Strengthening health research capacity in developing countries: a critical element for achieving health equity

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Equity in health as the core value of health for all advocated by the Alma Ata declaration has not been achieved. Poverty is widening and inequity prevails.[1] New illnesses have burdened and strained health systems. Rapid growth of private medical services, medical technology, and uncontrolled insurance markets in many developing countries with relatively rapid private sector growth have resulted in unwanted consequences, highlighted by the economic crisis in Asia.[2] The rising number of international organisations and institutions involved in global health has eroded national sovereignty. The migration of health professionals from the public to the private sector and from developing to developed countries has diminished their ability undertake research and implement research findings.[3] It has also limited developing countries' ability to participate in the political debates and decisions on global health governance. Greater support of research for development is needed and health equity must be adopted as a core value.

Summary points

- Health inequity is widening between and within countries
- Research capacity in developing countries is weak
- As a result developing countries are unable to participate effectively in national and international health policy development
- International and national cooperation and collaboration is needed to strengthen research capacity for health development
- Health policy should be informed by a wide range of stakeholders and underpinned by sound evidence
- Greater solidarity and commitment to tackling global health inequity is needed

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Defining health research capacity

Health research capacity is the ability to define problems, set objectives and priorities, build sustainable institutions and organisations, and identify solutions to key national health problems.[4] This definition encompasses research capacity at the levels of individuals, research groups, institutions, and nations. Research capacity can broadly be divided into four domains: skills and competencies; scientific activities; outcomes; and impacts on policies and programmes.[5] Measures on process, outcome, and impact are necessary to capture a comprehensive picture of research capacity (fig 1).

The Commission on Health Research for Development identified four components as "essential health research."[7]

- Analysis of the burden of illnesses and their determinants to identify and set priorities among health problems
- Research to guide and accelerate the implementation of research findings to tackle key health problems (for example, the cost effectiveness of preventing death from malaria among poor rural populations[8])
- The development of new tools and methodologies to measure and promote equity (a project to promote trust between the government and rural poor in Brazil resulted in improved maternal and child health[7 9])
- Basic research to advance understanding of disease and disease mechanisms[7] and to develop "orphan" drugs and vaccines.

In addition to carefully targeted programmes and intelligently designed social security systems, participatory research is important to ensure that those who are involved in or affected by the research understand the rationale for the research and the potential benefit that may accrue.[1]

Challenges for the research community in developing countries

The health research community in developing countries faces problems at several levels. At the global level there has been an increase in organisational and institutional players in international health[10] and a subtle but systematic erosion of national sovereignty. In some countries there is evidence that these players have been responsible for fragmentation of research and research capacity building.[11 12]

At the national level, political instability is a problem.[11] Where governments and health ministers are frequently changing, the translation of economic and social development plans to effective national and regional research initiatives is incoherent.[12] Gaps, duplication of effort, and fragmentation of research are common. Priority setting, resource mobilisation and allocation, quality control, and dissemination and utilisation of research findings are similarly impaired.[12]

At the institutional level research units have been over reliant on international funds, which have been diminishing in real terms over the past few years.[11] They have also failed to establish good links to national policymakers, non-governmental organisations, and the public. These two factors have resulted in much research that has not been well geared to addressing national health needs. In addition many research units are struggling to cope with a "brain drain" of basic scientists and clinical researchers to developed countries which offer more opportunities and greater political and financial security.

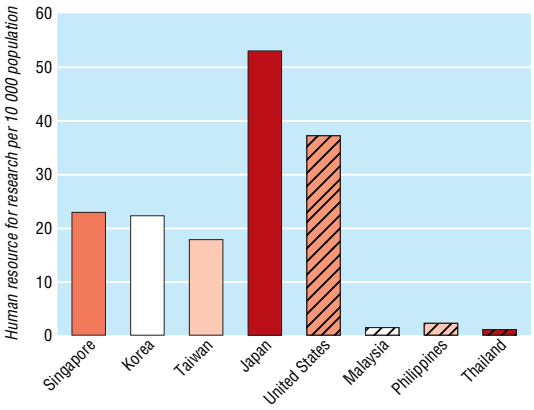

Fig 1 Number of researchers per 10 000 population in developing and developed countries[6]

Supporting research workers

Researchers in developing countries are poorly paid. Many have to work in private practice to make ends meet. Schemes to promote research as a viable career option by giving research awards and supplementing researchers' salaries have been tried but not yet systematically evaluated.[13 14] Intellectual isolation is another problem, although the increasing use of the internet is fostering more exchange between researchers in developed and developing countries. Encouraging researchers to join national, regional, and global networks is another way that isolation may be overcome and motivation increased.

International efforts to strengthen research capacity

Despite the problems outlined above, some international efforts have enhanced the research capacities and the research environment in many developing countries. Notable among these are the special programme of tropical disease research (TDR); the special research programme in human reproduction (HRP) of the World Health Organization; the International Clinical Epidemiology Network (INCLEN), initiated by the Rockefeller Foundation; and the Field Epidemiology Training Program (promoted by Centers for Disease Control).[10 11] The TDR and HRP programmes have been jointly sponsored by the WHO and other UN agencies and are governed by special boards, with the WHO acting as host and day to day manager. Their primary focus is on finding new knowledge and technologies for dealing with selected tropical diseases and with human reproduction (www.who.int/tdr, www.who.int/hrp). The TDR and HRP have contributed significantly to strategic and applied research in Africa, Asia, and Latin America, primarily by providing good training and support of local scientists, and help to promote the uptake of research results by end users (government, non-governmental organisations, private sector, and the public).[5 11]

Successful building of research capacity depends on national governments incorporating capacity building in their national plans. It also needs strong leadership from health professionals, transparent recruitment of research workers (who need to be given adequate support), and good exchange and partnership with reputable units in developed countries.[5] National research systems must also be accountable, operate transparently, and direct their efforts towards defined national health priorities.[5]

National initiatives

Developing countries have also invested in research and have achieved some successes. Before the economic crisis, South East Asian countries poured money into science to create a talent pool that can compete globally.[15] In Thailand, for example, the Thailand Research Fund has supported basic and interdisciplinary research in all branches of science, including basic medical sciences. The fund gives no-bonded research grants to students for PhD studies in Thai universities. Each grant covers not only the student's fees tuition and research allowance but also a budget to pursue elective studies and research and data analysis in any collaborating universities abroad. The efforts will help Thailand to improve its research capacity and university infrastructure (www.trf.org.th). The government also funds the Health System Research Institute.[14–16] These new programmes have highlighted the need for transparency and the importance of rigorous peer review. Other approaches to capacity strengthening include the award of non-bonded research grants to PhD students studies in local universities that have good links to reputable institutions in the North.[14]

Fig 2 Getting research into practice in rural Thailand

The way forward

In response to growing global health threats (including climate change, AIDS, tuberculosis, malaria, and epidemics of Nippah virus, which causes an encephalitis that is associated with a high mortality) and the transfer of health risk, developing countries and international donors need to invest in health research capacity building. Developing countries must be empowered to participate in debates and decisions about priority setting, regulatory frameworks, and codes of ethics for research collaboration. A good starting point for this is for countries in specific regions to start to cooperate to tackle common regional health problems. Representatives from the region can interact with other regions to reduce global health threats.[17] Mechanisms must be introduced to ensure that investment in research capacity building results in sound equable health governance. Politicians, professional groups, non-governmental organisations, and the public and private sectors must work together at all stages of research development and implementation.

The relative success of agricultural research under the direction of the Consultative Group on International Agricultural Research (CGIAR) may provide a lesson for the health sector.[18] CGIAR has successfully raised awareness of key issues, harnessed the expertise of independent scientific advisory committees, and created great donor solidarity.

Adopting a philosophy of *kalayanamitra* (friends-helping-friends) and intelligent solidarity will help promote a commitment to research to equity in health development.

We thank those who enabled us to participate in several key activities related to research capacity strengthening in developing countries, which form the basis of the argument in the paper; most notable are a special advisor to the Oslo study on the performance of the World Health Organization; the coordinator of the Asian dialogue to raise the Asian voice in health research; a consultant in the study on the cost benefit of the Government investment in health research by the Thailand Rating and Information Services. Special thanks to Drs Kelly Lee and Tessa Richards for making suggestions for revision of the document.

SEAN SPRAGUE/PANOS PICTURES

Fig 3 Vaccination in Bangkok: countries need to cooperate to tackle common regional health problems

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Commentary: Health research and human development in Papua New Guinea

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Because of the enormous health problems they face, less developed nations should give particular support to health related research, but regrettably this is rarely so. Sitthi-amorn and Somrongthong explore the global context of this inadequacy and discuss the elements required to develop research capacity. There are, however, a small number of health research institutes in developing countries that have already created national programmes of essential health research. The Papua New Guinea Institute of Medical Research is such an organisation.

The primary activity of the institute is conducting research into the health problems of the people of Papua New Guinea. Major programmes have been established in respiratory diseases, malaria, malnutrition, enteric diseases, sexual health and women's

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health, and the quality of this research is internationally recognised; it is raising global knowledge while informing local public health policy.[1]

One of the strengths of the Papua New Guinea Institute of Medical Research is that it has always taken a broader focus than the medical "problem." The studies have brought clinicians, epidemiologists, and laboratory workers together with anthropologists and behavioural scientists and, most importantly, the participating community, to look at disease in context, rather than as a series of isolated "puzzles." The interdisciplinary structuring of the institute is a rare model in medical research, but one which has undoubtedly made its work directly relevant to national health policy.

Building such an institution requires support, both financial and intellectual, and the form of this support is critical to maintaining independence and equity. The Papua New Guinea Institute of Medical Research receives substantial core funding from the national government, an act of foresight in a country that struggles to afford curative care. This is an important moral anchor, compelling the institute to deliver value, in terms of evidence to inform health policy. The use of this support to maintain a strong infrastructure means that the value of the research programme is multiplied through securement of external project funding. Much of this funding flows through collaboration with colleagues overseas, and a network extending through Australia, Europe, and North America allows the institute to benefit from project funding by such agencies as National Institutes of Health, the European Union, and the Wellcome Trust.

Significantly, many of these international colleagues have worked in Papua New Guinea for long periods and have made commitments not primarily based on self interest. Moreover, they have worked under the direction of the national system to help develop a national research institute, with up to date technical competence and with a strong research focus on health problems perceived as important by the community. These collaborations have also created many training opportunities for local scientists at all levels and prevented any feeling of intellectual isolation.

A unique aspect of the institute's international collaborations is that the benefit of partnership extends beyond simple twinning arrangements. The many different groups with long term research interests in Papua New Guinea have formed a "buttressing coalition" that crosses the boundaries of national or scientific interests. These include the Walter and Eliza Hall Institute, the Wellcome Trust Centre for Epidemiology of Infectious Diseases and Case Western University. Under the coordination of the Papua New Guinea Institute of Medical Research, the members communicate with each other to provide collective support for the development of the institute's general research infrastructure. It is certainly a refreshing experience to see scientists trying this alternate model of working, and benefiting as individuals from their contribution to a collective goal.

Government to government development aid funding, particularly from Australia, is an increasingly important source of support for health research in Papua New Guinea. Recognition of research as a critical element of health and human development is a satisfying victory for the committed lobbyists of the regional medical and scientific community. The Papua New Guinea Institute of Medical Research adheres to a simple formula in this respect: "no research without development; no development without research."[2] It is critical, however, that foreign government assistance remains a partnership that supports the agenda of the institute, not a directive that subverts it.

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Commentary: Does strengthening research capacity improve health equity?

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Sitthi-amorn and Somrongthong make the assumption, as do most international experts in public health, that further strengthening the research capacity of scientists and institutions in developing countries is unequivocally worthwhile. It is often stated that this will improve health equity and generate more and better information for national policy makers than has been the case in the past.

Yet after 20 years of activity to strengthen research capacity and millions of dollars of investments, we still know so little about the impact of these efforts. Individual programmes and projects have gone through their usual donor-driven evaluation cycles, but there is little systematic information available to evaluate the investments or inform new initiatives. Many programs count the number of scientists trained, others count the number of studies funded.[1] Most capture the reports and publications that have emerged from the investments, though much of the knowledge is not readily accessible as it never reaches the peer-reviewed published literature. Some have tried to measure the impact of published work by counting the frequency that the work is cited in other literature.[2] The contribution of research capacity strengthening in improving health equity is completely unmeasured and has been little more than a rhetorical, though important, goal statement.

Efforts are under way to address these deficiencies. The research capacity strengthening unit of the World Health Organization's tropical disease research programme and the applied research on child health project, at the Center for International Health at

Boston University, are working together to develop systematic criteria for the evaluating investments in strengthening health research capacity. Their activities have been driven by programme officers' desire to know if the research capacity strengthening investments make sense and spurred by the demands of donor agencies to document the results and impacts of the investments.

Three levels of impact are being measured: on individual researchers, national research insitutions, and the global health research system. Special attention is being paid to develop measurable indicators of the impact of these research investments on improvements in policies and programmes. Linking changes in population health status to specific investments in health research and capacity strengthening is extremely difficult. More progress has been made in developing a consensus on indicators of individual research skill development, research productivity, and individual career development. Measuring improvements in equity still has a long way to go. The Rockefeller Foundation has identified this as one of the subthemes of its health equity programme (www.rockfound.org/programs/healthequity/).

Those of us committed to strengthening health research capacity believe that an honest, systematic evaluation of the impacts of these efforts is becoming increasingly important as global scientific and political imperatives lead us into an era in which more funds will be invested in developing country scientists and institutions. Boosting the quantity and quality of scientific research carried out in developing countries is essential. But it is equally essential that the inevitably limited resources are well spent. This type of honest appraisal is a key element of *kalayanamitra,* or friends-helping-friends.

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Health technology transfer

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Global health relies on biomedical scientists and public health workers to solve infectious disease and other health problems at a local level. Yet investigators in developing countries face tremendous obstacles; scientific isolation, insufficient technical training and research tools, a lack of up to date scientific information, and limited financial, material, and human resources. To build local scientific capacity to monitor and control disease and to promote health, research on locally relevant issues must be supported and sustainable partnerships built to facilitate these efforts. We discuss key elements for transfer of technologies in health research and present two case studies of such programmes.

Summary points

- More funding must be made available to scientists in developing countries and to organisations that support in-country training and research
- Genuine partnership and mutual trust is a prerequisite for the sustainable transfer of technology from developed to developing countries
- Building local scientific capacity and long term North-South and South-South partnerships are important in establishing effective health research programmes
- Research topics should have local relevance and priority, and technology transfer should be participatory, equitable, and sustained
- Autonomous research centres attract funding and reduce administrative burdens

Developing countries need up to date technologies

Though 93% of the world's burden of preventable mortality occurs in developing countries,[1] too little research funding is targeted to health problems of developing countries, creating a dangerous funding differential.[2] In addition, many modern laboratory technologies remain inaccessible in these nations. Both utilitarian and humanitarian arguments can be made for training scientists and health professionals in developing countries in the use of modern laboratory and epidemiological skills. It takes only a day or two for a pathogen to get from any one place on the planet to any other; thus, building capacity in developing countries is a necessary strategy for preventing the global spread of infectious agents.[3] Additionally, as a matter of principle, all countries, especially those with high burdens of disease, should have access to the most effective tools to control their infectious disease problems.

Key elements in technology transfer

Through transferring biomedical technologies and conducting collaborative research in resource poor countries, we have identified key elements in the technology transfer process. In addition to technical issues, successfully implementing a new technology depends on economic support, political cooperation, functional infrastructure, good communication, and an understanding of sociocultural issues, and environmental concerns. Though likely to be beyond the direct control of the investigator, these factors can be

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Details of the case studies are available on the BMJ's website