

Brain drain: the flight of human capital

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The international migration of highly skilled professionals first emerged as a major public health issue in the 1940s, when many European health professionals emigrated to the United Kingdom and the United States. By the mid-1960s, the losses were enough to cause concern. In 1979, WHO published a detailed 40-country study on the magnitude and flow of health professionals, whose findings suggested that close to 90% of all migrating physicians were moving to just five countries: Australia, Canada, the Federal Republic of Germany, the United Kingdom, and the United States (1). In recent years, the migration of health workers has become a prominent and controversial feature of health sector planning.

A moral challenge

There is growing recognition, in both developed and developing countries, of the dangers posed by indiscriminate recruitment of skilled health professionals. Despite the awareness of the risks, little effort has been made to solve the problem. Regardless of one's point of view in the debate, the fundamental issue is the same: should skilled migration be left completely to market forces or should some form of intervention be introduced? If so, what are the possible options?

Intuitively, the indiscriminate poaching of skilled health professionals is unlikely to be a neutral phenomenon. It is potentially damaging to the effective delivery of health services in the source country, where it constitutes a huge financial loss and could have a negative impact on the economy. Indeed, the likelihood that poor developing countries may be indirectly subsidizing the health-care systems of richer countries raises ethical and moral questions. Fortunately, however, some developed countries are beginning to acknowledge the potentially harmful effects of their recruitment practices. The United Kingdom is a case in point: in 2001 the Department of Health initiated the *Code of practice for NHS employers involved in the international recruitment of healthcare professionals*. In 2003 the Commonwealth adopted a non-binding code of practice to guide ethical recruitment from member countries.

Despite these positive developments, many countries remain largely indifferent. Some, like Germany, are currently developing aggressive immigration policies targeted specifically at "the best minds" among professionals from the developing countries (2). A manpower strategy that is based on indiscriminate poaching of skilled human resources is rather shortsighted, however, and can only be a temporary solution. Its long-term consequences for the health and overall well-being of the affected populations may extend well beyond health to other sectors of the economy. To escape hardship, many skilled and unskilled persons may be forced to emigrate, and their destinations will almost certainly be in the industrialized countries. Such develop-

ments can only exacerbate the problems of illegal migration into many western countries. Consequently, more draconian measures will be needed to stem future waves of desperate refugees. Hence, merely for purely selfish reasons, the developed countries cannot afford to be spectators in the unfolding drama.

Solutions

Is there an inexpensive way to discourage richer countries from poaching scientists from poorer ones? Unfortunately not — the issues involved are complex and almost all countries are affected to varying degrees. At one end of the spectrum are countries such as Cuba that produce an excess of health professionals; at the other end are those such as the United States that train too few. In between is a variety of sending and receiving countries, each with a pattern of migration that reflects its level of social, political and economic development. Consequently, focusing solely on the "pull" factors that attract migrants may obscure the importance of the "push" factors encouraging them to leave, thereby diverting attention away from some important policy options.

Finding a workable solution requires the cooperation of all countries. The aim should be to solve the legitimate manpower shortages of the developed countries without damaging the health systems of the developing countries. A three-pronged approach may offer a chance for such a solution: first, a series of measures to be undertaken by the developing countries on their own; second, a set of measures that the developed countries can unilaterally adopt; and third, the development of an international code of practice to regulate the ethics of international recruitment. The following is a brief outline of possible elements of these suggested strategies.

Suggested national strategies for developing countries

- Determine the political, economic, social and professional reasons behind the decision to emigrate.
- Restructure training programmes to reflect the knowledge, skills and attitudes that are most appropriate for national development. This should not translate into the production of substandard health professionals, but rather a bold attempt to respond to pressing national needs.
- Involve local and rural communities in the process of student selection and scholarship awards for entry into health institutions. People tend to have more sense of obligation and responsibility to their families and villages than to a faceless, nameless bureaucratic system in the capital city.
- Convert the resources used to support the importation of foreign health professionals into incentive packages to encourage rural practice.

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- Invest in improving the working conditions of health professionals.
- Vigorously pursue policies that give priority to the development of science and technology research.
- Enter into bilateral agreements with receiving countries in an attempt to control the flow and derive some compensation for the loss of professionals.

Suggested national strategies for developed countries

- Make a genuine commitment to train more health professionals. Canada and the United Kingdom have both decided to do this, and Australia has gone a step further by explicitly tying the increase in numbers of medical students to rural requirements, and providing financial incentives for rural practice.
- Develop and implement a national code of conduct for ethical recruitment. The guidelines for ethical international recruitment, published by the United Kingdom Department of Health, are a clear example.
- Take a unilateral, principled decision to limit recruitment from countries with very clear staffing shortages; do not advertise job openings in the journals of such countries.
- Issue non-extendable visas, specifically geared to the acquisition of skills for the benefit of the source country.
- Pay some compensation to source countries through bilateral arrangements. This could take a variety of forms including financial help, the expansion of infrastructure (buildings and equipment), the expansion of communication and information technologies, improved access to library information, the creation of research grants targeted specifically to developing countries, and the development of a system of exchange of health professionals designed to enhance the quality of the source institutions affected by departures.
- Implement policies that facilitate the re-entry of skilled professionals into the host country after a period of stay in their countries of origin.

Suggested internationally binding regulations

For the above measures to yield measurable results, strict international rules are required to govern the recruitment of health workers. Formulation and adoption of an international code requires the active participation and cooperation of all the major

players: major developed countries, major developing countries, international organizations such as the International Labour Organization and WHO, and representatives of the health professions. Experience with the *Code of practice for the international recruitment of health workers* adopted by the Commonwealth health ministers will provide a good starting point.

The main objectives of such a code will be to:

- link international migration to the health policy goals of individual countries;
- identify countries from which recruitment may be less harmful;
- regulate the international movement of health workers in a way that allows a sending country to produce the extra manpower needed to meet the demands of a receiving country, without injuring its own health system;
- safeguard the rights of recruits in the host country;
- set appropriate guidelines for bilateral agreements on compensation between source and receiving countries. There is little doubt that the international administration of such a compensation policy is likely to be quite complicated; it is nevertheless necessary if we are to uphold the principles of fairness.

An important consideration in this effort will be the need to improve the underlying data on migration. The work of Carrington & Detragiache (3) has amply illustrated the weaknesses of existing databases. Very little documentary evidence exists on the sending countries. We need to understand the scope, magnitude and direction of the migratory flows, within and outside the country, as well as the characteristics and skill of the migrants. Such data are necessary if a clear distinction is to be made between local production shortage, internal brain drain to other sectors of the same economy, and international brain drain. The development of a core of standardized data collection instruments will be an essential step in ensuring international comparability. ■

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Rebuilding the ship as we sail: knowledge management in antiretroviral treatment scale-up

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In a recent film about the Napoleonic wars, a frigate suffers heavy damage and loss of life after a withering canon barrage from a faster and more heavily armed privateer. Listing with a damaged hull and broken mast, the crew assumes they will return to port

to rebuild. In the captain's mind, however, his duty is clear and their options are singular: they must rebuild as they sail.

In meeting the challenge of providing equitable care to the 40 million people in the world living with human im-

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immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), the course of the disease makes the goal doubly demanding, as it has become increasingly clear that the future path of this pandemic will run through the poorest and most densely populated areas of the world — areas that are the least well equipped to respond. Africa is home to 10% of the world's population but accounts for almost two-thirds of global HIV infections, so the greatest burden will be borne by countries with already weakened and in some cases failed health systems. Without proper health systems in place, is an effective strategy for scaling-up antiretroviral treatment (ART) possible? There is only one answer to this question: we must rebuild health systems as we confront the epidemic.

From an information science perspective, this is a two-fold problem. First, we do not have the information base and infrastructure to manage treatment and prevention and measure their impact. Second, which is more important, we have no mechanisms to recognize effective practice and disseminate this knowledge on a continent-wide scale. Simply put, expansion of treatment delivery has never before been accomplished on such a scale in such limited resource settings, and we do not know how to do it.

The maxim “learning by doing” has been adopted by WHO to capture the essence of the challenge ahead. It is clear that traditional approaches to operational research, though still necessary and vital, are not sufficient to respond with the speed and urgency that the global crisis demands. Classic double-blind peer-reviewed trials are, in many cases, too expensive and time consuming and may or may not have relevance or exposure to caregivers in clinics and hospitals in the developing world. In addition, information systems that have been proposed for Africa are often driven and owned by donor governments and international organizations and offered without local control or ownership of the information. This could have the unintended effect of undermining already weakened health systems in the countries most severely in need of assistance.

A new approach is needed

The world health report 2004 focused on the global challenge of HIV/AIDS and called for the application of knowledge management principles and techniques that can accelerate expansion of ART delivery as one way of meeting the historic challenge of delivering care to millions of patients in the most resource-challenged settings (1). WHO believes that effective delivery of care reduces stigma and offers individuals hope and incentives for prevention as well. But how can this be accomplished in practice?

WHO is advocating a new and ambitious holistic knowledge strategy to the historic challenge of ART scale-up in Africa. Combining the structures and techniques of knowledge sharing and management with information technology appropriately adapted to existing infrastructure and information-gathering practices, a vision of a system integrated throughout Africa is emerging that will capture, test and disseminate effective practice and innovation in HIV/AIDS treatment. The knowledge within this system will be locally generated, owned and applied but also shared across boundaries, with multiple benefits.

- HIV treatment centres will have instant access to patient information within their clinic or hospital as well as immediate, preformatted reports of area treatment information, from catchment area to district level and countrywide analysis.

- District-level analysis and resource allocation will be based on real patient care needs and data directly impacting on every aspect of care, from making available diagnostic tools to preventing stocks of ARVs from running out.
- Country-level policy-making will be based on locally generated information, thus adding a broad and relevant evidence base as a supplement to information gathered from guidelines supplied by international organizations.
- International organizations and research institutes will be able to identify evidence-based patterns and trends that could form the basis for better constructed hypotheses to help ensure relevance and success of classic research studies and trials, making them more problem-solving in focus and more cost-efficient.

All these aims will be accomplished with two basic tools used in an integrated way. The first is quantitative, with an electronic medical records (EMR) system designed specifically for low bandwidth settings with core data fields essential to monitoring and evaluation across borders, but flexible enough to add data fields to test out information that is of local urgency and relevance. The second tool is qualitative, a collaborative web space serving local networks of people through which knowledge can be shared across clinical settings; as new observations on treatment are made, testing strategies will be formulated to evaluate quickly and efficiently the promise of the emerging practices.

Although the driving urgency is the HIV/AIDS epidemic and the challenge of scaling-up ART, this system will be applicable to all of primary care from the first level of treatment to the making and implementation of effective policies. The end result will not only accelerate the pace and effectiveness of the expansion of ART in Africa, but will also strengthen health systems from the clinic to the global research community.

Is this approach realistic in Africa?

Four major categories of criticism have been levelled at this approach: information and computer technologies and human resource infrastructure are weak; there are cultural obstacles; nothing similar has been accomplished in Africa; and international organizations are unable to coordinate with each other let alone with local governments and organizations. These points are dealt with below.

Technology and infrastructure. It is true that general statistics on Internet connectivity have not improved much in Africa, rising from 1% to 2% of the general population in the last five years. In terms of total numbers, however, it is a dramatic increase, with 1 in 160 Africans now using the Internet (2). Regarding the weak human resources infrastructure, it is also true that the situation is bleak, often with no doctor present in the treatment centre. Paper information systems do seem to be in place, however, and are followed appropriately. As long as the electronic system is based on what is already being done effectively at the local level by the caregiver, professional or not, it should be easily learnt and will have an impact on the efficiency of workflow and will improve treatment.

Culture. Africa has been described as an information “gate-keeping” culture, with few traditions of information sharing or collaboration across organizations or communities. However, Africa also possesses an equally strong indigenous tradition of

storytelling and knowledge sharing “under the palaver tree” (3). Capturing knowledge through informal networks, better to inform decision-making in more formal administrative structures, is at the heart of knowledge management. From this perspective, Africa may prove to be a more effective setting than others for this form of knowledge transfer.

Previous experience. An effective EMR system is in place in western Kenya and has already had a positive impact on health care in rural clinics (4). The argument that nothing like this has been accomplished in Africa and therefore cannot be expected to work is no longer valid.

Coordination. Given the ever shifting political landscape experienced by many organizations working in Africa, either foreign or indigenous, effective coordination is always a challenge. WHO’s special relationship with ministries of health, its convening power, and its reputation as an “honest broker” will be crucial in aligning the locally operating partners that are essential to this strategy’s success.

What e-Health can offer

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“In a world rich with resources and knowledge, closing the gap between unnecessary human suffering and the potential for good health is one of the foremost health challenges of our times.” This quote from the Rockefeller Foundation’s Equity Initiative captures the spirit behind the increasing attention paid to reducing the chasm between what is known and what we do in health, the so-called “know–do gap”. How do we go about bridging this gulf, and what can e-Health do to help?

E-Health is an all-encompassing term for the combined use in the health sector of electronic information and communication technology (ICT) for clinical, educational, research and administrative purposes, both at the local site and at a distance (1). It lies at the intersection of medical informatics, public health and business. Some definitions associate e-Health strictly with the Internet, focusing on the growing importance of this medium in health transactions. There are over 100 000 web sites worldwide, proffering health information of varying quality, that are used by both professionals and laypersons. In 2001, 86% of all adults in the United States with access to the Internet had consulted it for health-related information, and 55% of primary care physicians in Germany and 90% in the United States had made use of it (2).

ICT can also make significant contributions to public health, as demonstrated by the role of telemetry data in onchocerciasis control in West Africa and the use of the Internet in the control of the SARS outbreak. But what can e-Health offer in the specific context of the know–do gap?

ICT has become indispensable to health workers, as the volume and complexity of knowledge and information have outstripped the ability of health professionals to function op-

The proposed integrated information strategy is practical, scalable, locally relevant and realistically achievable. Within its framework, all members of the HIV/AIDS treatment community — from the nonprofessional clinical caregiver to district-level resource managers, health ministers and researchers in medical institutes — will do their part in rebuilding the ship as we sail. ■

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timally without the support of information management tools. In the area of health research, for example, the volume of new information is enough to stretch even ICT-assisted decision-making systems: on an average day, there are 55 new clinical trials taking place, 1260 articles indexed in MEDLINE, and 5000 papers published in the biomedical sciences. In 2002, the world produced five exabytes^a of new information, 90% of it on magnetic media, and the annual growth rate is 30% (3).

There is an urgent need for ICT tools that can aggregate information from multiple sources, to give an overall understanding of the healthy human or to provide a clearer picture at the systems level.

The know–do bridge

E-Health systems can improve access to information, thus increasing awareness of what is known in the health sciences, while selective dissemination by electronic means can facilitate targeting of information on those who either request it or are most likely to use it. The most effective way of building the know–do bridge, however, is to provide just-in-time, high quality, relevant information to health professionals and, increasingly, to laypersons.

At the level of individual practice, ICT systems can support the mind’s limited capacity to sift through large quantities of health facts and identify those items that bear directly on a given situation. Doing the right thing, in the right place, at the right time, the right way — as LEE Jong-Wook, Director-General of WHO, exhorted the staff when taking office — can be greatly facilitated through e-Health. All decision-making in

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^a 1 exabyte = 1 billion gigabytes, the equivalent of 37 000 new US Libraries of Congress.

health would be supported by an ICT-mediated system that builds on Weed's vision (4) and ensures that all relevant options known to the health sciences are available for consideration. Specific features of the situation at hand that help discriminate between these options would be taken into account; appropriate associations would be made between the specific features of the situation and the various options; and the right technology would be deployed and local capacity developed to permit access to the knowledge.

The late James Grant declared that 80% of the children who died in Africa during his term as Executive Director of UNICEF could have been saved because the knowledge to save them existed. This knowledge simply was not available when and where it was needed. E-Health can promote ICT-mediated options for all countries of the world, with a view to helping us know what we need to know, ensuring that we all know what others know, and making what we know contribute effectively to improving people's health. A number of WHO programmes are dedicated to achieving these aims; for example, the Health Internetwork Access to Research Initiative (HINARI) provides health professionals in over 1200 institutions in developing countries with free or affordable online access to 2400 of the top scientific journals in the health field.

HINARI and other programmes that support knowledge communities in countries through, for example, communities of practice and collaborative workspaces, are enhanced by ICT. Such ICT underpinning has given impetus to a new area of inquiry called "technology enhanced knowledge translation", which examines the role that ICT can play in the actions of individuals, as well as systemic factors that militate in favour of successful transformation of available information and knowledge into action. It also looks at what e-Health tools need to be devised for capturing and sharing experiential (or tacit) knowledge. E-Health networks can remove distance and time barriers to the flow of information and knowledge for health, and they can help to ensure that collective knowledge is brought to bear effectively on health problems in individual countries, as well as globally.

E-Health systems for all

There is a tendency to imagine that e-Health systems are a tool exclusively for the industrialized world. This is not true, as evidenced by the number of telehealth projects in developing countries (5). Average rates of penetration of mobile phones and the Internet in the developing world rival those achieved in the industrialized world five years earlier; as expected, the catch-up process is occurring much faster with newer technologies than with older ones. Investment in such systems by developing countries represents money well spent, both for immediate benefits and for future gains. It is important to focus attention on the use of available knowledge by underserved communities, such as developing country health systems. Monitoring progress in the assimilation of ICT among the disadvantaged will be important as causal pathways are charted between e-Health technology and health outcomes for both the rich and the poor.

Building capacity

Another area in which e-Health systems can help bridge the know–do gap is in building capacity in countries, in terms of

both individual expertise and institutional capability. Traditional educational methods are inadequate to meet the needs of the health sector in many countries, particularly in the developing world. At the same time, there is an increasing view among educators and medical practitioners that ICT in general and the Internet in particular have the potential to revolutionize the way medicine is learned by students and health-care professionals (6).

Internet-based medical education offers a partial solution to the "brain drain" of health workers from developing countries: because higher-level educational opportunities are not always available locally, training is often undertaken in other countries and trainees do not always return to their own countries. To alleviate this problem, *The world health report 2001* suggested that centres of excellence for training and education should be set up in developing countries (7). In the e-Health model, the Internet offers promise as an alternative provider of local training (8).

Tracking developments

Despite the significant potential of e-Health systems to improve health, the evidence of the impact of ICT on health is thin. An important task for WHO is to stimulate development of the evidence base worldwide, through a global observatory on e-Health systems. The observatory would also track developments in relevant fields by collecting and analysing data on ICT and health, covering developments in research, industry, policy and practice.

Multilingualism will be an increasing challenge of globalization and the information era. ICT can contribute to promoting knowledge for better health through the creation of specialized e-Health networks to support the development of language-specific knowledge communities, by: building communities of practice around a given language for improved sharing of health information and knowledge, as well as for facilitating the development of new knowledge by removing language barriers to understanding; improving access to the wealth of health-relevant information available in a language and building on the concept of a virtual health library, and promoting the growth of health-relevant transactions in different languages on the Internet.

Developments in ICT have ushered in an era of profound opportunity and potential for worldwide advancement in health and health care, and e-Health systems today constitute a third major pillar on which the health sector is built.^b E-Health systems are an indispensable aspect of the health system of the future. Without appropriate ICT tools, the world has little hope of bridging the know–do gap in health. E-Health systems are a way of keeping pace with the exponential growth of health-relevant information, and applying more of what we know, individually and collectively, to resolving the health problems of the world. ■

Conflicts of interest: none declared.

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Why is research from developing countries underrepresented in international health literature, and what can be done about it?

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Although the highest burden of disease is concentrated in low- and middle-income countries (LMICs), data from the Institute for Scientific Information show large gaps in scientific production between industrialized and developing settings (1). In the fields of medicine and public health, the overwhelming majority of publications originate in the United States and Western Europe. Scientific papers where researchers from developing countries are the sole authors represent a very low proportion of published manuscripts.

Over the past few years, several articles have analysed various aspects related to the underrepresentation in international journals of public health problems and research conducted in LMICs (2–5). Complex and interrelated contributing factors have been identified; five are elaborated below.

Poor research production. Scientific production is poor in developing settings, both in terms of quantity and quality, because of a critical lack of continuous support for research and development activities including basic infrastructure from both local governments and international agencies, and lack of incentives for research activities. Furthermore, professional researchers are undervalued and their salaries are low, a situation that reflects the lack of status accorded to scientific production and contributes to a scarcity of full-time researchers ad hoc.

Poor preparation of manuscripts. Even manuscripts exhibiting high-quality research may not meet the requirements of peer-reviewed international public health journals in terms of language and scientific presentation. Although some journals' policies include assistance for writing and language editing, this support does not meet the needs. Language proficiency remains a fundamental barrier for scientists whose mother tongue is not English. Poor presentation may also result from a lack of the skills required to develop coherent arguments. Indeed, unlike developed countries where writing skills are an essential component of higher education, writing abilities in LMICs are

usually acquired informally on an ad hoc basis, at a later stage in a professional career.

Poor access to scientific literature. Authors from developing countries are often not adequately prepared to participate in the international scientific debate, as they have limited access to the published literature. Out-dated and insufficient or underresourced library stocks, high journal subscription fees and poor Internet access and computer availability represent serious limitations.

Poor participation in publication-related decision-making processes. Developing country experts are seriously underrepresented on editorial boards and review rosters of international journals. Editorial boards of journals devoted to diseases that mostly occur in developing country settings (e.g. tropical medicine) where local experts are not proportionately represented are an example of this situation. As a result, submissions from poor countries are usually evaluated by experts who may not be knowledgeable about the constraints associated with conducting research in these settings and, therefore, do not have a positive attitude to provide the guidance that may make the work publishable.

Bias of journals. Editors, editorial boards and reviewers of international medical journals may be insufficiently interested in the areas to which most researchers from developing countries devote their work, and may consider them unoriginal or irrelevant for their readership. The existence of a bias against the so-called “diseases of poverty” has also been suggested (6). This lack of interest may also reflect the preferences of the readership or the advertisers. In addition, researchers from poor settings have a limited capacity to buy reprints, which constitute a substantial source of income for scientific journals. Finally, international journals are usually more willing to consider papers that originate from prestigious research centres in developed countries than those from lesser-known academic entities, particularly when the authors are exclusively researchers from developing countries.

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Important steps to deal with some of the causes of this unequal representation have been implemented or suggested.

- WHO's initiative to expand developing countries' access to primary biomedical information constitutes a key effort to engage wider audiences that are currently unable to afford paid subscriptions to journals. For example, the Reproductive Health Library has been implemented as a source of up-to-date evidence for reproductive health care in developing countries.
- Collaboration between researchers from industrialized and developing countries has been proposed as a way to improve the quality of manuscripts and increase the likelihood of publication. The balance of power in such a relationship is an issue in this process.
- Increasingly active regional representation on editorial boards and the assignment of special reviewers to papers submitted from developing settings could also improve acceptance rates.
- Expanding access to the scientific literature through free electronic journals and workshops, and translation of abstracts or full articles into languages spoken in developing regions would contribute to easing the scientific isolation in which researchers from poor countries often work.
- Special issues of international journals and calls for papers with a regional focus would also help encourage submissions from developing countries.

All these interventions make intuitive sense and can be implemented. However, in order to suggest potentially effective strategies to increase the representation of health research conducted in settings with limited resources, a comprehensive and detailed knowledge of the current situation is required. Empirical data should come from rigorous surveys with large, representative

samples from both sides of the equation — researchers from developing countries and staff of international journals, including editors-in-chief and other key players such as assistants, reviewers and editorial staff who are instrumental in making preliminary decisions about whether or not papers can continue through the review process and eventually be published.

To be consistent with essential principles of health research, ongoing and new interventions should be carefully evaluated in terms of their feasibility, acceptability, sustainability and cost-effectiveness. All of these initiatives will require resources and long-term commitment from journals and international donors collaborating in health research capacity building. The investment will certainly pay off. As we enhance our understanding of the reasons behind the lack of visibility of poor countries in the international literature, we will develop the tools to disrupt the negative feedback cycle in which poor production of new scientific knowledge both results from and contributes to limited support for research and innovation in settings that need them most. ■

Conflicts of interest: none declared.

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