

Review Article

Building and Strengthening Research Capacity in Health: the Challenge to Africa*

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INTRODUCTION

One of the most refreshing concepts that has emerged during the last few decades is that of human development. In the past, human development was confused with the "technical consideration of the means to achieve it - and the use of statistical aggregates to measure national income and its growth" (1). Now a growing realisation and acceptance has come into focus that the objective of development is to benefit people, and that human development is a process of enlarging people's choices. "These choices should include access to income and employment opportunities, education and health, and a clean and safe physical environment (1,2)."

United Nations Development Programme proposed a human development index that combined national income with two social indicators - adult literacy and life expectancy. Life expectancy captures the totality of good health spanning from birth to death and incorporates nutrition, safe water supply and sanitation, access to health services, healthy life style, etc. The list of ranking by human development index places all but six African countries in the category of low human development. This observation closely tallies with the level of health research in African countries.

Health research has received increased attention during the last few years. I have been privileged to be associated with some of the groups involved in the discussion of this subject, and I wish to acknowledge that I have liberally included some of the ideas and findings in this paper (3-5).

Why health research. To some (and hopefully to a diminishing few), health research conjures an image

of sterile new buildings, test-tubes, expensive electronic gadgets, scientists in white gowns vociferating amongst themselves "on how many angels can dance on the head of a pin". These persons think that scarce resources are being squandered for activities that have little or no immediate relevance. To them health research is a luxury that poor nations with competing demands and scarce resources can ill afford. Of course sins have been committed in the name of medical research. Some of the specific criticism can be labelled as just and instructive, some as misinformed, but most fail to highlight the human gains from health research. They forget, for example, that health tools that are now in use have been developed through research. The strategies of primary health care, child survival, family planning, and nutrition programmes are a direct consequence of previous research.

Perhaps the most compelling justification for health research is that it is necessary to guide health action and implement health programmes by providing information necessary for understanding the health problems and to make decisions on the options available to resolve these problems. The efficiency and effectiveness of health programmes are compounded and assured if these are based on health research.

Another reason for health research is that it enables savings of money and multiplies benefits. Several examples can be quoted to illustrate this but I will cite two that have evolved from research at the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B).

The development of the oral rehydration salt solution for the treatment of diarrhoea is a classical example. Diarrhoea claims several million lives annually. The treatment for dehydration with intravenous solution is not only expensive but requires a fixed health facility with trained staff to administer it. In a series of studies conducted mainly in

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Bangladesh at the ICDDR,B, a treatment was developed that was very cheap, could be administered by mouth, corrects dehydration, and more significantly can be given by mothers as well as by health personnel. UNICEF has recently estimated that around a million lives are being saved yearly with the intensification of the application of this technology by Third World countries.

Research in family planning is another example (6). Overpopulation is one of the most important problems facing development efforts in Bangladesh. Accordingly, the ICDDR,B undertook research on the determinants of fertility and on optimal methods to deliver family planning programmes in a community with high illiteracy rates, low income and conservative traditions. These studies demonstrated that family planning programmes can succeed even in difficult settings when properly designed and implemented. The critical factors for success were found to be outreach activities and a female-based work force, proper record keeping and supervision, emphasis on providing a broad range of contraceptive methods, an effective system of referral and medical support, and emphasis on quality of services. The fertility decline reduced maternal mortality rates, crude death rates and child mortality rates. Of great importance, the studies showed that mortality does not have to decline before the fertility effects of family planning services will be seen.

Moreover, the family planning programme was shown to be replicable within the government's family planning programme, and Bangladesh has one of the best family planning programmes in the developing world.

A less urgent but no less important reason for health research is that it is necessary to develop new interventions. Although application of existing health technologies will save many lives and improve the health status of people, there is a crying need for new interventions that are either an improvement over existing ones (safer, cheaper), or are easier to apply. There are also many health problems for which there is no existing solution. This latter has come into focus with the emergence of the acquired immune deficiency syndrome as one of the greatest health challenges facing the African continent (and the world). There are a number of health problems limited mainly to Africa for which the responsibility to find solutions rests primarily with Africans.

Finally research should also be perceived as a means to introduce a culture of enquiry, inquisitiveness, and the application of the scientific method to problem solving.

State of health research in Africa. Africa's performance in science and technology, on research and development, and specifically on health research is severely wanting and calls for an urgent remedial action. The report entitled "Health Research: essential link to equity in development" analyses the state of health research worldwide and identifies

strengths and weaknesses (3). Many of the general observations in the report on developing countries are relevant to Africa. These include the great diversity amongst countries in performance of health research, the weak research capacity and low productivity, the severe dearth of health research manpower, and a common pattern of constraints for conducting research.

Researchers. The great shortage of scientific manpower is magnified by the fact that the few health professionals attempting to conduct research are often overwhelmed by routine service duties. Their salary is unattractive; they are intellectually isolated and have a restricted research agenda. Furthermore, they receive little understanding or encouragement from government bureaucrats.

Institutions. Although some developing country institutions compete with the best in the world, the majority suffer from serious constraints. Resource constraints include inadequate laboratory equipment, computers, etc.; lack of well-trained support staff; restricted mobility in the field, etc. These are compounded by misappropriation of funds and the inevitable cuts in research funds, and the bureaucratic and often inefficient research administration machinery. Health research is conducted in 1) university departments offering graduate and postgraduate education, and medical schools, 2) research institutes, 3) concerned (epidemiology, disease control) divisions of Ministries of Health, and 4) rarely, government and non-government organisation health facilities. The most productive are institutions conducting postgraduate education in which research is an integral requirement for graduation. In most of Africa, these institutions account for as much as 75% of all output.

During the last few decades several new medical schools have been established with postgraduate programmes in both basic medical sciences and clinical sciences, and the enrolment in universities has burgeoned. Schools of public health hardly exist in Africa and partly explain why health services research and operational research have attracted less attention. This is in part the legacy of colonial and neo-colonial dependence on the numerous schools of tropical medicine in the developed world that attract African students for training. However, this training is not always relevant and frequently ends in a reverse flow of brain power.

Health Information System. Another major problem is lack of easy access to health information and to information retrieval systems. Research thrives in an atmosphere where there is a critical exchange of views, where a system of peer review is in practice, and where health professionals from diverse specialities, such as basic medical science, epidemiology and public health, social science, etc.,

work and interact together. Such an environment is hard to come by in developing countries.

Demand for Research. The genesis of the existing state of health research lies in the lack of social appreciation and demand for research, and the fact that the research often fails to address the urgent needs of the people as well as of policy makers.

Finance. Sub-Saharan Africa spends less than 0.5% of the total global expenditure on research and development (global total was \$208 billion in 1980) (3). Worldwide investment in health research is estimated to be about \$30 billion, but only 5% (\$1.6 billion) is devoted to the health problems of developing countries, which account for 93% of the years of potential life lost in the world. Developing countries invested only 2.2%. There is evidence to indicate that due to economic difficulties, this amount has been declining over the past decade. Although accurate figures are not available, expenditure on health research is not likely to exceed \$100 million.

According to the World Bank, African research systems depend heavily on public sector support with government treasury meeting as much as 90% of the national research budget (7). This has its own price since in times of scarcity and competing demands, one of the first budgets to be slashed is that of health research. Indeed, the past decade has seen a steady deterioration of research and educational infrastructures in Africa and a slowing or even decline of research capability building. Bilateral and international assistance for health research constitute an important source of funds and, indeed, where research is not accorded high priority a high proportion of total runs come from outside, inevitably not without strings.

Type of Research. Most of the research conducted has a strong bias towards clinical disciplines, and is mainly descriptive in type. Population-based prospective studies are rare, as indeed is research that helps formulate policies and specific action plans. However, despite all the handicaps a few high quality research results have come out of Africa that have had global impact. The contribution of Uganda to a better understanding of severe protein-energy malnutrition and to a lymphoma that bears the name of the person who drew attention (Burkitt's lymphoma) are just two examples that immediately come to mind. In Ethiopia, the discovery of the plant "Endod" as a naturally occurring molluscicide pointed the way to a cheap control of schistosomiasis (8).

Indeed, there are many more, and Africans can be justly proud of them (9). Yet while we are struggling down the early paths of the industrial revolution, the rest of the world is in the throes of another revolution - that of the scientific revolution. An explosion of new knowledge in the biomedical

(as well as the natural) sciences including molecular biology, microbiology, immunology, biophysics and genetics, and the use of this knowledge in developing biotechnology for diagnosis, prevention and treatment have opened new possibilities for disease control not thought possible before. This newly acquired knowledge, as well as the traditional proven remedies, has to be seen in the light of the disease pattern seen in Africa, namely, the "pre-transitional" group of infectious and parasitic diseases, and reproductive and perinatal health problems, as well as the "post-transitional" chronic and degenerative diseases, such as cancer and circulatory diseases. Africans have the worst of both worlds!

How can Africa utilise health research to satisfy the calls and demands of its people for the right to live a healthy life?

The ENHR Strategy - Pathway to Effective Health Research. The recommendation of the Commission on Health Research for Development constitutes, in my opinion, the foundation stone for any strategy to promote health in the African continent. The Commission recommended the following (3):

- 1) All countries should vigorously undertake essential national health research (ENHR) to accelerate health action in diverse national and community settings, and to ensure that resources available for the health sector achieve maximum results.
- 2) The national efforts of developing countries should be joined together with efforts in industrialized countries in international partnerships that mobilize and focus the world's scientific capacity on the highest-priority health problems.
- 3) Larger and more sustained financial support from international sources should be mobilized to supplement investments by developing countries.
- 4) Finally, an international mechanism should be established to monitor progress and to promote financial and technical support for research on health problems of developing countries.

The concept of ENHR is not new. What is new is the clear articulation of what type of health research is essential for developing countries. The excellent description of ENHR in a recent book "A Strategy for Action in Health and Human Development", a companion of the report of the Commission on Health Research for Development, is relevant (10).

ENHR is an integrated strategy for organising and managing research, whose defining characteristics include its goal, its content and its mode of operation:

- ENHR's **goal** is to promote health and development on the basis of equity and social justice.
- ENHR's **content** includes the traditional types of research commonly described as epidemiology, social and behavior-

ral research, clinical and biomedical research, health systems research, and policy analysis; but it is specifically oriented toward the most important problems affecting the population, with particular emphasis on the poor, disadvantaged and other vulnerable groups whose health needs are often overlooked or ignored.

ENHR's **mode of operation** is characterized by inclusiveness, aiming to involve researchers, health care providers, and representatives of the community in planning, promoting and implementing research programs. In order to ensure appropriate input from various disciplines, ENHR should promote multidisciplinary and intersectoral research. It should establish mechanisms to close the gap between research and application, ensuring that the results of research are effectively translated to action; that objective scientific analysis guides policy and action; and that those involved in setting priorities for health research take note of problems identified by health care givers, policy makers and the public at large.

Each African country should have the capacity, in the first instance, to assess the major health problems of its people through a systematic collection of reliable data and then to identify and apply the available health technology to resolve these problems within the context of the country. The process is not only country-specific but also specific within the country, with regard to locality, age, gender - urban/rural, socio-economic status, etc. This is the very minimum and should form the foundation of ENHR. The other components include development of new interventions against health problems for which there are no satisfactory control measures, and research advancing the frontiers of knowledge in health which will benefit people across boundaries and reflect a country's moral commitment to humanity.

What are the attributes that confer capacity to conduct ENHR?

1. **Human resources.** A critical mass of researchers representing different disciplines including physicians, epidemiologists, health economists, biologists, biostatisticians, and social scientists. A mix of biomedical and social scientists is critical. Human resources also include research support staff such as laboratory technologists, field interviewers, maintenance personnel, data analysts, etc. These persons should have access to adequate training to acquire the necessary competence and skills required of their discipline. People rather than facilities are the key to successful and productive research.
2. **Institutions.** Viable institutions with the potential to "create, adapt and apply technologies to African health problems" constitute an essential element of ENHR capacity.
3. **Environment.** A conducive environment is the culture medium in which minds of researchers can grow and multiply. This encompasses the

researcher's personal environment and includes a defined career structure, satisfactory remuneration, possibility to interact with researchers elsewhere (and hence avoid intellectual isolation), and opportunities to upgrade skill and knowledge. The work environment should ensure access to information, presence of a multidisciplinary team, institutional stability and, more importantly, adequate funds for research.

Provision of the personnel and work environment assumes political commitment at the national level and hence public appreciation of research.

4. **Funds.** Secure and stable funding is necessary to conduct research. The major portion of this should be generated nationally in order to ensure sustainability. The funds should be allocated as an institutional budget and as grants for research to be allocated on a competitive basis.
5. **Dissemination of research results.** Communication and dissemination of research results to policy and decision makers, the lay public, health-care providers, and health administrators is necessary in order to enhance utilisation of the results of research, gain understanding and support of the bureaucracy, and create an informed public willing to support ENHR.

Steps required to build and strengthen research capacity in Africa. Underdevelopment rarely confers an advantage to a country or continent except perhaps in one respect. It offers the opportunity to avoid the pitfalls and mistakes and unnecessary expenditure that other countries have gone through. In designing strategies to build and strengthen research capacity in Africa, it is of immense advantage to study the development of science and technology, not only of the developed world but also of the "transitional" world such as Latin America (11). Such studies lead to the realisation that differing strategies are necessary to take into account the differing stages of development.

The recommendations that follow are generic and aim principally at the least developed of the developing world.

1. **Creation of an awareness** of the importance of health research and its link to health and development needs to be developed amongst policy and decision makers, including the highest executive. This can be started with a series of discussions on the report of the Commission on Health Research initially amongst senior officials of Ministries of Health, the Ministries of Planning and Finance, and other government bodies. It is also necessary to inform the health profession, particularly strong national medical associations, as well as others engaged in health.

Where an ENHR working group has been formed in a country, this group should spearhead the task of creating awareness. Otherwise it will be necessary to establish such a group from amongst those that are enlightened and/or are already involved in research. [The critical role played by the Commission on Health Research for Development and the Task Force on Health Research for Development in catalysing efforts to establish such working groups and in taking the role of a gentle bully of governments should be acknowledged.]

2. **Support for training** of young professionals is the most cost-effective investment in research capacity strengthening and has strategic importance since it can often be used to introduce individuals to ENHR issues. In this respect, graduate and post-graduate training programmes, including clinical specialties where research involvement is a requirement for graduation, should be encouraged because these have proven to be very useful. Where adequate facilities do not exist, the so-called "sandwich model" may be employed whereby part of the training not available in one institution can be undertaken in another where such facilities exist.

Wherever possible, early interaction of professionals between "basic medical" and "clinical" sciences and between biomedical and social sciences should be encouraged since this disciplinary mix fosters ENHR. In this respect national and regional programmes with adequate infrastructure and a large school intake tend to be more effective for attracting and building competence in junior researchers.

3. **Identification of viable institutions** with the potential to participate in ENHR is an important initial step. This should be done through a survey of existing institutions in a country. Selection has to be based in the first instance on availability of enlightened researchers who have not only some research experience but also managerial skill. Selection has to be followed by moves to strengthen the research infrastructure with provision of facilities, manpower, relevant equipment, etc.

Building a research institution is a long term process and should be undertaken progressively in phases. Cost can be reduced by sharing existing facilities in other institutions. Another important method of strengthening institutional research capacity is through networking and/or twinning. This should be done among institutions within a country, at regional level (South-South) and in the case of twinning particularly with institutions in the developed world (North-South).

Networking/twinning means reciprocation in

technical training, exchange of researchers, exchange of scientific knowledge, research collaboration, organising scientific conferences, sharing of facilities, etc.

4. **Provision of funds.** Funds for health research should be allocated by governments from their regular budget as a signal of political commitment to research and as an essential step to initiate the cascade of research development. The goal is to reach a level of at least 2% of national health expenditure in research and research capacity strengthening. How soon this should be reached depends on the existing level of support, but African governments should strive to reach this level over 3-5 years.

Bilateral and multilateral development agencies should allocate at least 5% of project and programme aid for the health sector for ENHR and research capacity strengthening, and thereby promote the conviction that health and, therefore, health research is an integral and essential component of human development.

Use of these two sources of funds should be carefully thought out to ensure complementarity. Funds from government may be used for physical infrastructure, remuneration of researchers and support staff, and other expenses on items required for research and available in the country. Bilateral and multilateral development agencies normally provide money in foreign exchange. Such funds could preferably be utilised for expenses such as purchase of equipment, books and journals, reagents, attendance at regional and international conferences, training abroad and such other services requiring foreign exchange.

5. **Patronage.** Health research needs a patron or patrons during its early growth and development. Like a newborn baby or young infant, its life is entirely dependent on support from others. It needs to be handled with care, fondled with love, guided steadily and firmly, and fed with the right food - namely funds. It should be immunised against the adversities of financial instability, bureaucratic rigidity, and disillusionment.

As recommended by the Commission, "the establishment of an international mechanism to monitor progress in health research and, when needed, to promote financial and technical support" should be endorsed by Africa.

6. **Regional and International Networking.** As the name indicates ENHR is basically a national concern. However, many of the health problems of African countries are similar and not infrequently diseases cross national boundaries without passports and entry permits. Close inter-country cooperation in surveillance

and control of communicable diseases, exchange in epidemiological information is mandatory. In addition, sharing of research output and resources is cost-effective and beneficial to all parties. Hence, networking of institutions involved in ENHR at regional and continental level is highly desirable and should be promoted. Centres of excellence may emerge for different health problems in different regions of Africa whose resources can be exploited for training and for targeting on specific health problems facing the African continent.

CONCLUSIONS

Dr. Muhammed Abdus Salaam, physicist, researcher and Nobel Laureate writes in his book "Notes on Science, Technology and Science Education in the Development of the South" (12) that

... in the final analysis, creativity, mastery and utilization of modern science and technology is basically what distinguishes the South from the North. On Science and Technology depend the standards of living of a nation. The widening gap in Economics and Influence between the nations of the South and the North is essentially the S & T gap. Nothing else neither differing systems of economics nor of governance, nor differing cultural moves, nor differing perceptions of religious thought, can explain why the North (to the exclusion of the South) can master this globe of ours and beyond."

Africa has to wake up from its slumber. The gap in science and technology is of relatively recent origin. As noted by Dr Abdus Salaam, until around 1450 A.D., predominant and exclusive leadership belonged to the Greeks, Chinese, Indians, Arabs, Africans, Persians, Turks and Afghans. Many countries, particularly in Asia, have demonstrated that the scientific revolution of the modern era can be carried out in a short span of fifty years.

We have to start now and heed the words of Alfred North Whitehead who said -

In the conditions of modern life, the role is absolute: the race which does not value trained intelligence is doomed ... Today we maintain ourselves, tomorrow science will have moved over yet one more step and there will be no appeal from the judgment which will be pronounced on the uneducated (12).

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