

National health research systems in Latin America: a 14-country review*

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ABSTRACT

This article discusses the main features of the national health research systems (NHRS) of Argentina, Bolivia, Brazil, Chile, Costa Rica, Cuba, Ecuador, El Salvador, Honduras, Panama, Paraguay, Peru, Uruguay, and Venezuela, based on documents prepared by their country experts who participated in the First Latin American Conference on Research and Innovation for Health held in April 2008, in Rio de Janeiro, Brazil. The review also includes sources cited in the reports, published scientific papers, and expert opinion, as well as regional secondary sources. Six countries reported having formal entities for health research governance and management: Brazil and Costa Rica's entities are led by their ministries of health; while Argentina, Cuba, Ecuador, and Venezuela have entities shared by their ministries of health and ministries of science and technology. Brazil and Ecuador each reported having a comprehensive national policy devoted specifically to health science, technology, and innovation. Argentina, Brazil, Costa Rica, Cuba, Ecuador, Panama, Paraguay, Peru, and Venezuela reported having established health research priorities. In conclusion, encouraging progress has been made, despite the structural and functional heterogeneity of the study countries' NHRS and their disparate levels of development. Instituting good NHRS governance/management is of utmost importance to how efficiently ministries of health, other government players, and society-at-large can tackle health research.

Key words Health research policy; Latin America.

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Research that is well-conducted and of adequate quality is essential to reduce inequities, improve population health and boost socioeconomic development in the countries. Particularly, research targeted to strengthening national health research systems (NHRS's) and regional cooperation is crucial not only for meeting current needs but also for adjusting national health systems to future challenges.

An NHRS is a set of institutions that govern, manage, coordinate, demand, require, communicate or use knowledge resulting from research to improve the population's health and status (1). A formally structured NHRS—i.e. an articulated system in which the role of all actors is defined, with proper stewardship, governance, management and a legal framework that defines the policy on

health research and its prioritization—offers the opportunity to strategically promote health priorities of a country. These priorities may be conceived of as a social asset as well as a tool for economic development, and may be addressed and carried out via scientific research and technological development (2).

In industrialized and developing countries, health research has driven the economy by increasing the knowledge base, boosting competition, improving access to useful products, strengthening the industrial, economic and health sectors, increasing social knowledge, enhancing the ability to solve complex problems and addressing some social determinants of health.

All countries need sustainable research systems to improve the health and welfare of their populations, reduce inequalities and social injustice, and promote economic and social prosperity.

While the significance of these systems is widely acknowledged, much remains to be done in order to strengthen local capacity for research and innovation in low and middle income countries, including those in the Region of the Americas (3).

FIRST LATIN AMERICAN CONFERENCE ON RESEARCH AND INNOVATION

To address these issues, with the overall aim of increasing the contribution that research makes to health and equity in Latin America, the First Latin American Conference on Research and Innovation for Health was held in Rio de Janeiro, Brazil, on April 15–18 (4, 5).

Among other goals, the focus of this conference was to improve regional cooperation aimed at solving or approaching common problems, discussing the need to develop and strengthen NHRS's in Latin America, and analyzing the different ways of financing and developing the human resources available for research. The conference brought together some 120 strategic actors, including officials in the areas of health, science and technology of the countries of the Region, representatives of development and technical cooperation agencies, networks and national research organizations, regional and global and technical staff of the Pan American Health Organization (PAHO) and the World Health Organization (WHO). The event was the

product of a partnership between the Brazilian Ministry of Health, PAHO, Mexico's Coordinating Committee of the National Institutes of Health and High-specialty Hospitals of Mexico (INSalud), Nicaragua's NicaSalud Network Federation, the Council on Health Research for Development (COHRED) and the Global Forum for Health Research. The Conference was funded by PAHO, the Ministry of Health of Brazil, Wellcome Trust, COHRED, the Global Forum for Health Research and the Special Programme for Research and Training in Tropical Diseases (TDR), coordinated by WHO (5).

In addition to the general presentations, four task forces were set up during the conference: (a) NHRS's, (b) Financing for Health Research, (c) Human Resources for Health Research and (d) Innovation, Product Development and Access. The discussions and presentations—partially based on 14 national reports on NHRS's (6)—led to definitions and recommendations regarding the core issues addressed. In addition, many work leads were established among countries, networks and international and funding agencies. Also, reports were submitted regarding new programs, grants and funding sources, and a draft agreement was reached for sub-regional cooperation in Central America. Participants agreed to hold a follow-up meeting to assess progress at the end of 2009 (5).

The following is a review of the main features of the NHRS's of 14 countries in Latin America. It is expected that the information submitted contributes to furthering the design of national health research policy and identifying strategies for developing and strengthening NHRS's in the Region of the Americas, so as to enhance and ensure the academic excellence of the systems and improve the population health.

SOURCES OF INFORMATION

Experts from 17 countries were asked to prepare a description of their country's NHRS. These experts were identified through consultations with national official authorities and had confirmed their participation in the First Latin American Conference on Research and Innovation for Health. The national reports were prepared in a standard format based on the recommendations described in the Framework for Devel-

oping a National Health Research System developed by COHRED (7, 8) with input from other agencies. According to these recommendations distributed by the organizers of the event in February 2008, the reports were to be developed jointly by representatives of the different institutions in the country invited to the conference—health ministries, science and technology agencies, academic institutions and NGOs involved in research activities—and should not exceed 2,300 words. The reports were due two weeks before the conference and were available for viewing on the Internet (6).

In addition to reviewing the reports submitted by the national experts, sources cited in the reports (legal and regulatory documents, national databases, the official internet sites of the ministries of health, education, and science and technology, academic institutions and social security agencies, and private development foundations, among other sources) were also reviewed for the analysis of NHRS features, as well as published scientific articles and experts' opinions. The national teams had the opportunity to review the information collected and send their feedback.

The reports were reviewed with an eye to three main issues:

- Governance and stewardship. Defined as the processes for collective action governing the relationship between actors, the dynamics of these processes and rules by which a society determines its behavior and makes and implements its decisions (9). Three components were identified: the governing body, i.e. the institution and structure through which the objectives of the system are established; the management structure, responsible for planning and implementing the activities required to achieve defined objectives; and the coordination mechanism used for setting objectives and coordination between different parts of the system.
- Legal Framework. A dedicated policy was considered to be in place when there existed an official document explicitly defining the intention of the government or government agencies to devote energy and resources to health research and to develop a legal framework to ensure its implementation and operation, and achieve its objectives. Not all countries in the region

issue such documents, or formalize them via national laws, rules, regulations or programs. Thus, the legal framework for health research was defined as the legal and regulatory structure within which all health research actors may operate, system goals are established, and strategies for their achievement are suggested. The legal framework consists of the set of laws, regulations, policies (departmental, institutional and provincial) and the strategies of the ministries (particularly those accountable for areas of health, science, technology and innovation, education and economic development).

- Prioritization of health research. This is determined by the existence of a formal list of priorities, contained in official documents from the Ministry of Health or other institutions, which demonstrates that some type of process is underway for the selection, prioritization, evaluation and adoption of issues, themes and research related problems which may guide the generation of knowledge.

To describe the countries' socioeconomic development, the Human Development Index (HDI) developed by the United Nations Development Programme (10) was used. The HDI is a composite indicator that measures the average progress of a country using three basic dimensions of human development: a healthy life, access to education, and a decent standard of living. These basic dimensions are measured, respectively, by life expectancy at birth; the adult literacy rate and the combined primary, secondary, and tertiary gross enrolment ratio; and GDP per capita (<http://hdr.undp.org/en/statistics/indices/hdi/question,68,en.html>).

To complement the classification of the countries studied, and to give an idea of the level of investment in each, the following factors were examined: public expenditure (on health and education), the number of patents granted to residents in the country (per million inhabitants), collection of royalties for patents (per capita), the percentage of GDP devoted to innovation and development activities, and science and technology costs. Charges were stated in 2005 dollars (US).

To place this analysis in the context of each country's level of scientific devel-

opment, several other general indexes were utilized: the number of researchers per million inhabitants and the number of scientific publications listed in the Latin American Literature on Health Sciences (LILACS) database in 2005 and the Institute for Scientific Information (ISI) database in 2007, also per million inhabitants. Liberal and conservative estimates of scientific throughput were generated using Paraje's methods (11).

SITUATION OF NHRS IN COUNTRIES STUDIED

NHRS reports were received from 14 of the 17 countries invited to participate (82.4%): Argentina, Bolivia, Brazil, Chile, Costa Rica, Cuba, Ecuador, El Salvador, Honduras, Panama, Paraguay, Peru, Uruguay and Venezuela. The global and development features of these countries are very diverse (Table 1).

Argentina and Chile had the highest Human Development Indexes (0.869 and 0.867, respectively), while Honduras and Bolivia had the lowest (0.700 and 0.695, respectively). Public expenditure on health as a percentage of GDP in the countries studied ranged between 1.8% and 5.5% and spending on education between 1.8% and 9.7%. The number of patents granted per million inhabitants in 2000–2005 was generally low, with the highest number awarded to residents of Argentina and Cuba. The percentage of GDP devoted to innovation and development activities was less than 1.0% in all countries except Brazil. Science and technology costs also varied widely, with the largest investments made by Argentina, Brazil and Chile. According to publications indexed by ISI, health-oriented scientific production per million inhabitants was highest in Chile, Argentina, Uruguay and Brazil and lowest in El Salvador, Honduras and Peru. Based on the analysis of ISI data, health research constitutes a significant part of the research occurring in the 14 countries studied (Table 1).

Governance and management

Six countries reported having formal governance and management structures for health research (Table 2). In Brazil and Costa Rica, both governance and management structures are led by the Ministry of Health, while Argentina, Cuba, Ecuador and Venezuela have

mixed structures in which the Ministry of Health and the Ministry of Science and Technology play important roles. In Argentina and Ecuador, the ministries of science and technology are responsible of management functions; in Panama structures lack coordination, because the law gives powers to an autonomous public research institution that is not part of the Ministry of Health and the Secretariat of Science and Technology. The remaining countries (Bolivia, Chile, El Salvador, Honduras, Peru, Paraguay, and Uruguay) have no formal governance nor research management structures. In Honduras, Paraguay and Uruguay there have been proposals to create the appropriate structures and these are at different stages of development. Some countries are involved in initiatives, such as the Evidence-Informed Policy Network (EVIPNet)—to strengthen the capacities of their NHRS's (12).

In other countries like El Salvador, Peru and Uruguay, there are structures and managerial activities that could lay the foundation for the creation of an NHRS. In Bolivia there is a proposal to create a national health research council and departmental councils under the aegis of the National Research Agency, a part of the Ministry of Health and Sport. In Chile, steps have been taken to strengthen the National Health Research Council as a body that generates recommendations and guidelines for health research. In Panama, the Gorgas Memorial Institute for Health Studies, through the Office of Research and Technological Development, manages and promotes national development of scientific research on health, both on its own and through other organizations working in this field.

Legal framework

Brazil and Ecuador reported having a dedicated, inclusive national policy on health science, technology and innovation. In Brazil, this legislation was issued in 2004 and has four goals (13): a) to develop the capacity to intervene in the chain of knowledge, from research with immediate application to technology and innovation oriented research; b) to call on the producers, funders and users of scientific and technical output to participate in health research; c) to guide production according to priorities set, and d) to take into account the social and economic significance of applying the results to solving

TABLE 1. Relevant features related to scientific research in analyzed countries^a

Country	Human development ^b		National commitment to health and education ^a		Knowledge and technology creation ^b			Scientific research products				
	Population, millions of inhabitants	Human development index (position among 179 countries in 2005)	Health spending, 2004	Education spending 2002–2005	Patents granted to residents, 2000–2005, per million inhabitants	Revenue from royalties and license fees, 2005, US dollars per capita	Innovation and development spending, 2000–2005	Spending on science and technology, millions of US dollars	Researchers engaged in research and development, 1990–2005, per million inhabitants	Publications indexed by LILACS, 2007, per million inhabitants	Publications indexed by LILACS, 2007, per million inhabitants	
											In all scientific fields	In health
										Index	%	
Argentina	38.7	0.869 (38)	4.3	3.3	4.7	1.4	0.4	845.2	720	29.5	134.9	78.1
Bolivia	9.2	0.695 (117)	4.1	2.4	ND ^c	0.2	0.3	23.0	120	11.2	20.0	15.3
Brazil	186.8	0.800 (70)	4.8	ND	1.0	0.5	1.0	7,290.2	344	78.1	113.5	72.5
Chile	16.3	0.867 (40)	2.9	2.4	1.0	3.3	0.6	633.7 ^d	444	95.0	210.1	92.6
Costa Rica	4.3	0.846 (48)	5.1	3.4	ND	<0.01	0.4	69.9 ^d	ND	19.8	66.7	51.6
Cuba	11.3	0.838 (51)	5.5	9.7	3.8	ND	0.6	234.2	ND	82.0	58.8	35.3
Ecuador	13.1	0.772 (89)	2.2	2.5	0	0.0	0.1	18.6 ^e	50	0.9	20.2	13.4
El Salvador	6.7	0.735 (103)	3.5	1.8	ND	0.4	0.1	ND	47	0.0	2.8	1.8
Honduras	6.8	0.700 (115)	4.0	3.8	1.2	0.0	0.0	3.5 ^e	ND	5.6	3.4	3.2
Panama	3.2	0.812 (62)	5.2	4.6	ND	0.0	0.3	38.0	97	0.6	94.4	70.3
Paraguay	5.9	0.755 (95)	2.6	1.9	ND	33.2	0.1	6.5	79	45.4	75.4	54.9
Peru	27.3	0.773 (87)	1.9	2.8	<0.01	0.1	0.1	100.5 ^d	226	0.3	3.8	3.5
Uruguay	3.3	0.852 (46)	3.6	2.5	1.1	<0.01	0.3	ND	366	37.0	130.0	85.5
Venezuela	26.7	0.792 (74)	2.0	4.6	2.62	0.0	0.3	333.1	ND	20.4	41.1	20.7

^a Data from 2005 unless different year specified.^b Adapted from Human Development Report 2007/2008 (9). Spending refers to public expenditure as a percentage of GDP in the year or period indicated.^c ND: No data available.^d Data from 2004.^e Data from 2003.

TABLE 2. Features of health research governance in countries studied having a formal governance body

Country	Governance body	Management structure	Coordination mechanism
Argentina	Ministry of Science, Technology and Productive Innovation Ministry of Education Ministry of Health	National Agency for Science and Technology Promotion National Council on Scientific and Technical Research National Commission on Health Research (Salud Investiga)	Health Research Forum
Brazil	Ministry of Health Ministry of Science and Technology Ministry of Education	1. Federal 1.1. Secretariat of Science, Technology and Strategic Inputs, Ministry of Health (Department of Science & Technology and Department of Industrial Complex & Innovation in Health) 1.2. National Council on Scientific and Technical Research 1.3. Coordination for the Improvement of Higher Education Personnel 2. State 2.1. State Health Ministry 2.2. State Ministry of Science and Technology	Policy on Health Science, Technology and Innovation National Council on Science and Technology National Agenda on Health Research Priorities
Costa Rica	Ministry of Health (National Health Research and Technological Development System)	Office of Health Research and Technological Development	Health Research and Technological Development Agency National Health Research Council
Cuba	Ministry of Public Health Ministry of Science, Technology and the Environment	Office of Science and Technology	National System of Health Science and Technological Innovation
Ecuador	Ministry of Public Health National Secretariat for Science and Technology	Science and Technology Process Commission on Science and Technology	National Forum on Health Research National Assembly of Researchers
Venezuela	Ministry of Popular Power for Health Ministry of Popular Power for Science and Technology	Executive Management of Research and Education	National System of Science, Technology and Innovation

Source: Compiled from descriptive national reports presented at the First Latin American Conference on Research and Innovation for Health, Rio de Janeiro, April 2008.

priority health problems. In Ecuador, the national policy on science, technology and innovation and the national policy on health research were issued in 2006 (14) and although the science and technology policy set by the Ministry of Health guides the National Secretariat for Science and Technology it does not outline specific priorities for the health sector.

Another 10 countries (Argentina, Bolivia, Chile, Costa Rica, Cuba, Panama, Paraguay, Peru, Uruguay and Venezuela), while not having a specific national policy, reported having a body of laws and regulations that establish rules and standards governing some aspects

of health research. These laws and regulations cover issues such as registration and execution of clinical trials, registration of pharmaceutical products, and responsibilities and duties of ethics committees.

Health research priorities

Of the 14 countries, 9 (64.3%) reported having established health research priorities in some form (Argentina, Brazil, Costa Rica, Cuba, Ecuador, Panama, Paraguay, Peru and Venezuela) and a third of the countries established these without a formal governance and health

research structure (Table 3). The procedures used to set priorities differed significantly (6). For example, Argentina set priorities using “interpretative” procedures initially established by the National Ministry of Health through the Health Research Commission (“Salud Investiga”). These procedures gradually evolved to become a “technical” model, based on expert opinion, surveys and the implementation of the Argentina’s combined strategy matrix (MECA), in turn based on the model of the combined strategy matrix (15). Both expert opinion and surveys were used to establish a list of priorities for 2002–2005. Since 2006,

TABLE 3. Health research priorities in countries studied having an explicit document on the subject

Argentina	Brazil	Costa Rica	Cuba	Ecuador	Panama	Paraguay	Peru	Venezuela
<p>Problems:</p> <ol style="list-style-type: none"> 1. Tuberculosis 2. Chagas Disease 3. Diabetes 4. Smoking 5. Road safety 6. Maternal morbidity and mortality 7. Acute lower respiratory infections in children 8. HIV/AIDS 9. Monogenetic diseases and congenital malformations 10. Neurological vascular diseases, behavioral, cognitive neuroscience and epilepsy 	<p>Sub-agendas:</p> <ol style="list-style-type: none"> 1. Health of indigenous peoples 2. Mental health 3. Violence, accidents and trauma 4. Health of the black population 5. Non communicable diseases 6. Elderly health 7. Childhood and adolescence health 8. Women's health 9. Health of individuals with special needs 10. Food and nutrition 11. Bioethics and research ethics 12. Clinical research 13. Health production complex 14. Technology assessment and health economics 15. Epidemiology 16. Demographics and health 17. Oral health 18. Health promotion 19. Communicable diseases 20. Health-related communication and information 21. Work management and health education 22. Health systems and policies 23. Health, environment, labor and biosecurity 24. Pharmaceutical assistance 	<p>Areas:</p> <ol style="list-style-type: none"> 1. Health systems and policies 2. Health economics 3. Morbidity and mortality 4. Food and nutrition 5. Health-related social problems 6. Technology management 7. Human resources development for research 	<p>Areas:</p> <ol style="list-style-type: none"> 1. Health problems related to the environment (water, sanitation and vectors) 2. Behavior- related factors (smoking, alcoholism, drugs, diet and nutrition, and sedentary lifestyle) 3. Non-communicable diseases and other negative impacts on health 4. Oral/dental diseases reemerging communicable diseases 6. Disabilities 7. Special environments (health in schools and the workplace) 8. Special groups (children, women and the elderly) 	<p>Trends:</p> <ol style="list-style-type: none"> 1. Biomedicine: Studies of cells, tissue, medicinal plants and animal experimentation 2. Clinical Trials: Human-controlled clinical trials 3. Epidemiology: Population studies of health and disease processes 4. Health systems and policies 5. Economics, sociology, anthropology, ecology and other health-related sciences 6. History of medicine and other disciplines 7. New themes such as gender studies, health promotion, and others 	<p>Areas:</p> <ol style="list-style-type: none"> 1. Environment and health 2. Risky behaviors and lifestyles 3. Education and citizen participation in health 4. Health inequities 5. Morbidity and mortality 6. Health services 	<p>Agenda:</p> <ol style="list-style-type: none"> 1. Surveillance, research, and control of risks and damage in public health 2. Promotion of health and equal access to health services (indigenous health, child and adolescent health, women's health) 3. Human resource development and public health training, public health planning and management 4. Biomedical research aimed at greater involvement by academic institutions 5. Vulnerability linked to climate change 	<p>Areas:</p> <ol style="list-style-type: none"> 1. Epidemiology and prevention of health problems of greater impact 2. Development, quality control and health interventions 3. Evidence about health determinants and implications for prevention 4. Development of health technology to improve efficiency and effectiveness of health interventions 	<p>Elements:</p> <ol style="list-style-type: none"> 1. Supply conditions that affect or limit the right to health 2. Movement toward models that explain the spatial representation of social needs, based on asymmetries 3. Social and health reality and its determinants 4. Analysis of health inequities among population groups, regions and social classes and emerging health problems 5. Methods of preventive intervention, early diagnosis, restitution and rehabilitation, and palliative care 6. Rigorous evaluation of the effectiveness and efficiency of health interventions 7. Development of socially sustainable technologies

Source: Compiled from descriptive national reports presented at the First Latin American Conference on Research and Innovation for Health, Rio de Janeiro, April 2008.

this list was amended in accordance with results obtained using MECA (16).

In another country, Brazil, this process took place in five stages: 1) analysis of the health situation and living conditions using reports requested from specialists in different fields, 2) creation of a Technical Advisory Committee, made up of health researchers and managers recognized in their work areas; 3) identification of 20 research sub-agendas, with themes and lines of research established via a process of discussion and reflection to reach consensus regarding the health status of different population groups, 4) review of topics and lines of research via a public consultation which allowed the input from various involved sectors to be incorporated, and 5) the approval of the National Agenda on Health Research Priorities for the 2nd National Conference on Science, Technology, and Innovation in Health, held in 2004 (17). The criteria employed to establish themes and lines of research were similar to those used in MECA, although other factors were also used to evaluate and discern priorities, such as cost-effectiveness, effects on social equity, acceptability and feasibility of the interventions and the quality of the research proposals.

In Costa Rica, inter-disciplinary discussions took place to establish the National Agenda for Research and Technological Development in Health for 2005–2010 (18). In Panama, the Ministry of Health formulated the National Strategic Plan on Science and Technology in 1998, coordinating the first inter-sectoral and inter-disciplinary agreement on policies and priorities for health research. In 2000, new health research priorities were established and were in effect until 2007. Then a new inter-sectoral and interdisciplinary consensus was reached on health research priorities under the coordination of the Gorgas Memorial Institute for Health Studies through the National Strategic Plan on Science and Technology's Health Sector Committee, under the National Secretary of Science and Technology (19).

Priority research topics were identified as specific problems or broad thematic areas, and could be subdivided into specific lines of research (Table 3). For example, Argentina prioritized 10 specific problems, including infectious diseases (Chagas disease, tuberculosis, HIV/AIDS), a chronic disease (diabetes),

TABLE 4. Formal bases for national health research systems in the countries studied

Country	Governance	Legal framework		Priority status
		Dedicated and inclusive policy	Set of laws and regulations	
Argentina	Yes	No	Yes	Yes
Brazil	Yes	Yes	Yes	Yes
Costa Rica	Yes	No	Yes	Yes
Cuba	Yes	No	Yes	Yes
Ecuador	Yes	Yes	Yes	Yes
Panama	No	No	Yes	Yes
Paraguay	No	No	Yes	Yes
Peru	No	No	Yes	Yes
Venezuela	Yes	No	Yes	Yes

Source: Compiled from descriptive national reports presented at the First Latin American Conference on Research and Innovation for Health, Rio de Janeiro, April 2008.

a group of age-associated diseases (acute lower respiratory infections in children) and risk factors (smoking and road safety). In other countries, the more general themes were subdivided into sub-agendas, areas, trends, etc. (Table 3).

Coordination, Financing and Training of Human Resources

It was noted that countries with a structured NHRS have formal mechanisms for coordinating health research (Table 2). Some, like Brazil and Costa Rica, have a national research agenda that defines the national priorities for health research developed from participatory inter-sectoral processes, while others, like Argentina and Ecuador, have a national research forum guided by priority research areas. Some countries that do not have a formal NHRS have mechanisms of coordination in place for the health sector or across sectors. For example, the Planning Unit of Bolivia's Ministry of Health and Sport has a health research coordination sub-unit that fulfills this function; in Panama, the Health Sector Committee of the National Strategic Plan on Science and Technology performs similar coordination functions.

With regard to funding mechanisms, the information provided by countries was inadequate and the level of detail varied greatly. Argentina, Brazil, Chile and Costa Rica reported having funding mechanisms both for their health ministries and institutions of science and technology. Cuba, Ecuador, Panama, Peru and Venezuela have funding mechanisms for institutions of science and technology exclusively or in coordination with other institutions focusing on

finance, planning and development, or research. While the information provided by the other countries is not sufficient for further analysis, most stated they receive international funding for health research (bilateral or multilateral foreign aid).

Brazil was the only country that reported having a strategy for the education, training and incorporation of human resources as part of its national policy on health science, technology and innovation. This strategy encourages scientific and technological production in the different regions of the country according to their features and culture. Of the remaining countries, only three have strategies to bolster the training of human resources for health research. These are either part of a law (Ecuador), due to a national strategy aimed at training human resources for health research (Cuba) or as a priority area in the National Agenda for Research and Technological Development (Costa Rica).

In general, only two countries (Brazil and Ecuador) have the three foundations for a formal NHRS, and four countries (Argentina, Costa Rica, Cuba and Venezuela) have an established governance structure and a process for prioritizing health research, but lack a dedicated and inclusive national policy on health science, technology and innovation (Table 4).

DISCUSSION AND CONCLUSIONS

The discussion on the development and strengthening of health research began nearly 20 years ago, when COHRED submitted its recommendations on how to approach health research (3, 20). Rep-

representatives of development and technical cooperation agencies and officials from the health ministries of several countries first articulated the concept of NHRS at the first conference on health research, held in Bangkok, Thailand in October 2000 with the sponsorship of COHRED, WHO, the World Bank and the Global Forum for Health Research (21–23). Later, during the Ministerial Summit on Health Research held in Mexico in November 2004, discussions by a number of health ministers, academics, researchers and representatives of international agencies (23) led to the World Health Assembly making a call on member countries to strengthen NHRS, develop a national policy and develop capable leadership in this field (24).

Other international meetings have developed these and other concepts, such as that held in Antigua, Guatemala, in August 2006 under the theme “Supporting the development of health research systems in Latin America” (25), the First Latin American Conference on Research and Innovation for Health held in Sao Paulo, Brazil, in 2008 and the Global Ministerial Forum on Research for Health held in Bamako, Mali, in November 2008 (5, 26, 27). In particular, the governments represented at the Bamako meeting issued a release in which they emphasized some points of the resolution from the 58th World Health Assembly, specifically that research priorities should be defined by the countries themselves and not by external entities. Thus the work begun almost two decades ago has climaxed with the Bamako Call to Action (28), the corresponding resolutions from the WHO Executive Committee and the Policy Research Proposal submitted by the Executive Committee of PAHO to the Directing Council in 2009 (29). At this stage, the countries of the region have made progress in creating, developing and strengthening their NHRS’s, albeit to varying degrees.

The structures of governance and management and the exercise of stewardship of NHRS’s in the countries examined differ according to how each country defines and establishes its government structure, either via health ministries, national science and technology institutions, or by a combination of both. In this regard, it has been suggested that the State must exercise stewardship and governance of NHRS through the health ministry, with the support of other state

and non-state actors (5) and that to be relevant, NHRS’s should integrate national systems of science, technology and innovation and other academic institutions and civil society, and should link their priorities to the social and economic development of each country.

Research lines should be defined based on national needs and should not be a result of decrees. Strategies for defining the lines of research for an organization include dialogue, participation and interaction of all stakeholders, taking into account the needs of the national health system and scientific data in the decision making process. If active participation on the part of the health authority is lacking, there is the risk of being excluded from the financial support plans that the countries have established. As noted in the cases of Paraguay and Uruguay, integration made it possible to coordinate a formal system of scientific and technological support.

It confirms the importance of having a formal structure for the stewardship and management of health research (30). The two countries that have a policy dedicated to health research (Brazil and Ecuador) have a structure for such purposes. In addition, five (83.3%) of the six countries that have a formal governance structure have identified research needs, while only four (44.4%) of the nine countries that lack such a structure have defined them. Moreover, in both countries with specific policies on health research—regardless of their level of coordination—the implementation of that policy has allowed them to effectively structure and fund their NHRS (13). Now that the country has a specific policy on health research, Ecuador is expected to make rapid progress in strengthening its NHRS and its functions.

In this study there was not enough information to carry out an in-depth analysis of the legal framework status in each country. Several countries that do not have a formal governance structure (Argentina, Cuba and Panama) reported having a set of legislative documents that could shape a policy framework for health research. The strategy adopted by each country to develop a dedicated policy, or basic laws and regulations, should be in accordance with that country’s political culture and local context.

Analysis of the documents showed that although NHRS’s have been developed to varying degrees in the countries

of the region, concrete results have been obtained in the effort to establish formal NHRS’s in the short and medium term, similar to those obtained in other regions (31–33). Comparative analysis of the NHRS situation in the different countries has allowed countries like Honduras, Paraguay and Uruguay to identify necessary actions at a national level to promote NHRS development (34).

It appears that the level of human and technological development is not a limiting factor in establishing the basic infrastructure necessary for an NHRS. However, it is essential to create conditions for job security and adequate salaries to ensure continuity of work and the appropriate human resource capacity. The progress observed in Ecuador and Peru underscore the significance of political will in achieving this goal. Communication and liaison between the various components of the NHRS and political will are both essential to achieve positive results. Brazil is a good example of how it is possible to link action with a specific policy and to build the platform needed to achieve long term goals that go beyond health authorities’ performance period. This is especially true when all stakeholders, including civil society, participate in the decision-making process related to setting priorities for health research (13, 17). The significant growth that Brazil has seen in science may be owed to the fact that Brazilian policies are living documents, which in addition to providing direction, indicate which roads to take in order to achieve objectives.

One of the weaknesses identified in this study is funding, as not all countries have established mechanisms for ensuring that health research is funded. At least 2% of health ministries’ budgets should be devoted to research and to strengthening research capacity (1, 3, 28, 35). When establishing a research agenda, the financial resources necessary for carrying it out must also be guaranteed (36, 37); efforts made by Argentina, Brazil, Chile and Costa Rica are successful examples. Another critical point is related to the training of human resources for research. The sustainability of NHRS’s requires a coordinated strategy for educating and training human resources, oriented towards defined priorities. Researchers must be trained via work on projects related to these priorities; training should be coordinated with the productive sector, and research

teams should be multidisciplinary and stable (5). The incorporation of students in research projects that allow them to train as researchers should be encouraged from the early stages. Educational institutions should encourage new generations of graduates to take an interest in conducting research and promote the careers of young researchers so as to ensure a generational renewal at the universities and public agencies. It should strengthen South-South cooperation in training human resources.

When analyzing these results some limitations should be taken into account. First, by basing this research on documents in which the views of the participants' institutions prevail, there may be an institutional bias. Second, it is possible that the health professionals who drafted the reports are not familiar with all aspects of the research done by other sectors involved in scientific research and technological innovation. Third, despite having had representatives from all the countries in the Region, reports from only 14 countries were received, reducing the scope of this analysis.

Despite these limitations, this is the first descriptive study of its kind based on standardized documents. In spite of heterogeneity in terms of the structure and function of NHRS's in the countries studied, and unequal level of development, encouraging advances have been achieved. Establishing adequate governance and management of NHRS's is essential in order for the Ministries of Health, other state actors and civil society to conduct health research efficiently. It is hoped that the information presented here is useful for promoting the development, or where appropriate, strengthening of NHRS's in accordance with each country's needs, resources and opportunities. While pointing out some gaps in governance and the political

framework of systems, this study is only a baseline from which the NHRS's in the region will be able to measure their development. Expanding the coverage of the research is necessary for an analysis that encompasses the entire region.

Further analysis to examine in more detail some elements of the NHRS is recommended, including the legal framework, funding mechanisms, human resource training, the use of research outputs in decision making and the formulation of health policies. These and other topics will be discussed in the follow-up meeting to the first conference in Rio de Janeiro, to be held in Havana, Cuba, in November 2009 as part of Forum 2009.

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RESUMEN

Sistemas nacionales de investigación para la salud en América Latina: una revisión de 14 países

En este artículo se discuten las principales características de los sistemas nacionales de investigación para la salud (SNIS) de Argentina, Bolivia, Brasil, Chile, Costa Rica, Cuba, Ecuador, El Salvador, Honduras, Panamá, Paraguay, Perú, Uruguay y Venezuela a partir de los documentos preparados por expertos de esos países que participaron en la Primera Conferencia Latinoamericana sobre Investigación e Innovación para la Salud, celebrada en abril de 2008 en Río de Janeiro, Brasil. Se revisaron también las fuentes citadas en los informes, artículos científicos publicados y opiniones de expertos, así como fuentes de información secundarias regionales. Seis países informaron poseer estructuras formales de gobernanza y gerencia de la investigación para la salud: en Brasil y Costa Rica, estas estructuras son lideradas por los ministerios de salud, mientras Argentina, Cuba, Ecuador y Venezuela tienen estructuras mixtas de sus ministerios de salud y de ciencia y tecnología. Brasil y Ecuador informaron poseer una política nacional dedicada e inclusiva de ciencia, tecnología e innovación para la salud. Argentina, Brasil, Costa Rica, Cuba, Ecuador, Panamá, Paraguay, Perú y Venezuela informaron haber establecido prioridades de investigación para la salud. Se concluye que a pesar de la heterogeneidad estructural y funcional de los SNIS de los países analizados y su desigual nivel de desarrollo, se han logrado avances alentadores. El establecimiento de una adecuada gobernanza/gerencia de los SNIS es de suma importancia para que los ministerios de salud, otros actores estatales y la sociedad civil puedan encausar eficazmente las investigaciones para la salud.

Palabras clave Política de investigación en salud; América Latina.
