Science for health: notes on the organization of scientific activity for the development of health in Latin America and the Caribbean[1]

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During the 1990s the countries of Latin America and the Caribbean went through profound transformations in their economic, political, and social structures—including in the way that those nations produced, disseminated, and used scientific knowledge that could enhance their citizens' health. Nevertheless, still more changes are needed to fully develop the potential of scientific activity to promote health in Latin America and the Caribbean (LAC).

In this task the LAC countries face two major challenges: building their capacity to develop, interpret, and adapt new knowledge and technologies, and creating opportunities for democratic consensus-building so that this capacity serves to improve the health of the peoples of the LAC countries. And while those nations confront many weaknesses in generating and mastering the needed scientific and technological knowledge, the situation in the 1990s was greatly improved over that in the 1980s.

CURRENT TRENDS

Current spending on research and development (R&D) in Latin America is relatively low in relation to population and gross domestic product (GDP). Nevertheless, between 1990 and 1996 R&D expenditures in Latin America grew by 57%, exceeding the increases of 8.5% in the United States of America, 43% in Canada, and 30.5% in Spain. In spite of that growth, R&D expenditures per capita in Latin America still lag behind other nations. The United States spends more than 10 times as much per person, Canada 12 times as much, and Spain 5 times as much. Latin American countries spend an average of 0.5% of GDP on research and development. Above that average are Costa Rica (1.13%), Brazil (0.76%), and Chile (0.64%). Total R&D expenditures in Latin America are highly concentrated. In 1996 Brazil accounted for 60% of the whole, followed by Argentina (12.5%) and Mexico (10%).

In Latin America the State is the principal source of financing, contributing more than two-thirds of the resources. This is the reverse of the situation in the United States, where some two-thirds of the funding comes from the private sector. There are contrasts as well in where R&D is performed. In Latin America, this is primarily a function of universities, while in the United States, Canada, and Spain, private companies mainly take this role.

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The number of "full-time equivalent" researchers in Latin America totals some 125 000, while the United States has eight times as many. The number of researchers in Latin America is highly concentrated, with some 50 000 of them in Brazil and 28 500 in Argentina. In Latin America the average number of researchers in relation to the number of economically active persons is 0.75 per 1 000, significantly less than the figures for Spain (3.25), Canada (5.51), and the United States (7.37). In spite of those figures, the situation in Latin America has improved in recent years. During the decade of the 1990s the number of university graduates at the master's level increased by 51% and those at the doctorate level by 65%.

The output of scientific publications in Latin America has followed many of the same patterns that spending and personnel levels have: small but growing, and concentrated in a limited number of countries. Latin America was responsible for just 1.37% of the articles registered in 1996 in MEDLINE, the most important international database on health. In the case of another major index, the Science Citation Index of the Institute for Scientific Information (ISI), articles from Latin America represented about 1.5% of the total number of pieces indexed in the mid-1990s.

Argentina, Brazil, Chile, Mexico, and Venezuela have been responsible for nearly 90% of the published articles from Latin America and the Caribbean, both in science in general and in the field of health sciences. Brazil and Argentina alone were responsible for nearly 60% of the production of Latin America indexed in MEDLINE in 1996. This type of concentration has also been observed in the English-speaking Caribbean, with Jamaica being responsible for some 75% of the health sciences publications from the Caribbean between 1976 and 1990.

In 1996 Latin American researchers produced an average of 15.1 articles per 100 researchers, fewer than half the 38.9 per 100 figure for Spain. In that same year Latin America produced 4.1 articles per 100 000 inhabitants, while in Spain the figure was 51.7. Latin American productivity is also low in terms of resources allocated to R&D. In 1996, 2.1 Latin American articles were registered by ISI for each million dollars allocated for R&D, while in Spain this same quantity of resources generated four ISI articles.

DEMANDS ON HEALTH SCIENCES

The demands on health sciences in Latin America and the Caribbean derive from two fundamental characteristics of the health situation in those countries. One is the rapid demographic and epidemiological changes, with aging of the population, growing urbanization, and declines in mortality, birth, and fertility rates. The other is the inequity that exists among groups and individuals, both in terms of morbidity and mortality profiles and in access to health care. This is in spite of the fact that almost all the LAC countries explicitly recognize a universal right to health. And even when those health needs are acknowledged, LAC nations may lack the appropriate resources and strategies to meet those needs.

One problem, already mentioned, is the heavy concentration of researchers—and their resulting publications—in a small number of countries. And while clinical research is distributed more uniformly across Latin America and the Caribbean, research on public health and biomedical issues is highly concentrated, with Brazil and Argentina responsible for nearly 70% of the articles published in each one of these two areas. In addition, the published articles from Latin American authors show an overwhelming focus on the health problems of individuals, rather than populations. Of the articles produced by Latin American authors and indexed by ISI between 1973 and 1992, only 2.7% were in the area of public health.

In health research in Latin America there are additional problems of an epistemological and methodological nature. The dominant paradigm, the so-called "risk approach," gives special importance to the study of risks linked to characteristics of individuals, while ignoring the social and environmental influences that affect the health of populations. Another limitation of the dominant paradigm is the idea that risk is individually determined and that "lifestyles" and "behavior" are matters of individual choice independent of the social context.

Awareness of the limitations of this paradigm has grown, and a new scientific trend has emerged, based on more comprehensive explanatory frameworks and new methodological developments. Among these is contextual or multilevel analysis, which tries to analyze the characteristics of individuals along with those of the social groups to which those persons belong.

Around the world in recent years there has been an increase in the quantity and quality of studies on the relationships among the health of populations, inequalities in living conditions, and levels of "social capital," or interpersonal trust, reciprocity, and mutual aid. Nevertheless, that interest does not seem to have extended to Latin America and the Caribbean. A recent review of international literature over a five-year period found nearly 400 references to studies dealing with these issues. A comparable review did not find a similar trend among LAC authors.

ORGANIZING SCIENTIFIC ACTIVITY TO PROMOTE HEALTH

Defining priorities

In order to preserve "the autonomy of science" many scientists resist the process of defining research priorities. Nevertheless, science is not located "above" society, moving at the initiative of independent scientists. Instead, science responds to demands put on it by various sectors of society.

Defining priorities is not the exclusive responsibility of experts but is a social task, involving various actors with their interests and perceptions, expressed in a space that facilitates the construction of consensus. To achieve this participatory process, behavior changes are needed on the part of such traditional actors as the State, researchers, service providers, and health professionals. In addition to serving as a financing agent, the State should help create spaces for the expression of various interests and perspectives in order to collectively define the path to take.

The process of identifying research priorities, of course, includes a technical dimension. In recent years several international agencies and committees have prepared health research agendas or have developed methodologies to define such priorities. One study, entitled "Investing in Health Research and Development," was prepared by the Ad-hoc Committee on Health Research Relating to Future Intervention Options, a group formed under the auspices of the World Health Organization (WHO). The main objective of that report was to define guidelines for national and international investments in health R&D.

Another WHO initiative was that of the Global Advisory Committee of Health Research (ACHR), a group that counsels the WHO Director-General and that is made up of prestigious international scientists from various disciplines. In 1998 the ACHR published "A Research Policy Agenda for Science and Technology to Support Global Health Development."

The third initiative of this type was promoted by the International Development Research Center of Canada, with support from the Council on Health Research for Development and from the Pan American Health Organization. This group's agenda was entitled "Prioridades en la investigación de la salud colectiva en América Latina" ["Research Priorities in Public Health in Latin America"].

As a whole, these three initiatives represent an important step forward in the methodology for defining research priorities. However, none of the initiatives was adopted by national and international organizations to guide their activities in financing and promoting research. One reason may have been that only the scientific community was involved in preparing the documents. The focus on the technical aspects of defining research priorities may have come at the expense of political aspects of the process.

Developing science and technology institutions

In the past in Latin America, there was a tradition of "centralizing" policies for science and technology (S&T). The State defined policies at the central level, and universities and other organizations merely carried out those policies. Now, with the move away from centralized planning, these other institutions have become active participants in the process of defining S&T policies and plans.

Universities. Universities in Latin America utilize almost 50% of the resources for S&T and account for 70% to 80% of the scientific output. Universities are perceived not only as creators of knowledge, but also as important agents of economic growth, through which countries can increase their human capital and better compete in a global economy. Ties have also been growing between academia and the private sector, such as through the creation of special S&T funds.

In spite of these new opportunities, in many universities there have been reactions against these changes, with self-preservation becoming the primary concern rather than research and teaching. One response to this conservatism has been to establish performance evaluation systems based on productivity. However, in some cases these systems in turn create distortions, such as by giving exaggerated importance to publications in international journals, reducing the importance of research and publication on local public health concerns, and even discouraging teaching itself.

State-affiliated organizations for research and development in health. There is a long tradition in Latin America of State-affiliated institutions for health research and development. Many of these organizations were created at the beginning of the twentieth century, often from the need to provide a given public good or service that the private market was not supplying. Among these entities are the Oswaldo Cruz Foundation in Brazil; institutions linked to Argentina's National Administration of Health Laboratories and Institutes, such as Malbrán and Fatala Chabén; and the National Institutes of Health in Chile, Colombia, and Venezuela.

These organizations share a number of special characteristics. While affiliated with the State, they are nonprofit but interact with the private sector. They have more administrative autonomy than do other State agencies. They are talent-intensive organizations that include a significant number of semi-autonomous units. They carry out research, teaching, and epidemiological surveillance; provide health care and laboratory services; and supply such products as sera, vaccines, and drugs.

These institutions face a number of special challenges in remaining up to date in science and technology and, at the same time, responding effectively and efficiently to the problems of society. In addressing these needs, there are a variety of steps these organizations can take. For example, they should seek greater autonomy and administrative flexibility in relation the State, such as by establishing contracts in which the allocation of public resources is done according to goals and results. At the same time, the institutions should create mechanisms and criteria to assess the impact of their activities.

In the area of human resources, these organizations need more flexible policies, including establishing monetary and nonmonetary incentives based on performance, as well as greater flexibility in hiring and dismissing personnel.

To face the changes in the regulation of intellectual property, the institutions should develop their capacity for technological management, with new structures to negotiate technology transfer contracts and promote technological cooperation agreements.

Funding

Long one of the most important elements of an S&T policy, funding is now even more critical due to the limited resources available, the growing demand for grants, and the increasing importance given to quality and selectivity.

At the macro level, there has been a general increase in R&D funding and a diversification of resources, especially from private and external sources. However, one aspect of this has been an increase in funds from large international companies for clinical trials of new drugs by local researchers. These tests have generated ethical concerns, given that vulnerable experimental groups suffer potential risks but are unlikely to benefit from the expensive new drugs developed.

Another trend at the macro level is the increase in external funds from such multilateral agencies as the World Bank and the Inter-American Development Bank (IDB). The World Bank and the IDB have financed several health sector reform projects in Latin America. Many of these loans have included funding for research, particularly operational studies. There is a need for research to evaluate the utilization of these resources and their impact on the production and use of knowledge and on local institutions' research capacities.

At the micro level, more and more of the national S&T councils in Latin American countries are using new tools to make decisions on which projects to fund, such as competitions and "calls for proposals."

There is a growing concern with evaluating the quality of the funding proposals in terms of their scientific merit and their relevance and importance. New forms of evaluation are needed that give opportunities to projects that represent new fields of research and take more risk. Nevertheless, in developing countries the review process still tends to be conservative.

While peer review is recognized as the evaluation mechanism par excellence, it has received criticisms on various levels. One complaint is that peer review puts in the hands of the scientific community the decision to use public funds, but without the corresponding public accountability. Peer review may produce better results in fields where there is a high degree of consensus and where intrinsic quality is the most important factor. In such interdisciplinary fields as public health, a better approach might be to apply two levels of evaluation, with peer review for intrinsic dimensions and "nonpeer" review for such extrinsic considerations as policies and programs.

Human resources

In the 1970s various Latin America countries made a notable effort to train researchers, by creating programs at the master's and doctorate level in almost all areas of science, and by granting fellowships for study abroad. Unfortunately, this effort was not duly coordinated with a clear policy of incorporating and utilizing these new professionals, leading to such consequences as the so-called "brain drain."

There is now an awareness that just as important as training researchers is providing them with adequate working conditions. Almost all the LAC countries that have a scientific community of significant size have developed professional career tracks for researchers, classifying the scientists in line with their training and their output. Salaries, incentives, and professional advancement are set according to those levels, regardless of the institution to which a researcher is linked. The positive aspects of this approach are evident, but depending

on the quality and productivity indicators used, distortions can occur, particularly in such areas as public health.

Developing human resources also requires exchange and cooperation among researchers. The scientific community and the governments of the LAC countries, with support from the United Nations and other organizations, have established exchange networks for the biological sciences, health systems and services, health economics and financing, and other areas of public health. Besides promoting training and exchange, publications, and the creation of databases, these networks also serve as mediators between the scientific community and the countries' S&T councils.

Dissemination and utilization of research results

In Latin America and the Caribbean there is a serious gap between the production of scientific knowledge and its dissemination and application. One result of that is a relative isolation of research and of the scientific community from the rest of society, making science a vulnerable target when resources are cut.

MEDLINE indexes only 45 Latin American journals, and the ISI Science Citation Index covers just some 15 LAC titles. In contrast, around 600 scientific publications from more than 30 countries of the Americas are indexed in the Latin American Literature in Health Sciences (LILACS) database, which is maintained by the Latin American and Caribbean Center on Health Sciences Information (BIREME). To expand the dissemination of LAC scientific output and to stimulate improved quality in LAC journals, BIREME has launched the Scientific Electronic Library Online (SciELO) project, which publishes leading journals from Latin America in an electronic format on the Internet.

Better dissemination and utilization of research results could also support the definition and implementation of health policies. Many persons believe the decision-making process is a linear one, with privileged actors making a series of rational decisions utilizing the best available information. In reality, decision-making involves various actors, with different interests, who act politically and not always rationally. What is required is not to neutralize the apparent "chaos" of the decision-making process in health, but to support the different actors with solid scientific evidence. This would diminish the enormous inequities in the access to information and knowledge and also encourage broader social involvement in promoting the health of each individual and the society as a whole.

New information and communication technologies offer enormous possibilities for reducing the inequities in access to health information and knowledge in the LAC countries. In the past, the management of knowledge by such organizations as the Pan American Health Organization (PAHO) was practically synonymous with transmitting knowledge from their staff members through technical assistance activities. Now, the management of knowledge should involve creating networks of institutions that capture, codify, and incorporate all types of information into a common platform that is accessible to all sectors of society.

Taking advantage of the experience gained by BIREME, PAHO is implementing this new concept of knowledge management through the Virtual Health Library (VHL). The VHL is an open virtual space on the Internet where the most relevant sources of health information are generated, updated, and stored by producers and intermediaries operating in a decentralized fashion. The VHL does not exclude anyone and promotes a collective effort to create healthy environments and behaviors; more equitable, effective, and efficient health systems; and participatory research agendas that respond to multiple interests and needs.

SINOPSIS

Ciencia en pro de la salud: notas sobre la organización de la actividad científica para el desarrollo de la salud en América Latina y el Caribe

Durante los años 90 los países de América Latina y el Caribe sufrieron profundas transformaciones en sus estructuras económicas, políticas y sociales, incluida la forma en la que han producido, diseminado y utilizado conocimientos científicos que pudieran mejorar la salud de sus ciudadanos. Sin embargo, y a pesar de que la situación ha mejorado mucho entre la década de los 80 y la de los 90, son necesarios más cambios para desarrollar plenamente el potencial de la actividad científica como promotora de la salud en América Latina y el Caribe. El gasto actual de América Latina en investigación y desarrollo es relativamente bajo cuando se toma en cuenta su peso relativo en términos de población o producto interno bruto e, igual que ocurre con el número de investigadores y el número de publicaciones resultantes, está concentrado en unos pocos países. Con el alejamiento de la planificación estatal centralizada, las universidades y otras instituciones deben implicarse más en la definición de las prioridades de la investigación en salud. Una mejor diseminación y utilización de los resultados de la investigación podrían contribuir a la definición e implementación de políticas de salud eficaces y equitativas.