

# Building capacity in health research in the developing world

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**Abstract** Strong national health research systems are needed to improve health systems and attain better health. For developing countries to indigenize health research systems, it is essential to build research capacity. We review the positive features and weaknesses of various approaches to capacity building, emphasizing that complementary approaches to human resource development work best in the context of a systems and long-term perspective. As a key element of capacity building, countries must also address issues related to the enabling environment, in particular: leadership, career structure, critical mass, infrastructure, information access and interfaces between research producers and users. The success of efforts to build capacity in developing countries will ultimately depend on political will and credibility, adequate financing, and a responsive capacity-building plan that is based on a thorough situational analysis of the resources needed for health research and the inequities and gaps in health care. Greater national and international investment in capacity building in developing countries has the greatest potential for securing dynamic and agile knowledge systems that can deliver better health and equity, now and in the future.

**Keywords** Health services research/organization and administration; Education, Graduate; Staff development; Investments; Access to information; Social justice; Academies and institutes; Interinstitutional relations; Developing countries; Developed countries (*source: MeSH, NLM*).

**Mots clés** Recherche en santé publique/organisation et administration; Enseignement de spécialité; Analyse coût-bénéfice; Encouragement performance personnel; Investissement; Accès à l'information; Justice sociale; Académie et institut; Relation interinstitutionnelle; Pays en développement; Pays développé (*source: MeSH, INSERM*).

**Palabras clave** Investigación sobre servicios de salud/organización y administración; Educación de postgrado; Desarrollo de personal; Inversiones; Acceso a la información; Justicia social; Academias e institutos; Relaciones interinstitucionales; Países en desarrollo; Países desarrollados (*fuentes: DeCS, BIREME*).

الكلمات المفتاحية: تنظيم وإدارة بحوث النظم الصحية؛ التعليم العالي؛ تطوير العاملين؛ الاستثمارات؛ الوصول إلى المعلومات؛ العدالة الاجتماعية؛ المعاهد والجامعات؛ العلاقات بين المؤسسات؛ البلدان النامية؛ البلدان المتقدمة (المصدر: رؤوس الموضوعات الطبية المكتب الإقليمي لشرق المتوسط)

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يمكن الاطلاع على الملخص بالعربية في صفحة 769.

## Introduction

Developing the capacity to effectively carry out essential health research is an integral part of health research systems at both the national and global levels. WHO, the Council on Health Research for Development (COHRED), the Global Forum on Health Research and other agencies concerned with international health have consistently emphasized that a primary function of sustainable knowledge systems is to create and continuously improve the human and physical resources for health research (1–5). If the Millennium Development Goals (6) are to be achieved by 2015 building the capacity to carry out multidisciplinary research in the context of national health systems must be a priority for health researchers (7, 8).

For developing countries, the process of embedding research into their health systems requires competent indigenous scientists and a strongly supportive and enabling environment that will allow research communities to grow and deliver research goods that contribute to the health of the public. Although there has been remarkable progress over the past two decades, it has been said that “research capacity in the South remains one of

the world’s unmet challenges” (9). This is especially true for the region of sub-Saharan Africa, where health research in most countries has an allocation of less than 0.5% of national health budgets, and health budgets are funded with less than 1% of gross domestic product (10).

In this paper we review the broad approaches taken to build research capacity and the likelihood that these efforts will prove sustainable. The paper is delimited to the function of creating and sustaining resources as outlined in the conceptual framework for health research systems proposed by Pang et al. (1). We cover issues that deal specifically with human resource development, the research environment, national health research systems and financing possibilities for these functions.

## Approaches to developing human resources

Approaches to building research capacity are best viewed and understood within the broad framework of capacity development. As such, building research capacity can be defined as the ongoing process of empowering individuals, institutions, organizations and nations to:

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- define and prioritize problems systematically
- develop and scientifically evaluate appropriate solutions and
- share and apply the knowledge generated.

Taking these steps allows health and development needs to be addressed in an equitable and sustainable manner.

A combination of short-term and long-term strategies, directed at individual, institutional and country levels are necessary to develop a sustainable system of health research. Table 1 shows various complementary approaches that may be taken to build research capacity at different levels, each described in terms of the extent of investment costs and the likelihood of sustainability. Fig. 1 provides examples of capacity-building efforts that use these approaches. Ideally, efforts should build on each level of output to contribute to a national health research system and, eventually, to contribute to regional and global health research bodies or programmes as well.

At the core of Fig. 1 is training for individual researchers and research users. Through the years, many excellent masters', doctoral and postdoctoral training programmes have been offered to scientists from low-income and middle-income countries to allow them to expand their competencies. Training programmes that are more directly related to poverty and development needs, for example, are the Enhancing Research Capacity (ENRECA) programme offered by the Danish Ministry of Foreign Affairs and training offered through bilateral development cooperation programmes (11, 12). On the other hand, there are highly competitive fellowships offered by research-funding agencies such as the Wellcome Trust, the US National Institutes of Health and the Fogarty International Center, all of which put a premium on the advancement of science, whether strategic or applied. Within the context of national health research systems and institutional research plans, the appropriate balance of human resources should be carefully planned, considering both science and technology needs and development needs.

“Learning by doing” approaches, usually in the form of developmental or seed grants, hands-on training in ongoing research programmes or mentorship programmes, are effective approaches that complement academic degree offerings. They are also most appropriate for building capacity on the “demand” side so that those who use research findings understand and appreciate their value in improving health outcomes. Research users include policy-makers, programme managers, health care practitioners and representatives of civil society, all of whom should be involved in setting health research priorities and applying evidence generated from research studies.

For example, the International Health Policy Program, Thailand, builds heavily on mentoring as a tool for problem-oriented capacity strengthening. A collaboration of the Thai Ministry of Public Health and the Health Systems Research Institute, the programme offers fellowships in health policy and systems research and apprenticeships with senior researchers and policy analysts (13). Co-learning (in which the mentor and the person being mentored learn from each other) that takes place through community-based organizations and civil society groups is an important way of strengthening the skills of other research stakeholders (14). This was demonstrated in India through a series of action–research workshops and actual “learning by doing” exercises for more than 150 community-based organizations in the country (4).

The two approaches described above focus on individuals and provide relatively quick and quantifiable training outputs; these approaches serve as the backbone of human resource development for national research systems. However, without a coordinated national plan and a strong enabling environment to support trained scientists, brain drain is likely to occur (15). The United Nations Educational, Scientific and Cultural Organization (UNESCO) has estimated that for research and development in 2002, there were on average 3 researchers out of every 1000 residents in developed countries compared with 3 out of every 10 000 in less developed countries (16). These

Table 1. Matrix of capacity-building strategies, likelihood of sustainability and research focus

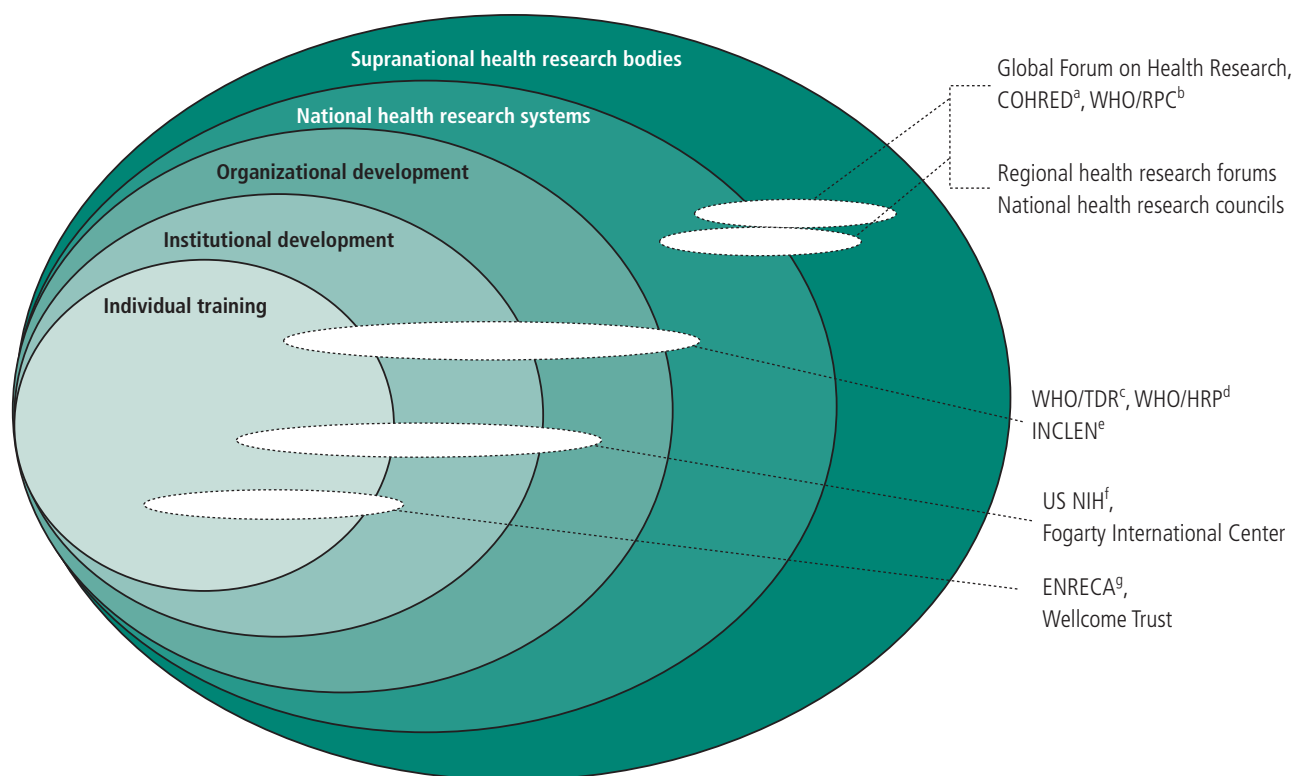
Entity targeted	Approach to capacity building			
	Graduate or post-graduate training	Learning by doing	Institutional partnerships between developing and developed countries	Centres of excellence
Individual <sup>a</sup>	+++	+	++	+
Institution	+++	++	+++	+++
Network	++	++	+++	++
National level	+	++	++	+++
Supranational level		++	+++	++
Financial investment <sup>b</sup>	++	+	+++	+++
Research focus →				
Likelihood of sustainability <sup>c</sup> →				

<sup>a</sup> + indicates the entity is targeted sometimes; ++ it is targeted moderately often; +++ it is frequently targeted.

<sup>b</sup> Plus signs in this row indicate the extent of financial investment needed by national health research systems or funding agencies: + for low; ++ for medium; +++ for high.

<sup>c</sup> Plus signs in this row indicate the likelihood of sustainability of various approaches: + for fair; +++ for strong.

Fig. 1. Examples of efforts to build research capacity, ranging from individual to global movements



<sup>a</sup> COHRED: Council on Health Research for Development.  
<sup>b</sup> WHO/RPC: WHO Department of Research Policy and Cooperation.  
<sup>c</sup> WHO/TDR: Special Programme for Research and Training in Tropical Diseases.  
<sup>d</sup> WHO/HRP: Special Programme of Research, Development and Research Training in Reproductive Health.  
<sup>e</sup> INCLEN: International Clinical Epidemiology Network.  
<sup>f</sup> US NIH: National Institutes of Health, USA.  
<sup>g</sup> ENRECA: Enhancing Research Capacity, Danish Ministry of Foreign Affairs.

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estimates underscore the global inequities in terms of training opportunities and retention of scientists in low- and middle-income countries.

A third broad approach that directly attempts to address such inequities is the creation of partnerships between developing and developed countries, and among developing countries themselves. This approach builds on the training of individual researchers but consolidates efforts so that outputs are greater than the sum of isolated efforts. There are many examples of institutions or groups that share similar interests collaborating through different arrangements, such as networks, coalitions and alliances across country and regional boundaries (17–19). For example, the Task Force on Malaria Research Capability Strengthening in Africa, a programme of the Multilateral Initiative on Malaria that is coordinated by the WHO Special Programme for Research and Training in Tropical Diseases (WHO/TDR), has provided grants to African investigators to work in partnership with European countries and the United States, while at the same time providing the means and context for training graduate students and postdoctoral fellows and promoting networking activities (20).

Potential gains from partnerships have included increased access to new ideas and best practices, technical expertise, and resources; wider coverage and impact of research benefits; and an

increased probability of sustainability, recognition and leverage of the research partnerships. However, mutually beneficial partnerships are often difficult to maintain. The costs of partnership include a loss of autonomy, the financial costs associated with the organizational functions of the partnership and, most importantly, the increased time and effort needed to build trust, create feelings of ownership, share decision-making, promote transparency and sustain indigenous research capacity (18, 19).

A fourth general approach to capacity building deals with efforts to create outstanding research groups at national and international levels. Such centres of excellence are numerous in developed countries, where recognition garners substantial support from multiple sources. This model has been extended to low- and middle-income countries. The US National Institutes for Health, for example, has promoted links between US institutions and leading research centres in developing countries, providing high-quality fellowships and on-the-job training in the context of well-funded international research programmes. In particular, the International Centers for Excellence in Research programme provides long-term research collaboration and research training at sites in India, Mali and Uganda (21).

Although these centres offer the greatest likelihood of sustainability and ensuring consistent quality in capacity building, they are difficult to set up in the developing world. They

require considerable “buy in” from national decision-makers or universities, are sensitive to the leadership of committed individuals, generally require substantial international funding over the long term, and are a fertile ground for headhunting from the private sector and international agencies. The latter is especially true for centres in developing countries, which run the risk of becoming ivory towers for externally-driven research agendas and a field site for scientists from developed countries (10).

## Issues related to the research environment

Identifying and training the right set of individuals with expertise in generating and using knowledge is only one of many essential steps in capacity building. The bigger challenge is to continually enhance the research environment to maintain the interest of researchers and those who use the research.

A study by Hyder et al. examined the effects of doctoral training in Pakistan (22). The most important problem identified after training was the lack of an enabling environment; this was characterized by a lack of competent institutional leaders, insufficient funds for research and salaries, poor career structure and inadequate infrastructure. The most telling indicator was that only 2% of people with doctoral degrees had had more than two grants after training, even though doctoral training had been completed as many as 15 years earlier (22). In contrast, in Africa, despite the fact that many research and development grants had been awarded, the inequities in the research environment made many capacity-building efforts unsustainable. Common problems cited with capacity building in Africa are the dependence of African researchers on funds from research institutions and donors in developed countries, the gross differences in salary scales between national and international entities, and an inadequate dissemination and uptake of research results by the countries (23).

Two important “disabling factors” common to most low- and middle-income countries are the inequitable access to scientific and technical information (24) and the dearth of active engagement with research communities. Because of the generally small number of scientists in any single unit or institution in a developing country, research communities that reach beyond institutions, countries and regions have a critical role to play in strengthening the research environment. Additionally, e-learning strategies that can be used to accelerate knowledge sharing should be explored but with due attention paid and resources given to overcoming the digital divide.

Building critical mass within academic and research centres has been an important part of the institution-building efforts of international programmes such as WHO/TDR, the WHO Special Programme of Research, Development and Research Training in Reproductive Health (WHO/HRP) and the International Clinical Epidemiology Network (INCLEN) (25–27). Additionally, in the year 2000, the INCLEN Trust changed its governance structure to facilitate research and training operations at the level of regional clinical epidemiology networks. Similarly, over the past three years, autonomous regional health research networks have also been established in Africa, Asia, Latin America and the Caribbean to consolidate efforts on health research priorities common to the respective regions (10, 28, 29). However, although networks established by developing countries have been hailed as a positive step towards promoting indigenous research communities, obtaining long-term core support for supranational coordination and networking has been difficult.

The demand side of the health research system has often been neglected when enabling research environments have been created. Many stakeholders in the private sector of developing countries, as well as potential research sponsors and consumers of research, do not place a high value on health research led by indigenous scientists. Conversely, many researchers fail to nurture such relationships or lack the skills to create sufficient demand (30). A survey conducted by the Alliance on Health Policy and Systems Research suggested there was limited engagement between researchers and external actors and that researchers had little influence on policy-making but, paradoxically, the researchers themselves perceived interactions with policy-makers to be generally satisfactory (31). With the growing use of the Internet to gain access to health information, the need to educate the public and health-care practitioners to demand and use good evidence for decision-making is becoming increasingly important. Both users and producers can learn from each other.

## Strengthening national health research systems

National health research systems must be strengthened so they can effectively create and sustain human resources for health research. Middle-income countries, such as Brazil and India, which have made relatively large investments in science and technology, have made major scientific advances through the work of their research institutions and councils. On the other hand, low-income countries, such as the United Republic of Tanzania, have made steady progress by systematically determining which are their national priorities for health research and by developing a national health plan.

Not only are political will and vision needed to support a national research system but so are competent leaders who can energize and mobilize the entire system. Leadership and management competencies need to be developed among the stewards and managers of each country’s research system. An important competence is the ability to carry out situational analyses of the various components of the system. There should also be wide agreement among stakeholders on a key set of indicators and benchmarks that will be used to assess the system’s performance. These indicators should not only measure the number and salary scale of research and development personnel and the number of research grants, functional laboratories and peer-reviewed publications but, more importantly, should assess the research environment. They should cover the following aspects: the extent to which the requisite scientific disciplines become part of national institutions, the ability to foster a new complement of scientists and allow research stakeholders to network formally and informally, and the accessibility and comprehensibility of scientific information.

Other leadership and management skills that need to be cultivated are: strategic planning; research priority setting; knowledge management; advocacy and demand creation; consensus building and negotiation; resource generation and allocation; partnership building across many stakeholders; communications, including virtual forms of networking; financial management; and systems performance assessment. At the macro-level, managers of the national research system must have the ability to effectively interact not only with the health system itself but also with other sectors such as education, science and technology, and finance (32).

## Financing national capacity building

Greater investments in health research are associated with better health outcomes for populations (33). The primary responsibility for investing in research and capacity building rests on the developing countries themselves; only by taking this responsibility will they be able to develop indigenous research capacity that responds to the country's own needs and priorities. For countries to assert national sovereignty and reduce colonialist tendencies in capacity building, it is necessary that they have the political will to redirect budget priorities towards health and health research.

But this is easier said than done. In a study of resource flows for health research in several countries, only Brazil and Cuba were found to have devoted 2% of health expenditures to health research and development (34); this is the minimum figure recommended by the Commission on Health Research in 1990 (35). In most countries in sub-Saharan Africa, where the annual per capita expenditure for health is less than US\$ 50 and is negligible for health research (36), the priorities for health research and capacity building may be distorted by the interests of donors and institutions from developed countries.

There are a few innovative schemes for financing national health research systems, including capacity development. Latin American countries have adopted taxation and other financial schemes to raise revenue for health research. For example, in the early 1990s the Colombian National System of Science and Technology, through the Institute for the Development of Science and Technology, financed health research with funding obtained from development bank loans, especially from the Inter-American Development Bank. Moreover, in 2001 a law was enacted in Colombia to create a health research fund drawn from 7% of the revenues of the lottery and other games of chance in the country, and a decree was later enacted to specify how the law was to be managed (Law No. 243, Article 42 and Decree No. 2878, respectively). In the Philippines, a former minister of health has found that allocating 1% of all sources of government revenues for health-related activities would potentially raise between US\$ 18 million and US\$ 54 million per year for a health research endowment fund (J. Galvez-Tan, personal communication, 2003). This idea has been written into a bill sponsored by another former minister of health who is now in parliament.

Whether funds for the national health research systems are raised through public funding for health research and development, novel taxation schemes, health research-for-debt swaps or supplementary support from international funding and development agencies, the custodians of such funds should ensure that a good proportion is allocated to capacity building; this should include programmes that enhance the research

environment. For most multilateral and bilateral agencies, the proportion of funds devoted to building research capacity has been around 60% of the total funds allocated to health research. In contrast, philanthropic foundations and research institutes in developed countries that support research in developing countries have devoted less than 1% to capacity building or not disaggregated it from the total fund for health research (34).

## Recommendations and conclusions

Developing countries that explicitly commit to strengthening their national health research systems should also invest adequately to ensure that human resources are developed, infrastructure is put in place and the research environment is strengthened. The proportion of health research funds committed depends on the maturity of the health research system, the nature of the plans to develop capacity and the absolute amount of funds available, but for forward-looking health research systems, capacity building is an essential budget item.

In addition, national health research systems, and institutions within these systems, should ensure that a certain proportion of research and development funds from external agencies are committed to national or local plans to develop the competencies and number of researchers. In many developing countries, well designed plans are formulated only after a thorough situational analysis has been done. At the regional or global level, part of this analysis should document and analyse successes and lessons learnt from countries and organizations that have devised innovative financing schemes for health research. This kind of knowledge sharing will help developing countries adopt and develop improved ways of supporting their own national health research systems and also include plans for capacity development.

Although financing is a paramount concern for capacity development, funds alone will not adequately address the inequities in health research. Political will and vision are needed at the highest levels of government, and committed and competent leaders must be developed to act as stewards of the health research system.

The models for capacity building adopted by any one country to carry out the national research agenda will depend on the level of maturity of the research system and the resources available. The models outlined in this paper are complementary approaches but efforts should be made to integrate the building of short-term and project-oriented skills with a more comprehensive and sustainable human resource development plan that addresses the continuing challenges and health inequities in the developing world. ■

**Conflicts of interest:** none declared.

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## Résumé

### Renforcement des capacités de recherche en santé dans le monde en développement

On a besoin de systèmes nationaux de recherche en santé forts pour améliorer les systèmes de santé et atteindre un meilleur état sanitaire. Pour « indigéniser » les systèmes de recherche des pays en développement, il est essentiel de renforcer les capacités de recherche de ces pays. L'article passe en revue les aspects positifs et les faiblesses de diverses stratégies de renforcement des capacités, en soulignant que ce sont les démarches complémentaires du développement des ressources humaines qui

donnent les meilleurs résultats dans une perspective cohérente et à long terme. En tant qu'éléments clés dans le renforcement des capacités, les pays doivent traiter les problèmes liés à l'obtention d'un environnement dynamique, en particulier la qualité de l'encadrement, la structure des carrières, la masse critique, les infrastructures, l'accès à l'information et les interfaces entre les auteurs de travaux de recherches et les utilisateurs de ces travaux. Le succès des efforts pour renforcer les capacités des pays en

développement dépendra en fin de compte de la volonté et de la crédibilité politiques, de l'adéquation des moyens de financement et de l'existence d'un plan de renforcement des capacités réactif, reposant sur une analyse approfondie de la situation des besoins pour la recherche en santé et des injustices et des lacunes dans les soins de santé. Une augmentation des investissements nationaux

et internationaux dans le développement des moyens d'action des pays en développement offre les plus grandes chances d'obtenir des systèmes de connaissances dynamiques et agiles, capables d'apporter une meilleure santé et une justice plus grande, à l'heure actuelle et dans l'avenir.

## Resumen

### Creación de capacidad de investigación sanitaria en el mundo en desarrollo

Se necesitan sistemas nacionales robustos de investigación sanitaria para mejorar los sistemas de salud y conseguir mejoras sanitarias. Si se quiere lograr que los países en desarrollo indigenicen los sistemas de investigación sanitaria, es fundamental crear capacidad de investigación. Examinamos aquí los puntos fuertes y débiles de diversas estrategias de creación de capacidad, resaltando que donde mejor funcionan los enfoques complementarios de las actividades de desarrollo de recursos humanos es en el contexto de una perspectiva sistémica a largo plazo. Como factor clave del aumento de la capacidad, los países deben abordar también los aspectos relacionados con lo que constituye un entorno propicio, en particular el liderazgo, las posibilidades de carrera, la masa crítica, la infraestructura, el acceso a la información y

los puntos de contacto entre los productores de investigaciones y los usuarios de las investigaciones. El éxito de las actividades de creación de capacidad en los países en desarrollo dependerá en último término de la voluntad y credibilidad políticas, de una financiación suficiente y de un plan de desarrollo de capacidad que sea responsivo y esté basado en un detallado análisis situacional tanto de los recursos necesarios para las investigaciones sanitarias como de las inequidades y brechas existentes en la atención de salud. Una mayor inversión nacional e internacional en la creación de capacidad en los países en desarrollo es la alternativa con más posibilidades para conseguir unos sistemas dinámicos y ágiles de adquisición de conocimientos que hagan posible una mejor salud y una mayor equidad, ahora y en el futuro.

## ملخص

### بناء القدرات في البحوث الصحية في البلدان النامية

وإتاحة المعلومات، الاتصال بين المنتجين للبحوث والمتفيعين بها. ويعتمد النجاح في الجهود المبذولة لبناء القدرات في البلدان النامية بشكل نهائي على الإرادة السياسية والمصادقية السياسية، والتمويل الكافي، وعلى خطة سريعة الاستجابة لبناء القدرات مرتكزة على تحليل شامل للوضع الخاص بالموارد اللازمة لإجراء البحوث الصحية ومعالجة الجور وسد الفجوات في الرعاية الصحية. إن المزيد من الاستثمار الوطني والدولي في بناء القدرات في البلدان النامية له أكبر قدرة على تأمين نُظم معلومات ديناميكية ورشيقة يمكنها أن تحقق وضعاً أفضل من الصحة والعدالة والمساواة في الوقت الحاضر وفي المستقبل.

الخلاصة: تبرز الحاجة إلى نُظم القوية للبحوث الصحية الوطنية لتحسين نُظم الصحة ولبلوغ مستوى أفضل من الصحة. كما تبرز حاجة البلدان النامية إلى بناء القدرات البحثية لتوطين نُظم البحوث الصحية. ونستعرض في هذه الورقة الملامح الإيجابية وجوانب الضعف في مختلف الأساليب المتبعة لبناء القدرات، مع التأكيد على أن الأساليب التكميلية لتطوير الموارد البشرية تحقق أفضل أداء في ظل منظور طويل الأمد يعتمد على تعدد النظم. وينبغي على البلدان الاهتمام بالقضايا المتعلقة بالبيئة المعززة بوصفها أحد العناصر الأساسية في بناء القدرات، ولاسيما قضايا القيادة، والبنية الوظيفية، والكتلة الحرجة، والبنية الأساسية،

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