

## The role of Europe and of international science and technology cooperation

### Specific needs for health research in low- and middle-income countries

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The challenges to health, equity and to social and economic development in low- and middle-income countries are manifold. Those for which research, science, technology and innovation can produce solutions are equally manifold. Yet, judging from the availability of international funds for health-related research for, in and with developing countries, it seems that international cooperation with low- and middle-income countries on health research, science and technology is of relevance only to a very limited set of conditions. The list is essentially limited to three: HIV/AIDS, tuberculosis and, more recently, malaria. And most of this research is done *for*, sometimes *with*, but rarely *by* researchers and research institutions in the countries in question. (IJsselmuiden and Kennedy, 2007). These three conditions are, of course, important – both to high-income and to low- and middle-income countries (LMICs) – but not to the exclusion of research and innovation for all the other conditions from which most people in LMICs suffer and die. There is, in fact, not a single LMIC where these three conditions jointly are responsible for the majority of morbidity and mortality. The relevance of this statement is that, on the one hand, many other research investments and efforts are needed in order to comprehensively address the health and equity challenges facing LMICs and that, on the other hand, the potential for research done in LMICs to be directly beneficial to the health or economic well-being of the sponsoring country is much greater than is generally assumed – given that we all face many similar problems but bring our own unique potential and creativity to the ‘research table’.

In his eye-opening publication “*The Fortune at the Bottom of the Pyramid*”, C.K. Prahalad investigated the potential of commercial activity for eradicating extreme poverty and demonstrated that it is quite possible to make profits and contribute substantially to poverty eradication at the same time. (Prahalad, 2005). Perhaps even more important, those at the bottom of the pyramid – individually and collectively – gain self-esteem and confidence, both essential for long-term societal development. Prahalad provided in-depth analysis of many such ventures, many of which are essentially dependent on high-quality research and development (e.g. iodising salt for human consumption in India). Several of them were developed in and by specialists in low- and middle-income countries for use there but have become so successful that they have been exported to high-income countries (for example, the Aravind Eye Care System<sup>1</sup> and the Voxiva surveillance system which pioneered the use of mobile telephony for surveillance of communicable conditions and has now developed many other applications for governments and industry in high-income countries<sup>2</sup>).

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<sup>1</sup> Aravind Eye Care System: <http://www.aravind.org>.

<sup>2</sup> Voxiva: [www.voxiva.com](http://www.voxiva.com).

## **Asking the right questions**

When asking “what are the global challenges [*in health and quality of life*] and what role is there for Europe in international science and technology cooperation [*to address these challenges*]?”, the focus is almost automatically on “problems” not on “systems”. It is not surprising, therefore, that the Bill & Melinda Gates Foundation which pioneered international science cooperation to address “grand challenges in global health” is focusing entirely on products to deal with “conditions” or “diseases”<sup>3</sup> not on “research or science or innovation systems” in which low- and middle-income countries can become active players in identifying problems requiring scientific solutions and can become initiators of research or of research collaboration to find these solutions, let alone systems which will generate solutions that may turn out to be of benefit to long-term social and economic development and to the sponsoring high-income countries.

If the question is rephrased to “how can international science and technology collaboration be structured so that it advances health, equity and socio-economic development globally?”, then the potential offered by the billions of people who do not yet contribute to global creativity and innovation comes far more sharply into focus. The mechanisms which can bring their creativity to global level comprise, in the first instance, helping to create national research, science and innovation systems that facilitate use of science and technology to address local (health) priorities and – in the process – enable researchers, research institutions and entire low- or middle-income countries to become contributors to global knowledge, health, wealth and fair distribution of all these. The first question – “what are the challenges and how can we help?” – limits Europe to its own capacity. The second – “how can science and technology collaboration improve global health/wealth?” – opens the door to the creativity of those currently living in or surrounded by conditions of ill health, poverty and under-development.

The subtitle of this paper “specific needs for health research in low- and middle-income countries” turns the question into one of aid and obliterates the view of “them” as potential contributors, originators and creators in spite of growing evidence that low- and middle-income countries, having attracted substantial investment in research capacity via commercial or scientific routes for many years, are now turning the table and are becoming leaders in areas where high-income countries have been uncontested until now. Brazil, China, South Korea, India, South Africa and other countries have shown that innovation can come from sustained and substantive research investment in LMICs. In the general commercial and industrial environment, the recent purchases by developing countries in the European motor manufacturing or heavy metal industries are well-known examples. In the health domain, there have been equally important developments in the pharmaceuticals industry, biotechnology and possible genetic manipulation. A group of middle-income countries sometimes labelled as “innovative developing countries” (IDCs) are investing heavily from their own resources in health-related research not only to solve their own health problems but also because investment in science and technology in the health sector can in itself be a source of socio-economic progress as it may lead to evidence-based decision-making, transparency and accountability, health equity and economic advancement. (Morel et al. 2005). This group of “innovative developing countries” includes South Africa, Brazil, India, China, Malaysia, Thailand, Mexico and others, but is now also attracting countries typically seen as low-income countries, including Nigeria and Uganda. The IDCs are rapidly overtaking high-

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<sup>3</sup> *Grand Challenges in Global Health*: <http://www.gcgh.org/Explorations/Pages/TopicsOverview.aspx>.

income countries in terms of publications and patents in science and technology in particular, but probably also in the field of health.

**From “health research” to “research for health” – from “vertical programming” to “responsible vertical programming”**

If long-term sustainable [economic] development is the priority of low- and middle-income countries, dealing with high-impact diseases affecting these countries is the concern of research sponsors and collaborators in high-income countries interested in the “problems” of these countries. Clearly, there is a great need for disease-specific research to find new treatments that could eliminate particular conditions, reduce their occurrence or mitigate their consequences or impact. Based on the successes of smallpox eradication and (apparent) control of vaccine-preventable conditions such as poliomyelitis, it is easily forgotten that reduction and elimination of serious communicable conditions in Europe, such as tuberculosis, was a consequence of gradually increasing wealth – specifically in terms of nutrition and housing – rather than of discovery of new drugs or technologies. This, in turn, was based on a culture of, and substantial investment in, science, technology and innovation. Although with the available treatments low- and middle-income countries can now “leapfrog” some problems, the basis for sustainable health improvement remains the same as in high-income countries – by building sustained national systems for research, science and technology and innovation.

As a consequence, the terminology is changing. Whereas “medical” and “health” research starts with medical or health problems as the basis for description and analysis, “research for health” starts with the intended outcome. If “health” rather than understanding or product development is the core focus of the research, the enterprise is likely to become more multi-sectoral, integrative and aware of the need to measure the impact. **“Research for health”** is changing the direction of research as a societal effort towards specific societal values, namely health and health equity. The change is meaningful in the context of international science and technology cooperation with low- and middle-income countries, as it promotes finding common ground for collaboration, i.e. achievement of health. “Health research” focusing on specific health problems can lead to perceptions that “health research” in LMICs is substantially different from that in high-income countries given differences in the causes of morbidity and mortality. Even though this distinction is rapidly becoming unusable given the economic progress and consequent changing health patterns in many low- and middle-income countries, it continues to fuel the perception that research in high-income countries deals with different topics and cooperation with low- and middle-income countries may, therefore, not be relevant. A shift towards “research for health”, however, will help to direct research, no matter where it is done, towards achieving health and finding the common ground needed to understand why cooperation between high- and low-/middle-income countries may be beneficial to both sides.

The way research is commissioned in Europe and North America leads, by and large, to the establishment of “topic-specific” research programmes. Using research excellence, as judged by publications and patents, as the key criterion, the bulk of international health research sponsors use competitive distribution methods to fund highly specific and narrowly targeted research projects. Often, there is no link with implementation, let alone with mechanisms to ensure that research is turned into innovation – into substantive changes in the way health care is being delivered or in health and health behaviour.

“Vertical programming” is the term used to describe this way of operationalising funding in health research in particular and in science and technology in general. Clearly, this way of funding research has had a great positive impact on health and well-being in Europe and North America and is continuing to deliver results. Nevertheless, vertical programming based on past research excellence not only makes it very difficult for low- and middle-income countries to enter this domain, but also delays harnessing their creative potential to the benefit of us all. Research and research sponsorship can also take forms that not only result in a product, treatment or understanding but also – at the same time – build up the capacity of low- and middle-income countries to use research, science and technology to become innovators. Vertical programming becomes “**responsible vertical programming**” (RVP) if the outcomes of research projects, programmes and investment leave a stronger national health research system *as well as* a product. This is the key to unlocking the global capacity for research and innovation, but it needs to be better understood.

### **International science and technology cooperation**

European support, whether by the Community or by individual Member States, can serve many purposes. In simplistic terms, investment in international science and technology cooperation with low- and middle-income countries can be justified on three grounds – seemingly separate but with boundaries sufficiently blurred to make any distinction somewhat artificial.

#### ***International collaborative health research: a matter of self-interest***

Firstly, if knowledge generation is the key intended outcome, then, from the point of view of the country or community sponsoring the research, there are many reasons for investing in international collaborative health research: (i) research opportunities are not available in high-income countries, for example for ethical reasons; (ii) research can be conducted better or quicker or cheaper in low- and middle-income countries; (iii) multi-centre studies or trials are needed in order to draw conclusions; for example, development of new drugs increasingly requires multi-centre trials as the margins of improvement in treatment have become ever smaller and even zero in “equivalence” trials; and (iv) because some conditions simply occur more frequently in low- and middle-income countries. For the first three reasons, the “self-interest” of the country or community sponsoring the research is perhaps the main reason why there is investment in such research. For example, the National Institutes of Health (NIH) is the world’s largest agency for sponsoring and conducting research, with an annual budget of over \$28 billion.<sup>4</sup> As a branch of the US Department of Health and Human Services, it focuses primarily on research to protect and improve the health of US citizens.<sup>5</sup> In spite of this, individual institutes and the Fogarty International Center are investing in research in low- and middle-income countries on the basis of its relevance to the USA. Even though it is extremely complex to know what proportion of total NIH expenditure is spent outside the USA,<sup>6</sup> let alone in developing countries specifically, it has been estimated that 1% to 1.5% of NIH research expenditure could be in the area of “global health”. Viewed from another angle, this makes the NIH the single biggest non-commercial investor in health research in low- and middle-income countries outside the Bill & Melinda Gates Foundation.

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<sup>4</sup> NIH appropriations: <http://www.nih.gov/about/almanac/appropriations/index.htm>.

<sup>5</sup> Mission of the National Institutes of Health: <http://www.nih.gov/about/#mission>.

<sup>6</sup> [http://www.fic.nih.gov/programs/international/forum/2006/summary\\_nov2006.pdf](http://www.fic.nih.gov/programs/international/forum/2006/summary_nov2006.pdf).

***International collaborative health research: a question of human rights, solidarity and development***

“The American public wants to address global health disparities and believes that health research should be top priority for international spending”.<sup>7</sup> There is no comprehensive information on collective bilateral or European Community spending on health research in low- and middle-income countries. With few exceptions, “health research” is not on the agenda of most European countries’ development agencies and there is a dearth of civil society organisations/non-governmental organisations in this domain unlike in other areas of health action. By contrast, research involving low- and middle-income countries is largely funded by grants to universities and research institutes in high-income countries and is dependent on science and technology budgets rather than on aid or development budgets.

Yet “research”, “science and technology” or “innovation” are crucial determinants of social and economic development and of health protection and improvement. Moreover, both are critically interlinked. Therefore, support for research to deal with global health problems is a key issue in global solidarity to reduce health inequities in and between countries. The lead given by the United States – public and foundation funding – needs to be matched by Europe and its institutions for the same reasons, i.e. the injustice of global health disparities in the face of our collective ability to address many of the underlying causes by means of action and research.

However, North America’s generosity in funding research to address global health disparities has one serious limitation – it is, by and large, focused on finding “technical solutions” to “global priorities” and not on enabling low- and middle-income countries to identify and begin addressing their own health problems and health systems nor on assisting countries to strengthen their science and technology sectors in the process.

**“Responsible vertical programming”** may be one key component that needs to be added to international collaborative health research to optimise the benefits of such research for development in general.

Similarly, including research as a core component of the agendas of international development agencies is crucial to harnessing the creative potential of low- and middle-income countries – if for no other reason than to offer additional funding to that provided by science and technology budgets. While institutions awarding research grants may have severely limited mandates – such as funding on a competitive basis and on the basis of global excellence only – such funding could become more comprehensive and “system-building” if it were matched by relevant system development grants from aid or development agencies which have funding mandates that may include “capacity-building”, training for research managers, establishing facilities or even improving financial control mechanisms. The “principle of complementarity” between research-sponsoring institutions and development agencies should be a major goal for all parties interested in optimising the potential of research for knowledge, health and health equity globally. As health-related research is often the only or the main investment in the science and technology environment in the lowest-income countries, simple “vertical programming” signifies a major opportunity lost!

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<sup>7</sup> *International Health Activities Report. Global Health Matters 2007*; 5: 1-4:  
<http://www.fc.nih.gov/news/publications/newsletters/ghmfeb2007.pdf>.

***International collaborative health research: a way of making friends***

Health as a foreign policy tool, as a means to protect national security, to achieve trade objectives and to promote economic advancement of both high- and low-/middle-income countries, has been receiving explicit attention from politicians, scholars and educational institutions recently. (Ministers of Foreign Affairs, 2007; Kickbush et al., 2007). “Bioterrorism” and “avian flu” were the two major topics which brought health diplomacy to the fore, but the impact of this new development in health cooperation is likely to grow once the anticipated consequences of environmental changes on health become more visible. Although up until now “health research” has not been prominent in the health diplomacy debate, it is highly likely to become an area of interest. One only has to consider “avian flu” and other “emerging or re-emerging” communicable diseases to know that one crucial component of control of global epidemics of any kind is to strengthen epidemiological surveillance, laboratory capabilities, outbreak investigation and follow-up research in the countries where the underlying epidemic originates. Strengthening national research systems in LMICs is therefore a key to the national [health] security of high-income countries. However, national security is not only concerned with communicable conditions. For example, economic immigration is perceived as a key problem by many European countries. By reducing ill health in low- and middle-income countries and by contributing to economic activity by investing in science and technology [for health], problems related to economic migration may be addressed at the same time.

Beyond the immediate utility of health research to protect the health of high-income countries, supporting health research as a means to improve health is likely to lead to long-lasting relationships between individuals, institutions and countries that can weather dips in diplomatic relations. Investment in health research capability in low- and middle-income countries is an excellent way of supporting development and building long-term relations and will become a more explicit part of “health diplomacy” in future.

**A specific role for the European Union in health-related science and technology cooperation in low- and middle-income countries**

Investment by the European Union in health research involving collaboration with low- and middle-income countries is essential for the EU’s own security, growth and science and technology prospects but also, and perhaps primarily so, from the perspective of achieving global health equity. This applies as much to the EU Member States as to collective European action. What then are the comparative advantages that funding by the European Union could have over bilateral or philanthropic funding?

Starting from the fact that research investments involving low- and middle-income countries need to be seen in context and, in particular, that the capabilities of these countries to conduct, commission, partner or use research to improve and protect the health of their citizens need to be increased in order to optimise the benefits of research for all stakeholders, including the European Union, the following list could constitute core characteristics of European funding:

- 1) ***Scale of funding*** – in terms of both ***magnitude and duration***. Research investment is, almost by definition, investment for the long term. Yet most agencies sponsoring research are tied by short-term political or institutional objectives. The European Union is in prime position to ensure long-term programming. Similarly, given that the EU is the sum of its parts, it should facilitate building large joint research programmes rather than provide

small-scale funding under “calls for proposals”. In the context of international health research, consideration should be given to *establishing an equivalent to the NIH’s Fogarty International Center (NIH/FIC) to provide substance and give a voice to the need for long-term thinking in collaborative health research with low- and middle-income countries*. Currently, there is no such facility anywhere within the EU’s sphere of influence and the EU’s ability to respond to “global health challenges” with research collaboration is severely limited as a result.

- 2) The EU can *invest in research ventures that are too risky for commercial development*, and in the health sector there are many of them: from developing vaccines, drugs, diagnostics and technologies for both common and neglected conditions to creating the multi-disciplinary research excellence needed to deal with the social determinants of health – all require more support than is available from normal sources. (Commission on Social Determinants of Health, 2007). Health systems research, “implementation science”<sup>8</sup>, equity-focused research and environmentally related health research are all beyond the interests of usual commercial research because of the uncertain outcomes. Yet each of these could develop into important tools, technologies and approaches that could benefit Europeans too. *Investing in areas of research that receive no funding at present* would be another way of saying this. Focusing on research needed to prevent premature morbidity and mortality from any condition in low- and middle-income countries, not just from the three major infectious conditions, could not only yield direct benefits for those in developing countries but also lead to better health technologies for Europe. Such areas include rehabilitation, disability, mental health, environmentally induced health problems or health system optimization.
- 3) *Invest in research or science and technology or innovation system growth*. Good health research systems in low- and middle-income countries will make international cooperation on science and technology for health easier, quicker and better. If countries have in place appropriate legislation, priorities, regulatory mechanisms, ethical review committees and long-term plans for human resources and facilities development, collaboration in research could be far more productive than it often is at present. Therefore, one big challenge for EU investment in science and technology in collaboration with low- and middle-income countries is to *fund system development as part of collaborative research and fund research into understanding how best to support such system-strengthening and how actually to implement “responsible vertical programming” or how to implement the 2005 Paris Agenda on Aid Effectiveness* (OECD, 2005) – how to align with national priorities for health research and how to harmonise the aid given by the Member States.
- 4) *Invest in ways allowing Europe to set and occupy the moral high ground* – provide science and technology funding with a “difference”. This is not merely based on human rights or social justice values but can also be part of the global health diplomacy that the EU should be developing. Perhaps the first and foremost part of “funding research with a difference” is to find ways to ensure that low- and middle-income countries remain in control of the research developments in their own country. Other aspects include promoting the principle of complementarity between the many funding stakeholders in health research; providing preferential grants to programmes that conscientiously work on understanding “capacity-building” better and acting on their findings; and applying a

<sup>8</sup> Implementation Science. Global Health Matters 2007; 5: 8.  
<http://www.fic.nih.gov/news/publications/newsletters/ghmfeb2007.pdf>.

“human rights” and “equity” lens to the way international research is funded. Research into “technology transfer” mechanisms could also make a meaningful contribution to helping to understand how science and technology cooperation can promote research creativity globally.

- 5) ***Support vibrant organised civil society/non-governmental involvement***, both locally (in European countries and in low- and middle-income countries) and internationally to provide technical support, engage in advocacy, support good governance and transparency and take on tasks not readily accepted by governmental or private-sector institutions. There are, in fact, excellent cases of substantive research for health being conducted by NGOs in low-income countries<sup>9</sup> that can set examples for high-income countries and other relevant partners for collaboration on health research. In addition, supporting establishment of networks of excellence between researchers in the “north” and “south” will be another meaningful contribution to global exchanges and collaboration on science and technology.
- 6) ***Invest in research needed to obtain and maintain a good understanding of international spending on research for health, provide analyses and set the directions for the future.*** There is currently very little evidence available and few, if any, sources of financial support to start such efforts. One such effort is the ***Health Research Web***,<sup>10</sup> which has started to organise and understand international research cooperation on health from the perspective of the “host country”. Once fully developed, such facilities will also make it much easier for European researchers to find appropriate colleagues and institutions in low- and middle-income countries and to track progress towards health goals.

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<sup>9</sup> For example, Centre for Science and Environment in India: <http://www.cseindia.org/>.

<sup>10</sup> <http://www.cohred.org/HealthResearchWeb/>.



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