Linking Knowledge and Action in Global Health – Current Concepts, Approaches, and Institutions

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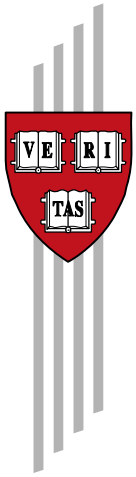
CID Graduate Student and Postdoctoral Fellow
Working Paper No. 12, August 2006



Working Papers

Center for International Development
at Harvard University

Linking Knowledge and Action in Global Health –

Current Concepts, Approaches, and Institutions

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Szlezák, Nicole. "Linking Knowledge and Action in Global Health - Current Concepts, Approaches, and Institutions." CID Graduate Student and Postdoctoral Fellow Working Paper No. 12. Center for International Development at Harvard University, August 2006.

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Nicole Szlezák

Abstract

There is a new interest in the role that research and knowledge play in improving health in developing countries. In particular, the question of how knowledge can be better linked to policy and action has been receiving increasing attention. This paper surveys approaches to linking knowledge and action as they appear in the global health literature and attempts to draw them together in a more systematic way. Two concepts are prominent – the *know-do gap in health* and the *10/90 gap in health research*, both intended to draw attention to global inequities in health and health research. Beyond these two basic metaphors, numerous other approaches to and debates about linking knowledge and action can be found in the literature. Underlying these different streams and debates are two competing notions of what constitutes "knowledge". The first one assumes that knowledge is largely independent of context and easily transferable. The second one conceptualizes knowledge as something that is place-bound and subject to negotiation, requiring the engagement of different stakeholders in its production and use. The paper concludes with the notion that the way in which we conceptualize the relationship between knowledge and action has important implications for current debates about governance in global health, but that the connections between these two discourses are rarely made. Considerations of knowledge-action linkages in global health must be made together with considerations of governance, and vice versa.

Keywords: health research, global health, knowledge, governance, know-do gap in health, 10/90 gap in health research

JEL codes: I1, I10, I18

Citation, Context, and Program Acknowledgements

This paper may be cited as:

> Szlezák, Nicole. "Linking Knowledge and Action in Global Health – Current Concepts, Approaches, and Institutions." CID Graduate Student and Postdoctoral Fellow Working Paper No. 12. Center for International Development at Harvard University, August 2006.

It is available at http://www.cid.harvard.edu/cidwp/grad/012.htm. Comments are welcome and may be directed to the author, Nicole Szlezák, at nicole_szlezak@ksg.harvard.edu or at the Center for International Development, John F. Kennedy School of Government, Harvard University, 79 JFK Street, Cambridge, MA 02138, USA.

This article is based on research supported by:
the Sustainability Science Program at Harvard's Center for International Development, see http://www.cid.harvard.edu/sustsci ; the U.S. National Oceanic and Atmospheric Administration's Climate Program Office (formerly the Office of Global Programs) through the Environment, Science and Development Program for the "Knowledge Systems for Sustainable Development Project," see http://www.ksg.harvard.edu/kssd ; Harvard's Kennedy School of Government Dean's Acting in Time Initiative project, "Institutional Innovations for Linking Knowledge with Action in Global Health," see http://www.ksg.harvard.edu/sed/health ; the Weatherhead Center for International Affairs for support of the workshop "International Knowledge Systems for Sustainable Development," see http://www.wcfia.harvard.edu/conferences/sustaindev/home.asp ; and the National Academy of Sciences' Roundtable on Science and Technology for Sustainabilty for support of the workshop "Enhancing the Effectiveness of Sustainability Partnerships" see http://www7.nationalacademies.org/sustainabilityroundtable/Public_Private_Workshop_Main.html.

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Table of Contents

ABSTRACT **2**
ABBREVIATIONS **5**
1. INTRODUCTION **6**
2. CHANGING PARADIGMS **8**
Health and Health Research in International Development *8*
The 'Health Research for Development Community' *9*
3. CONCEPTS OF KNOWLEDGE AND ACTION **11**
Knowledge about Health *11*
Knowledge and Action: The "10/90 Gap" and the "Know-Do Gap" *12*
4. APPROACHES, DEBATES, INSTITUTIONS **12**
Creating New Knowledge, Applying Existing Knowledge *12*
Horizontal and Vertical Approaches to Linking Knowledge and Action *14*
Measuring and Monitoring 'the Gaps' *15*
Principles for Linking Research and Policy *16*
Capacity Building in Developing Countries *17*
Institution Building *18*
6. SYNTHESIS AND CONCLUSION **22**

Abbreviations

ACHP	African Comprehensive HIV/AIDS Partnership
AHPSR	Alliance on Health Policy and Systems Research
Cohred	Council on Health Research for Development
DNDI	Drugs for Neglected Diseases Initiative
ENHR	Essential National Health Research
GFATM	The Global Fund to Fight Aids, Tuberculosis and Malaria
GFHR	Global Forum for Health Research
GPELF	Global Program for the Eradication of Lymphatic Filariasis
HINARI	WHO's Health InterNetwork Access to Research Initiative
HRSA	WHO's Health Research Systems Analysis
IAVI	International Aids Vaccine Initiative
INASP	International Network for the Availability of Scientific Publications
LDC	Less Developed Countries
MMV	Medicines for Malaria Venture
PPP	Public Private Partnership
WHO	World Health Organization
WHO/TDR	WHO's Department on Tropical Diseases Research

1. Introduction

There is growing frustration in policy circles about the apparent inability of the international community to bring knowledge about health to bear on diseases affecting developing countries (*1-7*). As a consequence, "knowledge" and "research" have been receiving increasing attention in global health circles (*8-10*). These discussions about linking knowledge and action are part of an emerging field of policy and study focusing on the generation, use and application of knowledge in global public health that is still in its infancy. As in every new field, numerous concepts and dialogues coexist, often overlapping or talking past each other. Numerous approaches exist based on different concepts of knowledge, action and the relationship between them.

This paper is an attempt to survey the different concepts of knowledge and policy/action as they have recently appeared in the global health literature. The paper is based on three main research efforts – a literature review[1], a yearlong research seminar, and an interdisciplinary workshop[2]. Produced for the purpose of comparison with global science and technology policy in other sectors (such as agriculture and environment), the paper's main aim is to give a broad overview as a starting point for further analysis. For this reason, concessions had to be made in favor of depth over breadth.

Section 2 of the paper places the topic of this paper in its broader context. A recent paradigm change in the way health and health research figure on the development agenda has generated new interest in the role of knowledge and research in global health. This is reflected not only in a growing literature, but also in dramatic changes in the institutional landscape[3]. A large number of new organizations have been recently set up to improve health in developing countries, with a subset of them explicitly devoted to increasing the role of knowledge and research in this endeavor.

In Section 3, the paper goes on to look at concepts of knowledge and action in the global health literature. The section first discusses concepts of *knowledge* and *health*. It then turns to ways in which *knowledge and action* are conceptualized. Two concepts dominate, both framed in terms of 'gaps'. The *10/90 gap in health research* is a concept that was formulated to draw attention to the lack of research and development in many

[1] The literature review is mainly based on Harvard's library catalogue (Hollis) and electronic databases such as Medline, PubMed and the Social Science Citation Index. I also hand searched relevant journals, reference lists from pertinent publications and the internet pages of major international institutions and initiatives, conferences and meetings in the field.

[2] A yearlong research seminar on "Knowledge for Development" ran through Harvard's Center for International Development. The workshop on "International Knowledge Systems for International Development" was held at the Weatherhead Center for International Affairs at Harvard in April 2004. Both the research seminar and the conference took a comparative approach to research systems in different sectors of science and technology policy. They brought together a wide range of scholars representing a variety of sectors (e.g., agriculture, engineering, health), types of organizations (e.g. national academy of sciences, universities, think tanks) and countries from the developing as well as industrialized countries.

[3] Increasingly, a distinction is being made between the term "international health", referring to the UN agencies, and the term "global health", which includes the many new organizations and initiatives set up outside and beyond the Bretton Woods institutions.

diseases that predominantly affect the poor in developing countries. The "*know-do gap"* in global health highlights the fact that in many cases, even simple *existing* health interventions are not available to patients in developing countries.

Section 4 of the paper looks at strategies to connect knowledge and action as they appear in the global health literature. Seven topics frequently appear in the literature and shed further light on the ways in which knowledge and action are conceptualized. They include the tradeoffs between investing in the creation of new knowledge versus the application of existing knowledge, and between horizontal (systems-based) versus vertical (disease-based) approaches to global health; concepts of local knowledge and local research capacity; the difficulties of linking research and policy; and ways of thinking about institutions that could bridge the *10/90 gap* and the *know-do gap*.

The final section takes a look at underlying concepts of knowledge and its transferability. It draws the different topics in the literature together on the common basis of the use of knowledge in decision-making, and, ultimately of governance. It makes the argument that two different concepts of knowledge are simultaneously present in the global health literature. One assumes that knowledge travels freely, whereas the other one postulates that it is dependent on local conditions and on the engagement of different stakeholders. The paper makes the argument that a more fundamental discussion about knowledge, its different forms and shapes, its transferability and relation to questions of governance would make a major contribution to efforts to improve global health governance.

2. Changing Paradigms

Health and Health Research in International Development

The focus on the role of health and health research is relatively new in the field of international development. Health policy and health research were traditionally not considered to be of strategic importance for developing countries, unless related to military or colonial affairs (*11*). This has changed substantially in the past decade. Starting with the 1993 World Bank Report "Investing in Health" (*12*), the notion that health is not simply a byproduct of economic growth, but an essential input into development (*13*) grew and became part of the dominant discourse (*3, 13*); today, four of the ten Millennium Development Goals are related to health[4].

In connection with the changing perception of health, *health research* is also receiving increasing attention. In 1990, a report entitled "Health Research – Essential Link to Equity in Development" was published by the Commission on Health Research for Development, which stated that only 5% of the world's research funding is devoted to diseases that affect 95% of the world's population (*14*). Since then, many new organizations have been founded (*15*), and conferences (*10, 16-18*) and journal issues[5] have been devoted specifically to the role of knowledge and health research in development. In 1998, the World Health Organization set up a new department of Research Policy and Cooperation, with the mission to strengthen national health research systems so that they can adequately serve their populations[6]. Health research is also presented as an indispensable tool for reaching the Millennium Development Goals (*3*).

In the context of the changes in the way health figures on the development agenda, a new institutional landscape has evolved in the field of global health. The past 10 years have seen an unprecedented increase in the number of efforts directed to this issue: there are now over 100 organizations working to improve health in developing countries (*15*). Global initiatives account for the largest group of actors, with increasing importance of the private sector, and of public-private partnerships (*15*). Prominent examples are the Global Fund to Fight Aids, Tuberculosis and Malaria, the Global Alliance for Vaccines and Immunisation (GAVI) and the Bill and Melinda Gates Foundation.

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[4] These are "eradicate extreme hunger and poverty", "reduce child mortality", "improve maternal health" and "combat HIV/AIDS, malaria and other diseases". See http://www.un.org/millenniumgoals/ .

[5] E.g. the September 30th issue of the British Medical Journal was entitled "Global Health Research", the Number 10, 2004 issue of the Bulletin of the World Health Organization was devoted to knowledge translation, and the December 1992 issue of Social Science and Medicine was devoted to research in developing countries.

[6] WHO RPC's mission is "to strengthen the informational, scientific and ethical foundations of health research systems; enabling these to contribute effectively and efficiently to health system development, health improvement and health equity, particularly in developing countries" (see also http://www.who.int/rpc/en/).

The recent changes in organizational players in global health have come with an increase in financial contributions, especially from philanthropy-based organisations. More than $35 billion has been committed to fighting the diseases that affect the developing world; the Bill and Melinda Gates Foundation is at the forefront of this new group of initiatives with a pledge of $6 billion since 1999 (*19*). HIV/AIDS is receiving the lion's share of this new attention: between 1996 and 2005, funding to combat HIV/AIDS went up from $300 million to $8 billion, with most of the money coming from the Global Fund to Fight Aids, Tuberculosis and Malaria, the World Bank and the President's Emergency Fund For Aids Relief (PEPFAR) (*19*).

The 'Health Research for Development Community'

Within the large number of new organizations devoted to global health, a small subset has explicitly devoted itself to increasing the impact of *health research* on health in developing countries. These include the *Council on Health Research for Development* (Cohred), the Global Forum for Health Research (GFHR), the *Alliance for Health Systems and Policy Research* (AHSPR), and the World Health Organization. Because of their explicit focus on knowledge and research, this set of organizations will be referred to as the '*health research for development community*' for the purpose of this paper.

The *health research for development community* originated in 1990, when the Commission on Health Research for Development published a report entitled "Health Research – Essential Link to Equity in Development" (*14*). The study was a first effort to conceptualize the relation between health research and health in developing nations by attempting to quantify it. Its main finding was that only 5% of global investment in health research goes into research on diseases that account for 95% of the global disease burden. This concept was later slightly modified and became known as the "*10/90 gap"* in health research (*9, 20, 21*). The commission further reported a misbalance in attention to health problems affecting the developing world: support for research on third world diseases was focused on human reproduction and contraception, tropical diseases, diarrhea and AIDS; however, important conditions such as acute respiratory infections, tuberculosis, sexually transmitted diseases, injuries, chronic degenerative diseases, and mental illnesses were neglected.

As a remedy to this situation, the commission envisaged a world wide health research system that would connect research across global, regional and national levels to address local and global health problems (*14*). Four major propositions were made to achieve this goal:

1. *Essential national health research* (ENHR): all countries need to undertake their own research according to their respective epidemiological priorities. They should devote 2% of their health budget to health research.

2. *International partnerships* to facilitate collaboration between scientists from industrialized and developing countries to address the world's most pressing health challenges
3. Mobilization of larger and sustained *financial support* for research from international sources. Donors should commit at least 5% of health project aid for ENHR and capacity building
4. Establishment of an *international mechanism* for monitoring, assessment and promotion of research on health problems of developing countries

The 1990 Commission Report triggered a number of follow-up efforts and events that eventually led to the creation of an international research and policy community with coordinated activities, regular meetings and conferences. In 1993, the *Council on Health Research for Development* (Cohred) was founded with the mission to build and strengthen national health research systems in developing countries (*1*). In 1996, the WHO's *Ad Hoc Committee on Health Research Relating to Future Intervention Options* (ACHR) for the first time identified four "Best Buys" for R&D priorities on major global health challenges; these were child and maternal health, microbial threats, noncommunicable diseases and injuries, and health care systems (*22*). In 1998, the *Global Forum for Health Research* (GFHR) was founded with the aim to monitor and narrow the 10/90 gap in health research. In 2000, the first international conference entitled 'Health Research for Development' was held in Bangkok (*15, 16*). In 2004, the World Health Organization for the first time convened the health ministers of its member countries at the Ministerial Summit on Health Research in Mexico (*4, 17*). This community holds meetings every four years, with the next one set to take place in 2008 (*17*).

3. Concepts of Knowledge and Action

Knowledge about Health

Numerous concepts of *knowledge* can be found in the global health literature. There is an increasingly broad notion of what constitutes *knowledge about health*, which goes beyond the previous, more narrow definition of "health as biomedicine" to include social and economic factors, as well as cross-cutting issues such as violence against women and road accidents (*20*). Simultaneously, there is a notion of *science* (and, more generally, research) as the solution to many existing problems in global health, as exemplified in the previously cited quote in which WHO assistant director general Tim Evans expressed a sense of general puzzlement over the persistence of health problems that were supposed to have been solved by modern science (*4*).

Beyond academic knowledge about health, there is a growing emphasis on the need to draw on *local knowledge* and build local research capacity (*1*, *4*, *17*). There are three main ways in which the notion of 'local knowledge' appears in the literature. First, local knowledge can be conceptualized as *knowledge about the local conditions* – cultural factors, political circumstances, and aspects of local infrastructure that are relevant to program implementation. One example of this concept is found in the operating principles of the Global Fund to Fight Aids, Tuberculosis and Malaria:

> *"The Global Fund's purpose is to attract, manage and disburse resources to fight AIDS, TB and malaria.* ***We do not implement programs directly****, relying instead on the knowledge of local experts."*[7]

Second, local knowledge can mean culturally specific, *indigenous forms of knowledge*. There are now increasing efforts to assist and enable developing countries to harness their traditional knowledge and natural resources, such as *medicinal plants*. For example, the World Bank is supporting efforts to catalogue, use and protect the medicinal plants used in their respective traditional form of medicine[8]. Finally, the building of national *research capacity* in developing countries is a way in which the notion of local knowledge is raised in the literature. Research capacity building is often presented as a way to more equitable allocation of resources (*23*) and to solutions serving the long-term needs of developing countries (*17*).

[7] See the Global Fund website: http://www.theglobalfund.org/en/about/how/#1
[8] See, for example, the World Bank website at http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/EXTINDKNOWLEDGE/0,,menuPK:825562~pagePK:64168427~piPK:64168435~theSitePK:825547,00.html

Knowledge and Action: The "10/90 Gap" and the "Know-Do Gap"

There are two main concepts in the literature that conceptualize the links between knowledge and action. Both are framed in the metaphor of a gap. The *10/90 gap in health research* originates from the 1990 commission report referred to above and reflects the argument that only 10% of the resources that the world invests into health research go to those diseases that affect more than 90% of its population (*14*). In addition to the argument about resources being devoted to the *creation of new knowledge* on diseases affecting the poor in developing countries, there is a separate argument about *existing* knowledge not being put into practice. This problem is commonly referred to as the *know-do gap* in global health (*2*). At the recent Ministerial Summit on health research in Mexico, WHO assistant director general Tim Evans summarized the problem as follows: "Why is the world so vulnerable to health problems that science is supposed to be able to solve?" (*4*). These two concepts build the foundation for thinking about the role of research and knowledge in the health research for development community.

4. Approaches, Debates, Institutions

Beyond the *10/90 gap* and the *know-do gap* a number of recurring debates and approaches to institution building shed further light on concepts of the links between knowledge and action in the global health literature. While not everyone in global health talks in terms of the two gaps, the underlying concern of most publications and approaches is still to find some remedy against existing health disparities between the developed and the developing world. Not all of them coincide with a particular community, and many of them can be found simultaneously in different approaches to improving health in developing countries. The following sections are not exhaustive, but are meant to give an overview of approaches, debates and institutions that are being proposed in connection with the knowledge action gap in global health.

Creating New Knowledge, Applying Existing Knowledge

One recurring topic effectively pitches the *10/90 gap* against the *know-do gap*, centering on the tradeoff between funding the *creation of new knowledge* about diseases affecting the developing world and promoting the *application of existing knowledge*. The perceived trade-off does not come from a supposed superiority of one approach over the other – indeed, some argue that the generation and application of new knowledge account for about 50% of health gains worldwide over the last 50 years (*24*). Rather, since much of global health is donor-funded, and resources are therefore sparse, the two approaches compete directly.

Creating new knowledge. There are many arguments for investing in the creation of new knowledge. Effective treatments are lacking for many diseases that mainly or exclusively

affect populations in developing countries, especially in the case of infectious diseases; where effective treatment exists, the problem of frequently arising antibiotic resistances still requires continued development of new drugs (*25*). In the case of vaccine development, the argument is that their value as a public health intervention is so large that it warrants the time delay required for their development and production[9].

There are many new efforts to draw attention to the lack of research and development on diseases that mainly affect developing countries. In particular, there is a renewed focus on the so-called *neglected diseases* such as malaria, tuberculosis and river blindness, which have not been attracting enough investment in terms of research and development (*9, 18, 20, 21, 25-29*). Between 1970 and 2000, only 13 new drugs were developed for these diseases (*30*), about half of which came out of the World Health Organization's special program on Tropical Diseases Research (WHO/TDR) (*31*). In recent years, WHO's efforts for neglected diseases have been joined by a number of mostly philanthropy-funded organizations (*31-34*). Examples include the International Aids Vaccine Initiative (IAVI), the Drugs for Neglected Diseases Initiative (DNDI), and the Medicines for Malaria Venture (MMV). While it is early to judge the success of most of these initiatives, major changes seem to be under way – there are currently over 60 new drug development projects in progress which are projected to lead to 8-9 new drugs in the next few years (*31, 33*).

Most of the new initiatives focus on the development of health interventions for particular (mostly tropical) diseases[10]. However, there are rare instances of efforts that take on more broadly framed problems. One example is the WHO-based *Alliance on Health Policy and Systems Research* (AHPSR), which is working to generate knowledge on developing country health policy and health systems (*35-38*).

Applying existing knowledge. Initiatives that invest their resources into the application of existing knowledge operate on the argument that for many diseases, effective interventions are already available, and the global community has a responsibility to make them available to patients in developing countries. A prominent example of this approach is the Global Fund to Fight Aids, Tuberculosis and Malaria, a recently founded public private partnership that has so far disbursed more than 5.4 billion USD for interventions against these three diseases in 131 countries. The Global Fund's website reads: "Public health experts have identified a number of highly effective interventions to prevent and treat AIDS, TB and malaria. If brought to scale, such efforts could change the course of these diseases. However, to achieve this scale-up, a substantial increase in resources is required"[11]. Thus the argument is that the most appropriate way to spend

[9] See, for example, the Global Alliance on Vaccine and Immunization (GAVI): "Childhood immunization is one of the best values in health care, providing tremendous benefit at very low cost. A child can be immunized for only $30. It is a near-perfect intervention, preventing disease before it is allowed to take root, protecting children when they are most vulnerable and providing them with a healthy start in life." http://www.gavialliance.org/General_Information/About_alliance/index.php

[10] See, for example, the Global Forum for Health Research's Initiative on Public Private Partnerships in Health (IPPPH) at www.ippph.org for a database that lists most of the new initiatives by date established, purpose and organizational design.

[11] See www.theglobalfund.org, and http://www.theglobalfund.org/en/about/road/

resources for closing the knowledge action gap in global health is to scale up existing interventions based on knowledge that is already available.

Horizontal and Vertical Approaches to Linking Knowledge and Action

Another frequently raised issue, also closely related to the allocation of resources is the one between funding the fight of a particular disease or health issue (vertical approaches) and funding initiatives to build capacity and health systems in developing countries (horizontal approaches) (*15*). The current institutional landscape in global health is characterized by a strong bias in favor of vertical approaches (*15*).

Vertical approaches. A prominent example of a vertical approach to *creating new knowledge* is the "Grand Challenges in Public Health" initiative by the Bill and Melinda Gates foundation (*19*, *39*). In this initiative, the international scientific community was invited to submit grant proposals to pursue a list of 14 defined problems in public health with financial support from the foundation. The initiative offered a total of $436 million for a total of 43 projects. Similarly, the Global Fund to Fight Aids, Tuberculosis and Malaria is a prominent example of a major new organization set up with the stated aim to *apply existing knowledge* into actual health interventions in countries that are affected by these diseases. Its main aim is to raise the funds necessary to enable a turnaround of these epidemics using existing interventions and knowledge[12].

Vertical approaches are thought to facilitate transparent use of resources, produce rapid, visible results, which can be measured in concrete terms such as the number of people put on treatment. Critics argue that vertical approaches are unable to incorporate long-term concerns of the developing countries (*17, 40*) and can have detrimental effects on local infrastructure and capacity building[13] (*4*, *15*).

Horizontal approaches. Horizontal approaches to improving health in developing countries are thought to induce sustainable changes, consolidate and coordinate donor efforts and build local capacity in terms of health systems and health research. The horizontal approach is reflected, for example, in calls for '*sector wide approaches*' (SWAPs) to health interventions (*41*), and for '*domain based*' as opposed to *issues based* approaches to global health research (*42*). Here, the problem is framed as one of generating knowledge about building health systems and health research systems capacity in developing countries. A recent study looked at health systems research capacity in developing countries and came to the conclusion that it is insufficient; producers of health policy and systems research are mostly small public institutions with an average of 3 projects, 8 researchers and a project portfolio worth $ 150.000 (*43*). The WHO-based

[12] See, for example, the Global Fund website at http://www.theglobalfund.org/en/

[13] Recent evidence from Madagascar showed that intensified focus on a program to prevent mother-to-child transmission of HIV caused a diversion of local health system capacities that in turn led to a rise in the number of children dying from congenital syphilis due to weakening of the neonatal screening system (13).

Alliance on Health Policy and Systems Research (AHSPR) is starting to address health policy and systems through case studies from developing countries (*35-38, 44-56*), and WHO's *health systems analysis* (HSA) and *health research systems assessment* (HRSA) initiatives are also systematically addressing this question (*57, 58*). Experiences from Cohred's Essential National Health Research building efforts are in the process of being evaluated (*59-62*). A first evaluation of WHO and Cohred case studies was recently published and found that low and middle income health research systems face a number of common challenges (*63*). These include a lack of coordination between national health research institutions, inadequate participation of stakeholders in the research, policy and implementation, inadequate demand for research and insufficient accessibility of research findings (*63*).

Measuring and Monitoring 'the Gaps'

Following from the basic concepts of the *10/90 gap* and the *know-do gap*, follow a number of efforts to measure, quantify and monitor these gaps. Generally, these efforts focus on developing metrics and tools as basis for matching health research priorities with the burden of disease in a given country and internationally. This work is broadly related to prior work on the *global burden of disease* done at WHO, the World Bank, and in academia as a means to assess health outcomes (*64, 65*), as well as to WHO's benchmarking of health systems (*58*).

Measuring the 10/90 gap. One of the main coordinators of efforts to measure and monitor efforts directed at the *10/90 gap* is the *Global Forum for Health Research*. GFHR's basic premise is that it is paramount to systematically link investments in health research to burden of disease, nationally and globally, and to establish strong links between basic research and the development of remedies for high-burden diseases (*9*). The *Global Forum on Health Research* is developing a database containing internationally comparable statistics on resource flows for health research (*9, 20, 21, 29*). However, data on global health research spending is scarce. According to GFHR, global funding for health research was US$ 73.5 billion in 1998 (2.7% of total health expenditures worldwide) (*9*). National governments accounted for US$ 27bn, or 50% of total expenditures; the pharmaceutical industry contributed US$ 30.5bn; the remaining US$ 6bn came from private, non-profit, and university funds. At the country level, only Brazil and Cuba approached the 2% national health expenditures recommended by the Commission on health research for development, with most LDCs in the low to middle income section being well below 1% (*9*).

Besides measuring and monitoring the 10/90 gap in health research, GFHR is also aiming to develop priority setting methodologies to help countries match their research efforts with their most pressing health problems (*9*). Complementary to GFHR's efforts to monitor and measure the 10/90 gap in health research, the Council on Health Research for Development is working with developing countries in building *Essential National Health Researc*h according to the recommendations of the 1990 commission report. Until

now, there has been little evaluation of these efforts, and results have been mixed (*59-62*). WHO's efforts to benchmark and build national health research systems (*57*) also belong into this context.

Measuring the know-do gap. Efforts to quantify the *know-do gap* in health are not situated in a particular institution. However, there are a number of studies that approach the *know- do gap* with the aim to quantify and measure it. For example, *The Lancet* published a study that estimated by how much current global child mortality could be reduced if existing interventions were made available to patients in developing countries; the study found that over 60% of the annual current 10 million deaths in children under five years of age are in theory preventable with a modest number of simple, known interventions (*5-7, 66*).

Principles for Linking Research and Policy

In order to bring health research that reflects LDC priorities to bear on their populations, it is argued, research needs to be effectively linked to policy and implementation (*2, 4, 17*). There is a growing discussion about the nature of these links, and the ingredients needed to improve them. Despite this growing emphasis, there is little literature about the topic, especially from the context of developing countries (*67*).

General agreement seems to exist that evidence is rarely applied to policy in a linear manner (*4, 67*). There are calls for more 'evidence-based policy making' (*68, 69*), and the perception that research-based information is often missing in policy decisions (*70*). A number of obstacles to research being used in policy making have been described. They center around the different cultures of research and policy making and include the perceived quality of research (*67*), its relevance to local conditions (*71*), and the concreteness of its recommendations including price, feasibility, process of a given intervention (*67, 72, 73*).

Commonly proposed ways to overcome these obstacles emphasize the need to improve communication between researchers and policy makers, the importance of two-way exchanges between producers and users of research, and the need for special organizations that can function as brokers between the research and policy community, or between producers and users of research. The following paragraphs will turn to each of these topics.

***Communication*.** Recommendations on how to improve communication between producers and users of research target both sides. Calls for more effective communication on the part of researchers (*4, 14, 45*) generally require them to be more flexible in their approaches to research questions (*72*) and expect them to take a proactive role in communicating, advertising and simplifying their research results in order to make them more readily usable for decision makers (*4, 73*). Recommendations directed to users of research (decision makers) generally emphasize the need to learn how to access research

based knowledge (*4, 45*), to commission research (*4*) and to combine research based knowledge with other types of knowledge (*4*).

Two-way exchange between users and producers of research. Calls for changing the interaction between producers and users of research go beyond merely improving communication. Growing recognition that research is rarely used in policy in a linear manner has lead to emphasis on the role of the end-users in the research process (*69, 73*); this also includes the argument that the implementation of policies also creates knowledge (*4*) and the postulation that two-way exchanges between researchers and policy makers at every stage of research and policy making are necessary for sustainable results (*74*). For example, in their conceptual framework for health research systems, Pang et al. at WHO call for the need to balance policy-driven and investigator-driven research (*75*). In a related argument, a sense of ownership is thought to be needed on both sides if successful exchange between producers and users of research is to be achieved (*67*). Community participation is emphasized by many as a special form of engaging the end-users of research (*4, 71*).

Organizations at the nexus of research and policy. Many publications emphasize the role of particular organizations as connectors between users and producers of research; these organizations have an integrating function in that they bring users and producers of research together, as well as convene and foster communication (*4, 45, 67, 73, 76*). Examples include permanent think tanks inside of ministries, steering committees, and national institutes of health.

Overall, there is a lack of studies of research and policy making from the context of developing countries. Even though the *health research for development community* has started to give the issue systematic attention (*36-38, 45-48, 51, 54, 71*), examples of in-depth studies and articles on the topic are rare to date. Many issues require in depth exploration, such as the cultural and political specificities of policy making in different contexts. Examples of studies that report on successful instances of linking research and policy in the global health domain include the use of research in Onchocerciasis Control (*77*), the use of public health laboratories in implementing family planning projects in Bangladesh (*72*), and a study of the use of research in Mexican health policy making (*67*).

Capacity Building in Developing Countries

The building of national *research capacity* in developing countries is presented as a way to more equitable allocation of resources (*23*) and to solutions serving the long-term needs of developing countries (*17*); sustainability of current approaches is viewed skeptically by some (*78*). Three aspects commonly recur in arguments on how to build research capacity in developing countries – building local research capacity, building partnerships, and providing access to information.

Building local research capacity is presented as the core and foundation of capacity building in developing countries (*23, 79-83*). Authors variously stress the need to build sustainable career structures for scientists inside LDCs and infrastructure for research (*81*); the importance of the broader enabling environment for health research (*79*) to counteract brain drain of capable scientists to developed countries; and the importance of strengthening the local private sector in innovation, research and development (*82*).

In addition to building an in-country research structure, ***partnerships*** between Southern countries and between North and South are frequently mentioned as a way to build capacity (*81, 83*). Here, much attention is being paid to the governance of the North-South partnerships. Current models of research partnership have been criticized for being "semicolonial" in nature (*84*), with priorities mainly set by outsiders (i.e. researchers in Western universities). Some authors postulate that this model be substituted with new forms of North-South research partnerships based on reciprocal exchange (*81, 85*), shared decision making, national ownership, and the development of national research capacity (*84*).

A third issue often mentioned in the context of local research capacity building is ***increasing access to information*** in developing countries. There is increasing agreement that scientific information and peer reviewed literature should be free for LDCs (*86*), and that the flow of information should go in both directions (*86, 87*). Efforts in this area are exemplified by the recent setup of WHO's *Health InterNetwork Access to Research Initiative* (HINARI), a voluntary partnership between WHO and 28 publishers to provide free access to over 1500 journals to institutions in the developing world (*88*) and the *International Network for the Availability of Scientific Publications*, (INASP) which promotes analysis and advocacy in this sector (*89*). However, important gaps are still in place, in large part due to lack of internet access in developing countries (*90, 91*).

Institution Building

A final topic that reflects all of the preceding concepts of the links between knowledge and action is that of institution building. Section Two has already pointed to the increased level of institution building activities currently taking place in the domain of global health. Overall, two approaches can be discerned. WHO and the *health research for development community* focus on the nation state as the primary unit through which and around which to build institutions for the creation and application of knowledge. At the same time, a growing number of organizations are set up at the global level, outside of the nation based system of UN institutions. Many of these approaches propose the transnational cooperation of a variety of stakeholders, including governments, non-governmental organizations, multilateral, and the private sector. The following paragraphs will turn briefly to each of these approaches.

Horizontal Approaches: Health Research for Development Community

The health research for development community puts the nation state at the focus of its attempts to link knowledge and action in the field of global health. Based on the premise that developing countries need to generate and apply their own knowledge, two foci can be discerned. One is on studying and building national *health research systems*. The other is on integrating and connecting these sites of knowledge generation with implementation in national *health systems*. The *health research for development community* operates on a broad notion of health, moving beyond the previously mainly biomedical framework to include social science research on diseases (*9, 16*). The *Global Forum on Health Research* advocates aligning research priorities with the respective burden of disease of a given country; the WHO is doing an analysis of national health research systems (HRSA), and the *Council on Health Research for Development* is working to build national health research systems. The recent "World Report on Knowledge for Better Health" summarizes the community's main recommendations (*4*). It proposes three main ways to better harness research for improving health in developing countries – increasing investment in health systems research, strengthening management of health research systems and bridging the gap between knowledge and action. The main emphasis of the report is on building functioning health systems as a means to accomplish these goals.

Building national health research systems. The WHO has been directing efforts at understanding and building national health research systems in developing countries. Authors at the WHO have recently put forward a first approach to conceptualizing health research systems in developing countries (*40, 75, 92*) as the basis for two of WHO's initiatives, the *health systems performance analysis* (*57, 58*) and *health research systems analysis (HRSA)* (*57*). The frameworks emphasize the need for a "systems" perspective on health research; the health research system of a given country is conceptualized as having to obtain "the "best bundle" of knowledge out of its investments in health research" (*75*). The WHO model specifies two goals of health research systems: the advancement of scientific knowledge and the utilization of knowledge to improve health and health equity; to attain these goals, the health research system must perform the four main functions of 1) stewardship, 2) financing, 3) creating and sustaining resources, and 4) producing and using research (*75*).

Based on this model of a health research system, the World Health Organization is currently undertaking a major *health research systems analysis initiative* among its member countries (*40, 57*). The aims of this initiative are twofold. The first aim is to develop a collective benchmarking approach to identifying and testing basic indicators to describe national health research systems. The second aim is to build national task forces on health research. Fifteen countries are currently actively involved in selection and testing of indicators, data collection and analysis (*57*). Results are still pending.

Connecting to health systems. A central issue often emphasized is the need to connect *health research* with the *national health system* as the means to actually deliver the fruits of research to the patients. Accordingly, the "World Report on Knowledge for Better Health" called for increased research into health systems as a major means to strengthen

the impact of health research on health in developing countries (*4*). The Ministerial Summit on Health Research identified three "grand challenges" for health systems (*17*): first, to make sure that safe, proven and cheap interventions reach those in need; second, to improve the distribution of health services; and third, to provide protection and safety (*4, 17, 93*). To date, little research has been done on health systems in developing countries (*43, 51*), although organizations like the WHO-affiliated *Alliance on Health Policy and Systems Research* are undertaking efforts to change this through case studies (*35-38, 44-56*).

Other Approaches

Since the mid-1990s, there is growing feeling that in a globalizing world, the nation state is increasingly inept in successfully accomplishing the provision of health services and the prevention of disease (although see Birdsall and others for an account of successful government-led public health interventions (*94*)). As a consequence, an increasing number of initiatives in global health now advocate the engagement of other actors besides governments to tackle global health issues. The following paragraphs will only be able to give a very sketchy overview of these approaches.

One group of actors that have been seen as a successful "bridgers" of the knowledge-action gap are national and international NGOs. A prominent example of an *NGO-led* large-scale community-based health intervention is the introduction of home-made oral rehydration therapy (ORT) in Bangladesh which is estimated to prevent millions of cases of child death due to diarrhea every year[14] (*95-99*).

In addition to NGOs, p*ublic private partnerships* have been getting increasing attention in the context of implementation of large scale health interventions (*19, 100, 101*). One of the most prominent examples is founding in 2002 of the *Global Fund to Fight Aids, Tuberculosis and Malaria* to speed up the fight against these three diseases (*102*). There are also a number of new partnerships between individual developing country governments, foundations and pharmaceutical companies with the mission to deliver drugs against tropical diseases. A frequently cited example is the Onchocerciasis control program (OCP), a partnership between the WHO, a number of African governments, foundations, and the pharmaceutical company Merck (*41, 103-106*). Merck developed and supplied a drug for the treatment of Onchocerciasis (also know as river blindness). The program claims to have resolved about 1.25 million onchocercal infections, saved 100,000 people at risk of contracting the disease and prevented 12 million infections in children up to today (*105*). Other examples of public private partnerships are the African Comprehensive HIV/AIDS Partnership (ACHP), a cooperation between the government of Botswana, Merck and the Bill and Melinda Gates foundations to provide Aids treatment in Botswana (*107-109*); the partnership between the World Bank, a number of

[14] In a community-based intervention, a Bangladeshi NGO taught over 12 million mothers how to prepare a rehydration solution from common salt and household sugar for the purpose of treating diarrhea in small children, one of the most frequent causes of child death in developing countries.

developing country governments, corporations and communities to reduce the incidence of Guinea worm by 98% (*110*); And the global program for the eradication of lymphatic filariasis (GPELF) (*111, 112*).

Accounts of successful partnerships increasingly mention *community participation* as a key factor for success, although it is seen as difficult to implement (*113*). Examples of large scale interventions that used community participation include the distribution of oral rehydration therapy in Bangladesh (*95*), the African Program for Onchocerciasis Control (*77*) and a program to reduce neonatal mortality in Nepal recently reported on in T*he Lancet* (*114*).

Concerns: Coordination and Competition

With all the new and existing organizations that are now operating in global health, a number of fundamental questions arise. One frequently raised issue is that of coordinating the large number of different actors and approaches. Many of these concerns come from the area of health program *implementation*, particularly from the field of HIV/AIDS, where many of the current efforts are centered. A recent report by UNAIDS showed that in Tanzania and Uganda, more than 25 different stakeholders from local government, civil society and the private sector are working to combat HIV/AIDS (*115*). This lack of coordination becomes and obstacle to success and leads to waste of resources. As a response, the report proposed the "Three Ones" program – one comprehensive national AIDS framework, one national AIDS coordinating authority, and one national monitoring and evaluation system.

On the health *research* side, the lack of an international health research architecture has frequently been lamented (*19, 116*). Proposals to build different forms of international health research architecture have come from a number of organizations. For example, the Global Forum for Health research calls for a global statistics centre for the collection of information on resource flows in global health research (*9*). The Council on Health Research for Development is building national and regional health research structures (*1*). A proposal for a comprehensive international research structure has come from WHO (*42*). In 1998, the organization's Advisory Committee on Health Research proposed setting up an international network that would be based on WHO and existing partnerships, and not require the creation of an entirely new organization[15] (*42*). The commission for a macroeconomics and health equally called for the creation of a $1.5

[15] The proposal had two components. First, a central entity called "Planning Network for Health Research" or "Planet HERES" was to be set up to initiate work on research planning processes. This entity is to perform the three main functions of enabling computer-supported discourse among members of the health research community, improving the utilization of existing knowledge and strengthening research capacity. This central node would then be complemented with IT based "Intelligent Research Networks", or "IRENEs". In the proposal, IRENEs are conceptualised as issue-oriented but domain-based, international and interdisciplinary networks Examples of research issues to be addressed by IRENEs are the global tracking of microbial resistance to drugs, new approaches to food production, security and distribution, health impacts of population growth, structural change and migration.

billion Global Health Research Fund for basic biomedical and health research as well as $1.5 billion in annual funding for existing institutions that aim at new vaccine and drug development (*13*). None of these proposals have so far been put into practice, presumably because of limited attractiveness to donors who would rather invest in programs that can measure their success in more concrete terms.

6. Synthesis and Conclusion

As the preceding sections of this paper have shown, there is a new focus and emphasis on the role of knowledge and research in improving health in developing countries. The past 15 years have witnessed a dramatic increase in the number of organizations focusing on health in developing countries, a subset of which is specifically concerned with the role of *health research* in improving health in the developing world. Parallel to that, knowledge and research have also been receiving increasing attention in the global health literature. As a result, a new field of policy and study addressing this topic is slowly emerging. While not everyone is using the same language, the concern of how to link knowledge and action is a major concern in the field, for practitioners as well as for academics.

The global health literature is characterized by a relatively broad notion of what constitutes *knowledge* about health; it transcends previous narrower biomedical definitions to include social and economic aspects of disease. “Knowledge” appears in the literature in a number of different forms, including as science and research, as knowledge about local cultural and political conditions, as indigenous and traditional knowledge, and as local scientific research capacity.

The relation between knowledge and action is often framed in two “gap metaphors” – the *10/90 gap health research* and the *know-do gap in health*. The gap metaphor serves to draw attention to commonly noted imbalances and disparities in global health in a forceful way. The *10/90 gap* concept is an example of that, emphasizing the issue of imbalance of resources allocated to research into diseases that mainly affect developing countries. Beyond that, the gap metaphor signals that a problem has been identified, that it is solvable, and that systematic steps (like measuring, monitoring, implementing) can be taken to address it.

While the gap metaphors are very powerful in drawing attention to certain aspects of the knowledge action gap in global health, they have been less successful in putting the focus on other aspects. This includes the question of how one thinks about the nature of knowledge: for example, different types of knowledge required for successful health interventions, the role and nature of health expertise, and the transferability of knowledge from one context to another.

While rarely discussed explicitly, questions about the nature and transferability of knowledge are not absent from the global health literature. In fact, two different concepts of knowledge are present. The "gap metaphor" suggests that knowledge is relatively 'disembodied', easily transferable and largely independent of its context. This is illustrated in the idea that closing the *know-do gap* requires taking stock, setting priorities, and implementing existing knowledge. At the same time, a different idea of knowledge is also present in the literature, one which implies that knowledge is in fact not disembodied or easily transferable, and which suggests that context, engagement and power matter in its production, application and use. This idea becomes apparent in discussions about how local knowledge and community participation are important for effective implementation of health programs, and how the 'end user' should be engaged in decision-making in order to effectively link knowledge and policy.

The question how we conceptualize knowledge about health and its production in different contexts and by different sources is important because it is closely linked to problems of decision making and governance. Discussions about linking research and policy are an illustrative example. Embedded in calls for more communication and engagement between researchers, policy makers and communities are fundamental questions about what is accepted as "knowledge", how priority setting is done, and how knowledge is used as basis for decision making. Similarly, deciding what is the "best bundle" of knowledge out of the investment in health research of a particular health system, as the WHO's authors suggest (*75*), depends on societal preferences in a given situation, and thus involves questions of power and representation.

Questions of decision making and governance are becoming ever more prominent in field of global health, often triggered by the many new organizations appearing at the global level, explicitly set up outside of the WHO and the Bretton Woods Institutions in general (*100, 117*). While these institutions are welcomed by many as providing solutions to problems that nation states and the UN system are apparently unable to solve, there are also increasing concerns about power, accountability, equity, and representation with respect to these new actors (*101, 118*). This paper's concluding point is that questions of research and knowledge are intimately intertwined with questions of governance in global health. Health is a science and technology intensive sector, in which 'knowledge' and research play an important role as the basis for policy, programs and proposals. As a consequence, many important governance issues are played out precisely around the negotiation of what constitutes 'knowledge', how to act on knowledge, or how to use it in decision-making. If new forms of institutions are the tools to bridge the 'knowledge action gaps', then we need to connect discussions about knowledge with discussions about governance.

Connections between knowledge and governance are already being made in the literature and in the field of global health more generally. However, these connections are often not made explicit. The presence of different concepts of knowledge, the appearance of concepts such as local ownership, local knowledge, and the engagement of end users in research show that these issues are real concerns in the field and in the literature. Likewise, the debates about horizontal versus vertical programs reflect competing ideas

about the closely intertwined domains of knowledge, governance and the allocation of resources.

Global health organizations today are already grappling with issues of knowledge and governance on a daily basis. A prominent example is the Global Funds to Fight Aids, Tuberculosis and Malaria, which is set up to rely entirely on local expertise and knowledge for the implementation of its programs[16]. It seems paramount to mirror these developments in the literature with a more fundamental discussion about the relationships between knowledge and governance in global health. For example, the question of how transferable knowledge about health is in practice, and whether there might be types of knowledge that are more easily transferable than others, is very important for the purpose of implementing health care programs This paper hopes to serve as a starting point to mapping and understanding concepts of knowledge and research in the global health literature for the purpose of further discussion and analysis.

[16] See www.theglobalfund.org

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