the migration of health professionals from ESA countries is the medical brain drain.
- The literature measures the medical brain drain in absolute and relative terms. The **relative measure** (the emigration rate, defined as the proportion of health professionals' workforce trained in their country of birth and living and working permanently abroad in the medical or healthcare occupation in which they were educated and trained in

their homelands) is a more analytically insightful measure of the extent of the MBD and the intensity of the human resource cost pressures it exerts on the health systems and economies of ESA countries than the **absolute measure** that is more widely used in the majority of the HRH literature.

Table 4: Emigration levels and rates for nurses compared with remaining numbers of nurses in their ESA countries of origin, 2000

ESA countries	Nurses' workforce at home	Emigration level	Emigration rate (%)
Angola	13,155	1,841	12.3
Botswana	3,556	80	2.2
DRC	16,969	2,288	12.0
Kenya	26,267	2,372	8.3
Lesotho	1,266	36	3.0
Madagascar	3,088	1,171	27.5
Malawi	1,871	377	17.0
Mauritius	2,629	4,531	63.3
Mozambique	3,664	853	19.0
Namibia	2,654	152	5.4
South Africa	90,986	4,844	5.1
Swaziland	3,345	96	3.0
Tanzania	26,023	953	4.0
Uganda	9,851	1,122	10.2
Zambia	10,987	1,110	9.2
Zimbabwe	11,640	3,723	24.2
All of Africa	758,698	69,589	8.4
Sub-Saharan Africa	414,605	53,298	11.4

Adapted from: Clemens et al, 2006.

- **Physician brain drain**: Using the 10% emigration rate (suggested in the migration literature) as the normative threshold above which the brain drain is assumed to be extensive, the physician brain drain appears to be severe in all ESA countries, except the DRC. In most cases, the physician brain drain is substantially more extensive than the brain drain for all other categories of skilled ESA migrants.
- **Nurse brain drain**: Using the same 10% normative threshold, the loss or nurses to developed countries is either significantly lower than the brain drain for all categories of skilled ESA migrants, marginally more extensive or about the same. Countries with the highest human resource cost pressures arising from the nurse brain drain are Mauritius, Madagascar, Zimbabwe, and Mozambique.
- The human resource cost pressures that the physician brain drain exerts on the physician workforce at home and, consequently, the health systems, population health status and the average level of labour market productivity are considerably more intense than those exerted by the nurse brain drain.

4.3.4 The social welfare costs of the MBD

The social welfare costs that are implied by the MBD have two broad dimensions:

- total net value of the healthcare services that the emigrated health professionals would have provided to the population had they not emigrated; and
- reduction in fiscal income and gross domestic product arising from employment income and consumption expenditures of the emigrated health professionals, had they not emigrated.

Note that these dimensions assume that all physicians and nurses who emigrated would have remained in the health sector and been fully employed in their profession. They also suggest a distinction between two categories of implicit costs of the MBD: those that fall directly on the health system (direct costs) and those that spill over from the health system onto the wider economic system (spill-over costs). Some of these costs that fall under the two dimensions defined are easily identifiable and quantifiable and can be valued in monetary terms, whereas others are not easily identifiable nor easily quantifiable, even if they are identified; and neither can they be valued (or easily valued) in monetary terms.

Table 5: The social welfare costs of the MBD for ESA countries

Types of MBD social costs	Health system	Population's health status	General economy
Opportunity costs of investment in medical education	x	x	x
Fiscal loss from foregone tax revenues	x	x	x
Economic loss from foregone income	x	x	x
Suboptimal physician-patient ratio	x	x	x
Suboptimal nurse-patient ratio	x	x	x
Replacement costs (general practitioners)	x	x	x
Replacement costs (specialist physicians)	x	x	x
Replacement costs (general nurses)	x	x	x
Replacement costs (specialist nurses)	x	x	x
A sharp rise in wages, salaries etc.	x	-	x
Medical research capacity constraints	x	x	x
Educational & training capacity constraints	x	x	x
Reduction in collaborative advantage	x	x	x
Reduction in network advantage	x	x	x
Lives lost due to lack of non-emergency care	x	x	x
Lives lost due lack of specialist care	x	x	x
Incapacity to maximise health funding	x	x	x
Incapacity to develop new programmes	x	x	x
Incapacity for medical innovations	x	x	x
Imperfect substitutability of staff	x	x	x
Expatriate personnel costs	x	-	-
Longer average working hours	x	x	x
Deepening healthcare inequities	x	x	x
Decrease in quality of health care	-	x	x
Increases in morbidity and mortality	-	x	x
Impairment of supervisory capability	x	x	x
Impairment of managerial capability	x	x	x
Increase in poverty and inequality	-	x	x
Out-of-country health costs	-	x	x
Closure of clinics and hospital wards		x	x
Implicit income redistribution	-	x	x
Lower labour market productivity	-	-	x

Sources: Awases et al, 2004; Baptiste-Meyer, 2001; Chikanda, 2004, 2005; Forcier et al, 2004; Labonte and Packer, 2006; Martineau, et al, 2002; Mejia and Pizurki, 2005; Ntuli, 2003; Stilwell, 2003.

For example, one quantifiable cost is the income that an ESA country loses in terms of income tax on the earnings of physicians and nurses who migrate permanently. Another example of a quantifiable cost is the lost productivity in the health sector and the general economy as a direct result of the emigration of doctors and nurses. As mentioned earlier in this review, the HRH literature has identified some of these costs, but it has not attempted to quantify, analyse and assess them, due primarily to data unavailability. As a consequence, an assumptiondriven qualitative discourse – sometimes quite emotional and ideological – is presented as a substitute for evidentiary quantitative analysis and evaluation.

Table 5 lists of some of the implicit social welfare costs of the MBD that were identified in the HRH literature. Costs are marked with an 'x'. The table indicates the different levels (ie, the health system, population's health status and general economy) at which the social costs of the MBD can be conceptualised and analysed.

Some of the MBD costs in *Table 5* are bi-directional spill-over costs; others are unidirectional spill-over costs. For example, fiscal losses from the income the emigrated physicians and nurses would have earned (assuming they would be employed full time at home for the duration of their working lives) reduce the amount of tax revenue available for financing the government's capital and recurrent budget. The reduction in tax revenue attributable to the migration-induced fiscal losses translates into negative impacts on financing healthcare services through the health sector budget, which in turn negatively impacts population health outcomes through the quantity and quality of healthcare services produced and delivered.

The production of physicians and nurses is the production of a mix of manpower inputs for the healthcare system. The HRH literature emphasises, quite correctly, that poor countries lose the investments their taxpayers make in the education and training of their physicians and nurses when these professionals emigrate. However, these investments are treated in the HRH literature as the public expenditure outlays on medical education and training. For example, if the total public expenditures for the university education and training of a physician is US$100,000 and that physician migrated to a rich country soon after his/her graduation, the HRH literature treats the US$100,000 as an economic loss. In social cost-benefit analysis, the US$100,000 public investment in medical education and training represents the sacrifice of alternative public investment opportunities to use the U$100,000 in medical education and training. Hence, the true economic loss, in this case, is not the U$100,000; it is the value of the public goods and services that the US$100,000 would have provided had it not been used to train the physician. The issue in this type of cost valuation assumption

is whether society places a higher value on the social welfare outcomes of training physicians or on the returns that the resources used to train physicians would have generated had they been invested elsewhere. It is not merely the US$100,000 that taxpayers invest in the medical education of the migrating physician that is lost. Rather, it is the economic and social value of the healthcare services that the physician could have provided. Over time, the value of his or her services could exceed the value of the initial medical investment cost of US$100,000, particularly if the physician turns out to be a brilliant physician. Calculating these lost benefits as a cost is not a straightforward matter, however.

If healthcare labour markets in ESA countries operate within a competitive framework, then the MBD would also imply two types of labour market adjustment costs, in addition to others. High emigration rates indicate large-scale emigration of physicians or nurses, relative to the size of the physicians' or nurses' labour force, implying shortages in the relevant labour market. The shortages may imply greater frictional losses than would the emigration of unskilled labour or the decision of a medical student or student nurse not to return home from overseas study in a developed country. The frictional losses may take quantifiable and nonquantifiable forms.

One typically quantifiable form of frictional losses is a sharp real rise in the salaries or wages of physicians or nurses, particularly those employed in the private sector (Ghosh, 2005; Mishra, 2006). The sharp real rise in the salaries and wages of private sector physicians or nurses in turn, may induce shifts in the supply of public sector physicians and nurses in response to the sharp real rise in salaries and wages in the private sector healthcare labour market. The rise in the supply of physicians and nurses to the private sector accompanied by a corresponding reduction in the supply to the public sector labour market highlights an equity issue, since this represents re-distribution of income towards the well-off in the ESA society and a reduction in the welfare of the less-well off.

The second type of costs arises from the loss of collaborative advantage or teamwork advantage in the production and distribution of health care services. The loss of collaborative or team work advantage may be manifested in a decline in the average level of productivity in the physicians' or nurses' labour market, respectively, with additional welfare cost implications for the health status of the population as a whole. However, quantifying and assessing these costs would be extremely difficult because of the absence of reliable labour market data on labour's share in national income by professional occupation and on the average level of productivity in the health sector workforce before and after emigration.

Box 2: Two ESA country case studies on the costs of the MBD: Kenya and Malawi

Kenya

Kirigia et al (2006) attempted to quantify, analyse and assess the financial costs or losses to Kenya of physicians and nurses who emigrate to selected OECD countries. They also identified and qualitatively described some of what they regarded as the non-financial losses associated with the migration of physicians and nurses from Kenya.

The authors employed a three-step approach to their analysis:

1. They estimated the total private costs (tuition, books, accommodation and living expenses) for educating Kenyan physicians and nurses during their primary, secondary and university education in the private sector educational system. This approach makes two key cost assumptions. First, the total education costs for physicians should also include the costs for their primary and secondary education. Second, the private (as opposed to the public) costs reflect the true economic costs for educating physicians and nurses.
2. They then aggregated the primary, secondary and university cost estimates and compounded the result in the time period from the age of emigration (which they assumed to be age 30 for all physicians) and the time of retirement (which they assumed to be at age 62), using a mixture of the average commercial bank fixed deposit and mortgage rates.
3. They concluded with a sensitivity analysis of the results under Step 2 to the physicians' and nurses' pensionable age in their country of immigration.

Kirigia et al report that, in Kenya, the total cost for educating and training a physician from primary school to university is US$65,997 and the total cost for educating and training a nurse from primary school to nursing college is US$43,180. Further, for every physician who emigrates, Kenya loses approximately US$517,931 in returns on the educational and training investment in that physician. For every nurse who emigrates, Kenya loses US$338,868 in the returns on theeducation and training investments in that nurse. The authors interpret their results as "the returns from the investment foregone by [the Kenyan] society when a doctor or a nurse emigrates".

Malawi

Muula et al (2006) replicate the Kirgia et al (2006) three-step approach to estimate the financial losses they report Malawi would sustain from the emigration of its nurses. The authors made some interesting finding. For example, the total cost of a nurse-midwife's education from primary school through nurse-midwifery training in Malawi was estimated at US$9,329.53. For a nurse-midwife with a degree, the total cost was US$31,726.26. For each nurse-midwife that emigrates out of Malawi, the country loses between US$71,081.76 and US$7.5 million at bank interest rates of 7% and 25% per annum for 30 years respectively. For each nurse-midwife with a degree, the lost investment ranges from US$241,508 to US$25.6 million at 7% and 25% interest rate per annum for 30 years, respectively.

As mentioned earlier, during the literature search, only two ESA case studies were found that attempted to identify, quantify, and assess the costs of the MBD. *Box 2* presents a summary of the findings of each of these two case studies.

4.3.5 The social welfare benefits of the MBD

The specialist HRH literature places far greater weight on the health system and social and economic costs of MBD than on the actual and potential benefits. Three reasons may be:

- The main cause is a lack of quality data on benefits in the literature.
- In addition, the HRH literature takes the nationalist theoretical model of the brain drain as the intellectual foundation for its discourse on international migration, which emphasises the actual and potential welfare costs of the MBD for source countries, while downplaying the actual and potential welfare benefits.
- While there is general consensus in the HRH literature on the social costs of the MBD to developing countries, there is no such consensus on the social benefits.

4.3.6 Financial remittance flows

Financial remittances are the most easily observable and objectively measurable dimension of how source countries benefit economically from international migration. Migrants' financial remittances are the one key source country economic benefit of migration around which the vast amount of social science literature on international migration and economic development currently revolves. While the academic and policy literature on international migration and economic development extols the development value of financial remittances and the international development community vigorously promotes policies, strategies and programmes to maximise the development value of remittances, the treatment of remittances in the HRH literature ranges from contradiction to contempt.

For example, the WHO (2006) considers remittances as one of the major "redeeming features" of international migration, since each year, the "billions of dollars in remittances (the money sent back home by migrants) has been associated with a decline in poverty in low income countries". In support of this perspective, Record and Mohiddin (2006) suggest that, if properly managed, the migration of health professionals from Malawi could be a large source of financial remittances and other benefits for the Malawian economy. In contrast, the strand of the HRH literature that views the MBD as an unmitigated disaster for African countries with high rates of HIV/AIDS voices disagree with these findings (Stilwell et al. 2003; Labonte, Packer and Klassen 2005; Labonte and Packer 2006; Hagopian et al. 2004). They argue:

- The research literature on remittances shows that highly skilled immigrants remit less than low-skilled immigrants. Therefore, immigrant physicians and nurses remit *less* (if they remit at all) than low-skilled immigrants.
- If immigrant physicians and nurses remit at all, their level of remittances is not sustainable in the long term, since the family members back home to whom they remit would join them as soon as they (the immigrant physician and nurse) become more firmly integrated in their new society (this is referred to as the 'remittance decay argument').
- Remittance-receiving households consume the remittances they receive and therefore these flows are not available for investment in the health sector, or for financing healthcare services.
- The net annual volume of remittance flows to developing countries – particularly African countries – is not large enough to offset the costs of the MBD from these countries.

Assuming one has reliable data on the total monetary value of the costs of the African MBD, the only one of these propositions that might not elicit vigorous debate is the proposition that remittance flows to African countries are not large enough to off-set the costs of the MBD. (This proposition will be discussed later in this section.) One counter argument to the first proposition might be that literature on remittances focuses largely on flows from unskilled and low-skilled immigrants as sources of family and community or village-based project finance in the rural areas of developing countries, and not on high-skilled immigrants. Where the migration and development literature focuses on high-skill immigrants, the emphasis on this sub-category of immigrants is more as sources of technology (S&T, R&D, venture capital and entrepreneurial knowledge), trade, and investment flows, and less on remittances. Another counter argument might be that, due to limited comparative empirical evidence across and within countries and across and within regions on remittance-receiving household expenditure patterns over time, the interactions among migration, remittances and development is among the least understood topics in the social sciences (Taylor, 2003). However, some householdlevel empirical evidence does exist, which challenges propositions two and three (e.g. Connell and Brown, 2004; Hildebrant and McKenzie, 2004; Frank and Hummer, 2002; Wolpin, 1997).

In 2002, ESA countries received through official channels 1.3% (US$1.7 billion of global remittance flows, which is 23.4% of the US$7.2 billion that flowed into Southern Africa in that same year. ESA countries that received the largest annual inflows of remittances between 2000 and 2004 are Kenya, South Africa, Uganda, Lesotho, and Mauritius in that order.

All the available estimates of remittance flows worldwide indicate that Southern Africa receives the smallest amount of remittances compared to other regions. For example, there was an estimated US$133.9 billion in global remittance flows in 2002, of which Southern Africa received US$7.2 billion or 5.4% compared to Latin America and the Caribbean (25.2%), South East Asia (21.4%), Middle East and North Africa (19.2%), East Asia and the Pacific (14.9%), and Europe and Central Asia (13.9%).

Table 6 shows estimates of the remittance flows from developed countries to ESA countries.

In terms of healthcare financing, the proposition that financial remittances sent home to African are insufficient to offset the social costs of health worker migration should await evidence-based research verification before any conclusion is drawn. Moreover, if it can be argued that a household that receives a remittance and spends it on improved nutritional intake

and access to healthcare, better housing, better clothes, and education is also directly and indirectly financing the healthcare system, it cannot be reasonably argued, on the contrary (as argued in some parts of the HRH literature) that remittances are 'consumed' and, therefore, they make no impact on the healthcare systems in developing countries.

Table 6: Estimated remittance flows (US$M) through official channels to ESA countries, 2000–2005

Countries	2000	2001	2002	2003	2004	% GDP	% ODA
Angola	-	-	-	-	-	-	-
Botswana	26.0	26.0	27.0	39.0	39.0	0.4	0.4
DRC	-	-	-	-	-	-	-
Kenya	537.9	516.8	395.3	494.3	494.3	3.1	3.9
Lesotho	252.0	209.0	194.0	288.0	355.0	26.0	7.5
Madagascar	11.0	11.0	17.0	16.0	16.0	0.4	28.3
Malawi	1.0	1.0	1.0	1.0	1.0	0.1	25.0
Mauritius	177.0	215.0	215.0	215.0	215.0	3.6	0.6
Mozambique	37.0	42.0	53.0	70.0	58.0	1.0	20.8
Namibia	9.0	9.0	7.0	12.0	16.0	0.3	3.1
South Africa	344.0	297.0	288.0	435.0	523.0	0.2	0.3
Swaziland	74.0	74.0	62.0	88.0	89.0	3.5	4.6
Tanzania	8.0	15.9	12.1	9.1	10.9	0.1	15.4
Uganda	238.0	338.0	416.0	285.0	347.0	4.2	17.0
Zambia	-	-	-	-	-	-	-
Zimbabwe	-	-	-	-	-	-	-

Source: World Bank, 2006.

4.3.7 Network externalities: technology, trade, and investment flows

A growing body of economic and sociological research emphasises the role of immigrant knowledge networks, business networks and social networks in the transfering benefits from developed to developing countries (Gould, 1994; Head and Ries, 1998; Rauch, 2001; 2003; Docquier and Lodigiani, 2006; Kugler and Rapoport, 2005; Mundra, 2003; Light, Zhou and Kim, 2002; Saxenian, 2002; Biao, 2005; Wescott, 2006). The network-

based benefits take the form of technology transfers (i.e. tacit and explicit knowledge and information exchange in S&T, R&D, trade and investment) as well as the dollar value in trade and investment in goods and services that highly-skilled immigrants promote between host and home country through the various types of social networks (e.g. knowledge, trade and business etc.) that they build and actively maintain with their countries of origin. However, many of these findings relate to transnational networks of Asian and South American high skilled immigrants and may not be generalised to include other groups of high skilled immigrants.

4.3.8 African immigrant health professionals and the transfer of healthcare technology

New evidence is coming to light of the development of networks of highly educated African immigrants, some of whom are directly engaged in the transfer of knowledge and skills from their host country to their homeland. *Table A9* (see Appendix) lists some of these networks. In the area of healthcare technology transfers, Teferra (2004) highlights the role of the Ethiopian North American Health Professionals Association (ENAHPA) in healthcare technology transfer from the USA to Ethiopia, and in healthcare capability and capacity building through virtual and on-the-ground transfer and diffusion of that technology. Newland (2004) also highlights the role of highly skilled Eritrean immigrants in building the capacity and infrastructure of the health sector in their homeland. Marks (2006) describes the role of the South African Network of Skills Abroad (SANSA), a network that includes physicians and nurses, in transferring healthcare technology from North American and Europe back to South Africa. Finally, in their econometric analysis of international medical technology diffusion from 'frontier countries' to 'non-frontier countries', Papageorgiou et al (2006) found a 3.4 year increase in life expectancy in sub-Saharan Africa (prior to the reversal due to AIDS since 1990). They attribute part of this increase in life expectancy to the contribution of African-born immigrant scientists employed in the pharmaceutical industry and in medical R&D in North America and Europe. The search process discovered only the documented cases cited of the positive network externalities in the healthcare field directly associated with the MBD from African countries. More cases of these and similar types may exist. Therefore, one challenge is to identify and document them through careful case study research and to promote policies and programmes to scale them up. In this regard, some useful models (e.g. IOM MIDA models in the Great Lakes Region, including DRC) already exist. These can be adapted to suit particular contexts.

5. GENERAL DISCUSSION

5.1 Cost-benefit analysis and the migration of health professionals

Cost-benefit analysis (CBA) is a systematic quantitative economic method for identifying, comparing and analysing the magnitude of the costs and benefits associated with a programme or an investment project to assess its social welfare consequences. Typically, CBA is concerned only with quantitative economic magnitudes expressed in monetary terms. The Terms of Reference for this paper optimistically assumed that cost-benefit studies were standard features of the HRH literature on the migration of health professionals from ESA countries. The literature search reveals that application of quantitative CBA in the study of healthcare manpower issues is uncommon and non-existent in the literature on health personnel migration, and non-existent in the literature on skilled migration in general.

One possible reason for this is that the issues of interest to healthcare professionals and managers generally involve costs and benefits that cannot be easily expressed quantitatively nor measured in monetary terms. Another explanation might be that the theoretical and analytical details required in application of the CBA methodology demand familiarity with economic concepts, quantitative economic tools and a foundation in welfare economics. The only two case studies that attempt to identify and analyse the monetary costs of the migration of health professionals from Kenya and Malawi (outlined in Box 2) ran into conceptual, methodological and analytical difficulties when trying to identify, quantify and choose the discount rate in order to analyse and evaluate these costs.

5.2 Methodological and conceptual issues in discourse on costs and benefits

Quite apart from conceptual and methodological challenges of applying CBA methodologies in the study of the migration of health professionals, perhaps the most compelling challenge in an ESA country-level context is the lack of of quality data required for this type of analysis. Even where some data on the migration of health professionals exists, it is fragmented, inconsistent across and through time, undated and un-sourced, which raises issues of quality, reliability and comparability. This issue is a common theme running throughout the HRH literature and is regarded as a major institutional and structural challenge in African countries. Instead, a narrative discourse on costs and benefits is substituted for quantitative analysis. Anecdotal

information and impressionistic data rather than 'hard' facts supply the 'evidentiary' basis for the narrative discourse on costs and benefits. As indicated in the preceding paragraph, unavailability of hard statistical and economic data more than any other reason seems to be responsible for this approach in the HRH literature.

While a focus on the impacts of migration may be technically correct, the discourse could be strengthened in a number of respects. First, by definition, 'impacts' implies 'down-stream' changes in health systems that can be traced over time directly to the act of human migration. These changes may be either negative (costs) or positive (benefits), both positive and negative, more positive than negative, or more negative than positive. In the vast majority of cases reviewed, the HRH discourse focuses far too much on the negative impacts (costs) of the migration of health professionals and far too little on the positive impacts (benefits). Even in the very few cases where remittances are mentioned as a benefit, the discussion is dismissive of the development value of this type of benefits.

Impacts can be a very useful concept in CBA, if an analytical distinction is made between the gross and net impacts of the migration of health professionals on health systems. Such a distinction presupposes information on the total direct and direct costs and benefits and comparison of total direct and indirect costs with total direct and indirect benefit. There is a marked failure in the literature to make this distinction, even conceptually, and this has resulted in the absence of any serious discussion and analysis of the net impacts of the migration of health professionals. This is quite puzzling since all of the HRH discourse on these costs and benefits reviewed make conclusions on the impacts of the migration of health professionals and to propose policy recommendations.

The medical brain drain is the principal category of human resource costs of health worker migration from developing countries; all other costs are derivatives of the medical brain drain. The HRH literature typically defines and measures the medical brain drain in terms of the actual and potential numbers of health professionals who migrated or plan to migrate. While this approach may be useful in terms of the aggregate level of health professionals who migrated or plan to migrate, a more analytically useful measure of the brain drain is the proportion of the total health professionals' workforce at home (differentiated by occupation specialties and sub-specialties, education, whether education was tax-financed or privately financed, experience and gender characteristics) living permanently and practicing in their field or fields of occupation specialties and sub-specialties in another country. Such

a measure gives more policy insights into the pervasiveness and intensity of the brain drain as a human resource costs than the absolute number of health professionals who emigrated or plan to emigrate.

The education and training costs of physicians and nurses involves more than a simple calculation of money outlays. It involves an attempt to estimate the total resource cost of the investment in terms of alternative opportunities foregone either by a society as a whole or by the private individual. This concept of costs raises two issues. The first is that in considering the education and training costs of physicians and nurses, in particular, how far back into time should one go? Kirigia et al (2006) and Muula (2006) include expenditure outlays on the primary and secondary schooling of physicians and nurses in their cost analysis on the grounds that primary and secondary schooling is also part of the 'true' costs for educating and training physicians and nurses. One may ask whether the inclusion of the expenditures on primary and secondary schooling into the costs of physicians' and nurses' education does overstate the actual social costs of physicians' and nurses' education and training, since expenditures on primary and secondary schooling are not the outcome of the act studying medicine or nursing nor of providing medical education and training. If the expenditures on primary and secondary schooling are included in the costs of education and training of physicians and nurses, what is the rationale for not going further back in time and also factor expenditures on the kindergarten or infant school education into the costs of medical education and training? For the purposes of CBA, the total resource costs society incurs for the medical education and training of physicians and nurses are the resource costs that directly and indirectly arise as a result of the act of providing medical education and training.

These typically include:

- the alternative opportunities society foregoes when it invests scarce resources in the university education and training of physicians and nurses;
- the gross earnings that physicians and nurses forgo while pursuing their medical education and training; and
- the foregone national income and employment multiplier effects of both the above points.

The migration of health professionals from a developing to a developed country involves a flow of costs and a flow of benefits typically occurring at different times. In CBA, the two flows are reduced to a single time dimension using an appropriate discount rate, then comparatively analysed

and evaluated for their net welfare impacts. In economic analysis, if the CBA is undertaken from the private (individual) point of view, the appropriate discount is the interest rate that reflects the private opportunity costs of the funds (personal and/or family) invested in his or her medical education and training. If the CBA is undertaken from society's viewpoint, the appropriate discount rate is the interest rate that reflects the social opportunity costs of the public funds invested in the individual's medical education and training. Hence, in economic analysis, the private rate of discount and the social rate of discount are treated separately.

The methodological assumption of this approach is twofold. First, the discount rate accounts for the potential benefits that the individual or the society could receive from investing the same amount of funds for the same length of time in an alternative other than in medical education and training. Second, governments (which invest scarce public funds in the medical education and training of their citizens) and the individuals who invest their own funds in their medical education and training) view that alternative differently, and consequently, they weigh the benefits of their medical education and training relative to the costs very differently.

Krigia et al (2006) and Muula (2006) use commercial bank savings rate and mortgage rates as the discount rate to arrive at the social cost of migration. When the CBA is taken from the society's point of view, an economist never uses commercial bank rates on individual savings or housing market interest rates as discount rates, since these are rates reflect the private opportunity costs of funds rather than the social opportunity costs of public funds. Although there is no unanimity among economists as to the appropriate social discount rate to use in the CBA, most would agree with Harberger (1972) Lind (1990) that the government's longterm borrowing rate is the best measure of the social opportunity costs of the public funds invested the medical education and training of health professionals.

The international migration of health professionals is a two-sided equation involving emigration countries (the supply side) and immigration countries (the demand side). There are costs and benefits on both sides. Effective management of the migration of health professionals from ESA to OECD countries requires evidence-based information on these costs and benefits. Future policies and programmes to manage the international migration of health professionals will rest on an incomplete evidentiary foundation if the costs and benefits on the side of *immigration* countries are ignored in CBA.

Undoubtedly, the major source of some of these limitations in the HRH literature is the fourth-best data and information environment in most sub-Saharan African countries and within which researchers have to operate. In consequence, the analysis and evaluation of the costs and benefits in the HRH literature lack 'hard' facts.

5.3 Information gaps and biases

The following information gaps and biases in the HRH literature were identified:

- No quantitative analysis of the benefits relative to the costs of the migration of health professionals either from developing countries as a whole, or sub-Saharan Africa including ESA countries currently exists either in the current HRH literature or in the skilled migration literature in general. This may be due to the absence of reliable quality and quantity statistical and economic data on the emigration of health professionals at country-level or regional level in developing countries, ESA countries in particular. This gap could be remedied with the establishment of a serviceable comprehensive statistical and economic database established either regionally, sub- regionally for the purpose of servicing the policy research information and knowledge needs of the 16 ESA countries
- The vast majority of the publications that were reviewed use qualitative tools to develop and present a narrative discourse on the costs of the migration of health professionals. The narrative discourse stresses the health system and attendant social costs impacts of the migration of health professionals for source countries without distinguishing between 'gross' impacts and 'net' impacts. As a consequence, there is very little, or no, discussion on the actual and potential benefits of the migration of health professionals to ESA countries. In the few cases where remittances are mentioned as benefits, the development value of these benefits is dismissed as inconsequential.
- The nationalist model of the social welfare aspects of skilled migration provides the conceptual framework that defines the terms of the discourse on this subject. This model emphasises the negative consequences of skilled migration for developing countries, while downplaying the benefits. There is virtually no recognition in the HRH literature of the beneficial brain drain or the positive effect of transnational network models on developing countries.

- Only tow studies use quantitative costing methodologies. Unfortunately, they do not distinguish between tax-funded costs of medical education and training and privately funded medical education and training. Nor do they distinguish between discount rates appropriate for financial analysis and discount rates appropriate for analysis of tax-funded medical education programmes.
- The HRH literature emphasises the medical brain drain as the principal costs of the migration of health professionals. Typically, the medical brain drain is defined and measured in the HRH literature as the absolute number of physicians and nurses who emigrate. While counting the brain drain is useful for assessing the level of emigration of health professionals, it provides very little analytical insights into the pressures the ESA medical brain drain puts on the health workforce at home and the intensity of the ESA medical brain drain in a source country, and neither does merely adding up the number of physicians and nurses who emigrated facilitate inter-occupational, regional and international comparisons of the human resource cost intensity of the medical brain drain.

6. DIRECTIONS FOR A FUTURE PROGRAMME OF CBA RESEARCH

It is recommended that future CBA research into the migration of health workers should consider the following issues:

- developing a demand-driven database on ESA health professionals' migration;
- modelling the net welfare benefits of the medical brain drain;
- the need for a paradigm shift in research and analysis of the medical brain drain;
- migrants' remittances and health outcomes in remittance-receiving households;
- harvesting the benefits of the medical brain drain;
- foreign aid, the medical brain drain and the welfare of the population at home; and
- the limitations of the 'pure' form CBA of the migration of health professionals.

6.1 A demand-driven database on health worker migration from ESA

Any CBA of health worker migration and skilled migration in general, is data demanding. Therefore, one should not underestimate the data and information requirements that a CBA programme of this type of applied research will impose on country-level institutions and organisations charged with developing and implementing such a programme. As emphasised throughout this paper, the HRH literature constantly reminds governments, civil society and international agencies of the woeful inadequacies of the available data on the international flow of health professionals from developing to developed countries. Therefore, investments in institutional capacity and technical capability for building a functioning and serviceable database on the international migration of health professionals cannot be overemphasised if the objective is evidence-based ESA policy regimes directed at mitigating the negative and building on the positive social welfare consequences of the medical brain drain.

Simple questions including the following should guide institutionalisation of the database:

- Who will be the main actual and potential users?
- Where are the actual and potential uses located?
- What are the revealed migration statistical data needs of these users? Are their revealed needs temporary or permanent? What institutional factors that will sustain these needs?
- Given their revealed needs, what are the dimensions (e.g. economic, demographic, sociological, anthropological and ethnographic etc.) of health worker migration on which data should be collected, processed, stored, and periodically updated?
- Given the revealed needs, how will the actual and potential users use the data in the database?
- Given the revealed needs, how will the actual and potential users access the data in the database? Will access be fee-based or non-fee based?
- Should the database include time-series, cross-sectional and census data on both the supply and demand sides of the international migration equation? How will these kinds of data be collected? How regularly will they be collected? What or who will be the main sources for these kinds of data?
- Who will be directly responsible for servicing the database?
- How will the data be stored, processed and retrieved?
- Who will be directly responsible for building, managing and promoting the database?
- Who will fund the establishment of this database?
- Will, or should, the database be financially self-sustainable?

Useful starting points for building a functioning and serviceable database on the migration of health professionals include Gupta et al, 2003; Hagopian et al, 2004; Stilwell et al, 2003; Mullan, 2005; Docquier and Bhargava, 2006; Docquier and Marfouk, 2004; Clemens and Pattersson, 2006; WHO; and the World Bank. These sources have suggested a range of statistical and economic data for tracking, measuring and evaluating the net bilateral migration flows of health worker migration and its impacts on source developing countries. Boxes 1 and 2 (above) provide information on the range of cost data that should be collected and stored in a comprehensive database on the international migration of health professionals from ESA countries. In addition, data on the beneficial impacts of immigrant health professionals on their homelands should be collected and stored in the database, such as:

- annual flows of financial remittances directly attributable to health workers;
- network-based transfers of medical knowledge, skills, and expertise;
- the number of health workers who returned home with enhanced knowledge and skills;
- increased enrollment in medical schools as a direct result of the health worker migration;
- homeland medical philanthropy of immigrant health professionals;
- homeland educational philanthropy of immigrant health professionals;
- homeland humanitarian assistance of immigrant health professionals;
- the financing of community health and other community-based projects; and
- the financing of rural social and cultural infrastructure projects.

A comprehensive database of this type could also serve as a strategic institutional resource for other purposes as well, such as development of evidenced-based strategic approaches to financial and non-financial incentive-based policy regimes at the national, regional, subregional levels for managing the migration of health professionals as well as for conducting research-informed policy and programme development dialogue at the international level. Institutional capacity and capability building in computerized data collection, storage, processing, and retrieval of 'frontline' health sector organisations, institutions, and agencies could be a first step towards development of such a comprehensive database.

6.2 Modelling the net welfare benefits of the medical brain drain

Evidence-based understanding of the magnitude of the medical brain rain, the type, scope and magnitude of the costs and benefits for ESA countries and the channels through which various types of benefits are transmitted from developed to ESA countries is an imperative for ex ante policy formulation and ex post evaluation of policies and programmes to manage the emigration of health professionals. The research challenge is to devise robust CBA methodologies for quantitative modelling and estimation of the overall net welfare benefits of the international migration of health professionals and for advancing practical policy understanding of these impacts. Developing and implementing such a methodology will require investment in technical and institutional research capacity and capability strengthening at the country, regional and sub-regional levels in ESA countries and a multidisciplinary

research effort. It will involve considerable country-specific quantitative and qualitative data on tangible and intangible costs and benefits on both the supply side and demand side together with the factors that correlate with the structure of costs and benefits associated with the international migration of health professionals. It will also require reliable quality and quantity data on the emigration rates of health professionals disaggregated by occupation, education, age, gender, and other person-specific characteristics.

6.3 The need for a paradigm shift in research and analysis of the medical brain drain

Modelling the net welfare impacts of the international migration of health professionals on ESA countries requires a paradigm shift, conceptually and analytically. The HRH literature prefers to emphasise the social costs of the migration of health professionals from African countries while discounting the health system and general development value of the social benefits. This approach is consistent with the theoretical assumptions of the nationalist paradigm, which holds that the emigration of skilled persons from developing to developed countries constitute a permanent unmitigated loss of human capital to developing countries. In contrast, the new and emerging theoretical and empirical research literature on the economics and sociology of the brain drain emphasises the actual and potentially large positive economic growth and social welfare benefits of the brain drain relative to the costs to developing countries and the network-based channels through which these benefits are transmitted from developed to developing countries. The key implication of this new and emerging empirical evidence for managing the outflow of health professionals from ESA countries, is that the migration of health professionals to developed countries does not necessarily constitute a permanent unmitigated welfare loss to the population remaining behind; but rather a potential source of medical human resources for increasing the skills, knowledge, expertise, and experience in the health sector workforce at home. This emphasis suggests the need for a paradigm shift in HRH research and analysis of the migration of health professionals directed at harvesting the benefits of the medical brain drain for ESA health systems capacity improvement, improved population health outcomes, and for increasing the overall labour market productivity of the population remaining at home.

6.4 Migrants' remittances and health outcomes in remittance-receiving households

As indicated earlier in this review, the HRH literature rejects the notion that remittances are a source of development finance since, in the view of this literature, remittance-receiving households – the overwhelming majority of

which are poor family households – consume the monies they receive instead of handing them over to the state for investment in the health sector or for financing healthcare services for the poor. The reality is that remittances are relatively small sums of monies that periodically flow directly in the hands of the poor from their relatives and friends abroad. Indeed, when this reality is examined in the context of the HRH argument that it is the poor who suffers most from the international migration of health professionals, since they cannot afford the private costs of health services, the obvious weakness of the HRH 'statist' perspective is the assumption that remittances directly in the hands of the poor translate into a direct negative correlation between 'remittance consumption' and health profiles of the poor.

An argument can be made that the most obvious way by which remittances improve health outcomes of the poor is that it provides money income to poor households that would have no money income without remittances and more money income to poor households that have little money income to purchase healthcare services or better healthcare services, or to purchase health-improving goods and services. This argument implies that it is possible to predict that remittances directly and positively affect health outcomes of poor households through at least two mechanisms: income effects, and education (i.e. health knowledge) effects. The income effects arise since the incomes from remittances that poor households receive allow them to purchase health improving goods and services or increase purchases of pre-remittance levels of health-improving goods and services. The education effects arise because, as Levitt (1996) argues, remittances also transfer health information from migrants to family members that improve household health outcomes.

Given these assumptions, it cannot be definitively concluded, as the HRH literature has concluded, that empirical correlation between remittance flows and healthcare investment is negative, meaning that remittances have no positive impact on the health status of poor people. The relationship between migrant remittances and health profiles of members of remittance households need to be empirically established before such conclusions can be justified. One research approach in this direction – in fact the only empirically-valid approach – is a comparative longitudinal study of the health profiles of a sample of poor households receiving remittances with a sample of poor households receiving no remittances. Such a study would provide the 'hard' research evidence to dispassionately assess, or provide a nonideological assessment of the household health investment effects (income and health knowledge) of remittances and for devising policies and programmes either to creatively foster these effects or scale them up.

6.5 Harvesting the benefits of the medical brain drain

Financial and non-financial retention policy regimes were the core emphasis of the March 2001 Regional Conference in Arusha on Health Worker Migration and Retention in ESA. These policies are important tools for managing the outflow of health professionals. Research informed, judiciously designed and judiciously implemented they can have a positive net impact on the emigration rates in some ESA countries. However, they constitute only one approach to the management of health worker migration. Strategies for harvesting the economic and social benefits of the brain drain are reinforcements to country-level financial and non-financial retention policies. Current research evidence on the role of Indian, Chinese and Korean immigrant professionals in the scientific and technological development of their homelands, indicates that dynamic brain gain circulation and brain drain reversal is a viable strategy for mobilising the skills, knowledge and expertise of ESA physicians and nurses working in OECD countries for healthcare services in their homelands and for mitigating the human resource costs of the medical brain drain. Under this strategy, an ESA physician or nurse might start off initially by providing technical advice, consultancy services, training, or other types of service in his or her homeland for 'fixed periods' in the 'brain gain circulation mode' using various media such as telemedicine, and this same physician or nurse may later be engaged in a future period on a permanent basis in the 'brain drain reversal mode'.

Three institutional factors should guide consideration of a future programme of CBA research directed at harvesting the benefits of the medical brain drain. The first is that an ESA political, economic, medical professional, infrastructural, cultural and policy environment conducive to the medical brain-gain circulation and brain-drain reversal strategy, matters. Writing about the potential catalytic role of African immigrants' knowledge networks in African economies, Teferra, the Ethiopian scholar points out that "the barriers to brain circulation [in African countries] are numerous and complex. Collaboration efforts between Diaspora communities and home country intellectuals and their institutions confront a plethora of challenges as the two bodies engage, in the brain circulation process, from a variety of political, social, academic, inter-generational, infrastructural, economic and cultural platforms" (Teferra, 2004). Both homeland-based health professionals and transnational knowledge networks of ESA immigrant physicians, nurses, and other health professionals living and working in OECD countries can positively contribute to development of an ESA domestic environment conducive to the blending of the medical knowledge and expertise that ESA migrant health professionals acquire in OECD countries and the medical knowledge and expertise that remain in the health sector workforce at home.

Strategically, an ESA immigrant health professionals' community-homeland government collaborative development agenda is of great importance. ESA governments and healthcare professionals who remain at home and have a positive vision of their overseas immigrant community of health professionals as reservoirs of medical talents, knowledge, skills, expertise and other technical resources and who help to develop their communities in their homeland have greater prospects of learning from abroad and for sustained long-term health sector development than countries that emphasise restrictive and punitive policies.

As indicated earlier, a number of African immigrant knowledge networks (AIKN) are evolving, such as the South African Network of Skills Abroad (SANSA), Ethiopian North American Health Professionals Association (ENAHPA), Kenyan Community Abroad (KCA), and African Distance Learning Network (ADLN). These and other AIKN of similar focus are engaged in a number of homeland activities including healthcare services. The existence of these networks, and their altruistic motivations for engagement in the development of their homelands, suggest a third institutional factor of critical importance: we need a capable ESA-based organisation/institution for coordinating and integrating the transnational network-based homeland health services and other initiatives of AIKN. ESA organisations/institutions at both the country, regional and sub-regional levels that can capably perform functions including interdisciplinary and inter-organisational communication bridges and become the focal point for joint actions between ESA immigrant health professionals' networks, governments, private sector, and civil society organisations, are important institutional mechanisms for sustaining the homeland health sector initiatives by the community of ESA health professionals abroad.

6.6 Foreign aid, the medical brain drain and population welfare at home

One of the policy proposals of the internationalist model of the welfare effects of the brain drain is that foreign aid could be used to compensate the population of developing countries, whose welfare is reduced as a direct result of the migration of their skilled compatriots. More specifically, one may consider: 'Does the net aggregate dollar value of the foreign aid that the recipient OECD country gives to the health professional's ESA country exceed the net dollar value of the relevant welfare gains?' This question may be broken down into two parts.

The first part relates foreign aid to the brain drain from developing to developed countries and considers the possibility of foreign aid as policy tool for compensating the marginal population residing in an emigration

developing country for their welfare loss due to the brain drain. Assuming that foreign aid dollars actually leave the capitals of aid-giving countries (a questionable assumption, given tied aid regimes) a research focus on this question would consider, among other factors, the group or groups (the rich, the poor and the relatives of emigrants) in developing countries who directly benefit from foreign aid flows, and whether they are the same groups whose welfare is directly reduced as a result of the medical brain drain. Second, it also assumes that it is developing countries, not the developed countries that give the foreign aid, that actually benefit from it.

Researching the issue of foreign aid flows as a medical brain drain compensating mechanism within a CBA framework is important from the policy standpoint in both immigration and emigration countries. Policy understanding of the nature of the relationship between foreign aid flows, the welfare of the marginal population remaining in developing countries and the brain drain is important from the standpoint of heightened concern about the brain drain and its impact on development including aid-financed development projects and programmes. It is also important to determine the extent to which foreign aid facilitate or discourage the brain drain and the relationship between foreign aid flows, remittance flows, and the welfare of the poor in aid-recipient emigration developing countries.

The second part of the question pertains to the welfare gains that developed countries receive from the medical brain drain, and how to identify and quantify these gains. A number of methods may be employed to measure these gains. One method is the replacement cost method, which involves, identifying and quantifying the cost to an OECD country of the total human capital investments it would have made for providing the educational and training investments embodied in imported health professionals. A more useful approach is estimation of the net present value of the lifetime economic contribution of imported health professionals to fiscal income, business income, employment, and national income growth of OECD countries. A third approach is estimation of the net efficiency gains from the employment of immigrant health professionals along the lines of the Borjas (1995) method for estimating the 'immigration surplus' of highly skilled immigrants.

6.7 Limitations of 'pure form' CBA of the migration of health professionals

CBA is an economic tool to aid social and economic decision-making. It is also valuable tool in the design of policies and programmes for managing health personnel migration within and from ESA countries. Indeed, as emphasised previously, when understood and correctly applied to the issue

of the migration, CBA can help increase the effectiveness of policies for managing the mobility of health personnel and for fleshing out programme strategies to maximise the social benefits associated with this mobility, while minimising the social costs. However, in its pure form, CBA rests on two technical assumptions:

- All the relevant costs and benefits are capable of being defined, measured, analysed, compared, and evaluated in dollar terms.
- Only when net benefits are expressed in dollars is the Kaldor-Hicks welfare criterion applicable in determining policies and programmes designed to optimally address social costs and benefits imbalances (arising from the international and/or internal health worker migration) between and among population groups or between countries.

As indicated earlier, not all health worker migration-related costs and benefits of policy and programmatic interest to healthcare managers, administrators, policy makers and researchers can be expressed in dollar terms. Therefore the CBA calculus alone may not be conceptually, methodologically and analytically adequate for guiding policy and programming in managing health worker migration. Perhaps, where the costs and benefits associated with health worker migration cannot be expressed in monetary terms, alternative methodological procedures should be used.

One of these alternatives is qualitative CBA. Under this technique, the researcher first identifies and quantifies all costs and benefits in monetary terms that can be so quantified and then identifies and makes qualitative estimates of the relative importance of all costs and benefits that cannot be expressed in monetary terms. Once these qualitative estimates are made, reasonable assumptions based on experience can be used to rank the costs and benefits so estimated by order of welfare magnitude. For example, the loss of a poor country's highly experienced and highly accomplished health professionals to a rich country also implies a real loss of healthcare leadership, as well as a real loss of institutional knowledge. Loss of healthcare leadership and loss of institutional knowledge are costs that cannot be easily expressed in monetary terms, or otherwise quantified. However, with some creativity, qualitative estimates can be made and ranked in order of the perceived magnitude of their impact on the home country's health system the health status of its population.

7. SUMMARY AND CONCLUSION

7.1 Summary

Both the voluntary and developed country policy-induced migration of health professionals from developing to developed countries reflect what Kimberly and Yau (2004) call the "global tug-of-war for health care workers". It also represents part of a wider trend in the global integration of labour markets at the high skill end.

Although the international migration of health professionals from developing countries to developed countries' labour markets is not a new phenomenon, a steady and increased flow of these professionals from sub-Saharan Africa, in particular, where they are needed most in absolute terms to the "greener" pastures of OECD labour markets is indeed a real development problem for Sub-Sahara African countries in three critical respects:

- Given the reality and magnitude of supply-side labour market adjustment costs, increased flows of health professionals from developing to developed countries impose the threat of a medical brain drain on developing countries. They can adversely affect the capacity of their health systems to deliver healthcare services efficiently and equitably to the population as a whole in measurable and objectively verifiable ways.
- The wide disparities in medical technology and employment conditions between the labour markets of developed and developing countries have given force to the argument that developed countries are net winners when it comes to the migration of health professionals from developing countries to developed countries, and developing countries are net losers. Consequently, it is possible that the total social welfare gains from the medical brain drain for developing countries (sub-Sahara Africa, in particular) may not offset the total welfare losses to these countries.
- Slow or stagnant economic growth and IMF/World Bank policy prescriptions have also encouraged more health professionals to emigrate from sub-Saharan African countries to developed countries. Governments face increased fiscal constraints on their ability to fund replacements, improve working conditions and slow or reverse the outflow. Research is needed that identifies, quantifies, and assesses the costs and benefits directly associated with the migration of health professionals from ESA countries – in other words, CBA research – with the view of finding evidence-based solutions to mitigate the social welfare losses while enhancing the social welfare gains.

As a first step in this direction, this paper sets out to conduct a critical review and analysis of the secondary HRH literature, which identifies, quantifies, and assesses the costs and benefits directly and indirectly associated with the international migration of health professionals from ESA countries to developed countries. Review objectives included a critical evaluation of the theoretical framework and methods used in the existing HRH literature in identifying and assessing the costs and benefits of the migration of health professionals, critical evaluation of the conceptual and methodological soundness of the HRH discussion and analysis of the costs and benefits.

From an economist's perspective, costs and benefits by definition are quantitative variables (although there are some costs and benefits that may not be easily quantified, and therefore have to be treated qualitatively). The literature review and analysis finds that, currently, the specialist (HRH) literature on the migration of health professionals from sub-Saharan Africa, ESA in particular (as well as the general literature on skilled migration) lacks quantitative analysis based on 'hard' data. Qualitative discourse on the costs and benefits of the migration of health professionals seems to take precedence over quantitative analysis in the specialist HRH literature. The qualitative approach is important because it helps to make policies and programming more sensitive to the actual and potential costs and benefit components of the migration of health professionals. However, this emphasis may be caused by the lack of quantity and quality statistical and economic data on the problem, as pointed out by all the literature reviewed in this paper. The current lack of quality data makes identification, analysis and assessment of the costs and benefits of migration very difficult, if not impossible.

Methodologically, quantitative CBA typically involves the definition and measurement of costs and benefits in monetary terms from a particular point-of-view, given some welfare function to be maximised. However, while the emphasis is on quantifiable costs and benefits in the healthcare industry, some items of costs and benefits of policy and programmatic import are not easily defined and expressed in monetary or other quantitative terms. Where all relevant costs and benefits are not measurable in monetary terms, the paper argues for the qualitative CBA approach as a complement to the quantitative CBA approach. Application of either or both approaches either in tandem or separately to the migration of health professionals and skilled migration requires an enormous amount of quantitative and qualitative data for implementation, however. Therefore, one should not underestimate the overall data and information requirements that technically sound quantitative and qualitative CBA-type research demands as an input in the decision-making process.

7.2 Conclusion

While the call for CBA-type research and analysis of the migration of health professionals is important and timely, equally important is the need to first develop the requisite database at country, sub-regional and/or regional levels to facilitate this type of research enterprise. Without the availability of statistical and economic data of reliable quantity and quality to facilitate identification, analysis and evaluation of the all relevant tangible and intangible costs and benefits of the migration of health professionals from ESA countries, policy and programming decisions to manage these human resources outflows will continue to heavily rely on the largely speculative discourse in the HRH literature.

At the same time, there is much useful information in the existing HRH literature that might be a useful starting point from which to build a future programme of evidence-based policy research. Studies that use 'hard' economic and non-economic time-series and panel data on costs and benefits, a more balanced conceptual framework and sounder analytical research techniques should become mandatory. The migration of health professionals from ESA countries needs to be managed in a way that minimises the costs to ESA countries while allowing them to harvest the benefits. In conclusion, the most important step to be taken is the establishment of a well-resourced comprehensive and demand-driven data base on the economic, social and demographic aspects of the migration of health professionals from sub-Saharan African countries.

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APPENDIX

Table A1: GDP, unemployment rate and health expenditure by country, 2004

Country	Current GDP	Growth GDP	Per capita GDP	Unemployment rate	Total health expenditure GDP
Angola	19.6	11.1	1,942	n/a	2.8
Botswana	9.0	4.9	7,344	23.8	5.6
DRC	6.5	6.8	382	n/a	4.0
Kenya	16.1	4.3	1,586	40.0	4.3
Lesotho	1.4	3.1	2,152	45.0	5.2
Madagascar	4.4	5.3	965	4.5	2.7
Malawi	1.9	7.1	519	n/a	9.3
Mauritius	6.0	4.4	12,306	10.2	3.7
Mozambique	5.9	7.5	1,053	21.0	4.7
Namibia	5.7	6.0	5,921	5.3	6.4
South Africa	214.7	4.5	8,506	28.4	8.4
Swaziland	2.5	2.1	5,893	4.3	5.8
Tanzania	11.3	6.7	732	n/a	4.3
Uganda	6.8	5.6	1,088	3.2	7.3
Zambia	5.4	5.4	1,013	50.0	5.4
Zimbabwe	4.7	(4.2)	1,588	8.2	7.9

Sources: World Bank, 2006; WHO, 2006. Estimates are for various years between 2000 and 2006.

Table A2: Estimates of the size of the health workforce by country, 2004

Source: WHO, 2006.

Country	Number of health workers
Angola (1997)	14,534
Botswana	7,117
DRC	52,542
Kenya	66,956
Lesotho (2003)	1,532
Madagascar	18,700
Malawi	8,309
Mauritius	10,538
Mozambique	20,129
Namibia	16,244
South Africa	319,992
Swaziland	12,914
Tanzania (2002)	48,508
Uganda	35,445
Zambia	41,429
Zimbabwe	16,680

Note that health workers include physicians, nurses, midwives, dentists, pharmacists, laboratory technicians, public and environmental health workers, health management and support workers, community health workers and other health workers.

Table A3: Estimates of changes in the size of the physicians' workforce, 2000-2004

Country	2000	2004	Change (%)
Angola	881	881	-
Botswana	530	715	34.9
DRC	5,647	5,827	3.2
Kenya	3,855	4,506	16.9
Lesotho	114	89	(21.9)
Madagascar	1,428	5,201	264.2
Malawi	200	266	33.0
Mauritius	960	1,303	35.7
Mozambique	435	514	18.2
Namibia	466	598	28.3
South Africa	27,551	34,829	26.4
Swaziland	133	171	28.6
Tanzania (2002)	1,264	822	(35.0)
Uganda	2,429	2,209	(9.1)
Zambia	670	1,264	88.7
Zimbabwe	1,530	2,086	36.3

Sources: Clemens and Patterson, 2006; WHO, 2006.

Table A4: Estimates of changes in the size of the nurses' workforce, 2000-2004

Country	2000	2004	Change (%)
Angola	13,135	13,627	3.7
Botswana	3,556	4,753	33.7
Congo, Dem. Rep.	16,969	28,789	69.7
Kenya	26,267	37,113	41.3
Lesotho	1,266	1,123	(11.3)
Madagascar	3,088	5,661	83.3
Malawi	1,871	7,264	288.2
Mauritius	2,629	4,604	75.1
Mozambique	3,664	6,183	68.8
Namibia	2,654	6,145	131.5
South Africa	90,986	184,459	102.7
Swaziland	3,345	6,828	104.1
Tanzania	26,023	13,282	(48.9)
Uganda	9,851	19,325	96.2
Zambia	10,987	22,010	100.3
Zimbabwe	11,640	9,357	(19.6)

Table A5: Estimates of physicians' and nurses' density (per 1,000 population), 2004

Country	Population	Physicians	Nurses
Angola	15.5	0.08	1.15
Botswana	1.8	0.40	2.65
Congo, Dem. Rep.	55.9	0.11	0.53
Kenya	33.5	0.14	1.14
Lesotho (2003)	1.8	0.05	0.62
Madagascar	18.1	0.29	0.32
Malawi	12.6	0.02	0.59
Mauritius	1.2	1.06	3.69
Mozambique	19.4	0.03	0.21
Namibia	2.0	0.30	3.06
South Africa	45.5	0.77	4.08
Swaziland	1.1	0.16	6.30
Tanzania	37.6	0.02	0.37
Uganda	27.8	0.08	0.61
Zambia	11.5	0.12	1.74
Zimbabwe	12.9	0.16	0.72

Source: WHO, 2006.

Table A6: Estimated annual migration of ESA-trained nurses to the UK from certain ESA countries, 1998-200

Country	1998 /99	1999 /2000	2000 /01	2001 /02	2002 /03	2003 /04	2004 /05
Botswana	4	-	87	100	39	90	91
Kenya	19	29	50	155	152	146	99
Malawi	1	15	45	75	57	64	52
Mauritius	6	15	41	62	59	95	102
South Africa	559	1460	1086	2114	1368	1689	933
Swaziland	-	-	-	-	21	43	73
Zambia	15	40	88	183	133	169	162
Zimbabwe	52	221	382	473	485	391	311
Annual totals	656	1,780	1,779	3,162	2,314	2,687	1,823

Adapted from: Bach, 2006.

Table A7: Professional, managerial and technical (PMT) skill mix of the health workforce, 2004

Country	PHY %	NUR %	HMAN %	DEN %	PHAR %	P&EH %	LABT %	OTH %	COMH %
Angola (1997)	6.1	93.8	-	0.01	0.2	-	-	-	-
Botswana	10.0	66.8	11.6	0.5	4.7	2.4	3.9	-	-
DRC	11.1	54.8	28.6	0.3	2.3	-	1.0	2.0	-
Kenya	6.7	55.4	2.7	2.0	4.6	9.7	10.5	8.4	-
Lesotho (2003)	5.8	73.3	1.2	1.0	4.0	3.6	9.5	1.5	-
Madagascar	27.8	30.3	32.3	2.2	0.9	0.7	0.9	2.8	2.1
Malawi	3.2	87.4	-	-	-	0.3	0.6	8.5	-
Mauritius	12.4	43.7	19.3	2.2	13.6	2.3	3.1	1.3	-
Mozambique	2.6	30.7	47.3	0.8	3.1	2.8	4.7	8.1	-
Namibia	3.7	37.8	47.9	0.7	1.8	1.5	3.0	3.7	-
South Africa	10.9	57.6	8.8	1.9	3.9	0.8	0.6	12.7	2.9
Swaziland	1.3	52.9	2.9	0.2	0.5	0.9	0.6	4.3	36.4
Tanzania	1.7	27.4	1.4	0.6	0.8	3.8	3.1	61.3	-
Uganda	6.2	54.5	18.3	1.0	1.9	2.9	4.8	10.2	-
Zambia	3.1	53.1	26.2	1.2	2.5	2.5	3.4	8.0	-
Zimbabwe	12.5	56.1	3.5	1.9	5.3	10.8	5.5	4.5	-

PHY = Physicians; NUR = Nurse and midwives; HMAN = Health management and support workers; DEN = Dentists; PHAR = Pharmacists; P&EH = Public and environmental health workers; LABT = Lab technicians; OTH = Other health workers; COMH = Community health workers

Source: Estimated from data in WHO, "Core Health Indicators", 2004.

Table A8-1: Point-to-point estimated emigration rates of all highly skilled persons by ESA countries, 1990-2000

Country	1990	2000
Angola	7.1	25.6
Botswana	1.7	2.1
DRC	8.3	7.9
Kenya	26.9	26.3
Lesotho	6.2	2.4
Madagascar	55.2	36.0
Malawi	7.5	9.4
Mauritius	37.2	48.0
Mozambique	18.2	42.0
Namibia	2.9	3.4
South Africa	7.2	5.4
Swaziland	3.6	5.8
Tanzania	14.8	15.8
Uganda	29.9	21.6
Zambia	12.2	10.0
Zimbabwe	5.1	7.6

Source: Docquier and Marfouk (2004),"Measuring the International Mobility of Skilled Workers, 1990-2000" World Bank Policy Research Paper N0. 3381

Table 8A-2: Point-to-point estimates of all highly skilled persons from Africa by region of emigration, 1990-2000

Region	1990	2000
Northern Africa	6.8	6.2
Central Africa	9.8	13.3
Western Africa	20.7	26.7
Eastern Africa	15.5	18.4
Southern Africa	6.9	5.3

Source: F. Docquier and A. Marfouk (2004),"Measuring the international Mobility of Skilled Workers, 1990-2000" World Bank Policy Research Paper N0. 3381 (Note: Some of the Docquier-Marfouk 2000 estimates vary slightly from those published in 2006 (see chapter 5, Table 5.3 in International Migration, Remittances and The Brain Drain, eds.), C. Ozden and M. Schiff, 2006, World Bank

Table A9: Selected North American based African diaspora knowledge networks and brief description

Networks/associational forms	Status	Network focus/ mission/ activity
Continent-wide ADKN (7)		
International Society of African Scientists (ISAS)	Active	Network building and network development; Science & technology for development
African Scientific Network	Active	Science & technology for development
The African Community International (The African Center)		Network building and network development
International African Students Association (IASA)	Active	Engagement with counterparts in Africa
African Distance Learning Network	Active	Education and training for development
Pathfinder Foundation for Education and Development	Active	Science & technology education; science & technology for development
African Educational Research Network (AERN)	Active	Production and dissemination of information on social and human development in Africa
Bethel Investment Partnerships (Faithbased, located in Ottawa)	Active	Capital market development in homeland
Country-Specific ADKN (22)		
Cameroon (1)	The Cameroon Society of Engineers	Active	S&T information exchange among network members and with homeland counterparts
Ethiopia (8)	Society of Ethiopians Established	Active	Network building and network development in the Diaspora
	Ethiopian Professionals Networks	Active	Professional advancement of members
	Ethiopian Professors	Active	Academic collaboration with homeland
	Ethiopian Distance Learning Association	Active	Education for development
	Ethiopian Chemical Society in North America (ECSNA)	Active	Knowledge exchange among of members; Science and technology for development

Ethiopia (8)	Ethiopian North America health Professionals Association (Toronto)	Active	Healthcare capability building; health sector capacity building
	Addis Ababa University Alumni Association International (AAUAAI)	Active	Institutional support for the AAU
	Association of Higher Education and Development (AHEAD, Ottawa)	Active	Higher education sector capacity building Health sector capacity building
Kenya (1)	Kenyan Community Abroad (KCA)	Active	Economic and political development
Nigeria (3)	Association of Nigerians Abroad (ANA)	Active	Social, economic, educational, technological and political development
	Nigerian Business Forum	Active	Trade, investment, and entrepreneurship
	Association of Nigerian Physicians in the Americas	Active	Knowledge and information exchange; collaborative research; policy advocacy
South Africa (2)	South African Network of Skills Abroad (SANSA)	Active	Promoting collaboration between S. African immigrant scientists, engineers, physicians, etc., and their homeland counterparts
	The South African Diaspora Network	Active	Entrepreneurial networking between South African firms and influential SA diaspora
Uganda (1)	Friends of Makerere University (FOMAC, Winnipeg, Toronto)	Active	Higher education and development
Sudan (1)	Sudan-American Foundation for Education, Inc.	Active	Educational sector philanthropy
Tunisia (1)	The Tunisian Scientific Society (TSS)	Active	S&T for development; promoting S&T government-academia-industry collaboration

Sources: Based on B. Meyer and J.P. Wattiaux (2006), "155 Diaspora Knowledge Networks identified in 2005", UNESCO and Author's Web Search, 2006

Equity in health *implies addressing differences in health status that are unnecessary, avoidable and unfair. In southern Africa, these typically relate to disparities across racial groups, rural/urban status, socio-economic status, gender, age and geographical region. EQUINET is primarily concerned with equity motivated interventions that seek to allocate resources preferentially to those with the worst health status (vertical equity). EQUINET seeks to understand and influence the redistribution of social and economic resources for equity oriented interventions, EQUINET also seeks to understand and inform the power and ability people (and social groups) have to make choices over health inputs and their capacity to use these choices towards health.*

EQUINET implements work in a number of areas identified as central to health equity in the region:

- Public health impacts of macroeconomic and trade policies
- Poverty, deprivation and health equity and household resources for health
- Health rights as a driving force for health equity
- Health financing and integration of deprivation into health resource allocation
- Public-private mix and subsidies in health systems
- Distribution and migration of health personnel
- Equity oriented health systems responses to HIV/AIDS and treatment access
- Governance and participation in health systems
- Monitoring health equity and supporting evidence led policy

EQUINET is governed by a steering committee involving institutions and individuals co-ordinating theme, country or process work in EQUINET: R Loewenson, R Pointer, F Machingura TARSC; M Chopra, M Tomlinson MRC South Africa, M Masaiganah, Peoples Health Movement, Tanzania; I Rusike, CWGH, Zimbabwe; G Woelk, University of Zimbabwe; TJ Ngulube, CHESSORE, Zambia; L Gilson, Centre for Health Policy, South Africa; M Kachima SATUCC, D McIntyre, Health Economics Unit, Cape Town, South Africa; G Mwaluko, Tanzania; Martha Kwataine MHEN Malawi; A Ntuli, Health Systems Trust; S Iipinge, University of Namibia; L London, UCT; N Mbombo, UWC Cape Town, South Africa; P Makombe SEATINI, Zimbabwe; I Makwiza, REACH Trust Malawi, S Mbuyita, Ifakara Tanzania

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