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# A CONCEPTUAL MODEL FOR PUBLIC HEALTH RESEARCH<sup>1</sup>

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## INTRODUCTION

As health needs and systems have become increasingly more complex, research in the public health field has become the object of greater demands and expectations. Some of these coexist with both old and new questions: What is the best institutional location for public health research (PHR): universities, ministries of health, or some kind of decentralized and autonomous agency? What is the sphere of action of public health research? How is PHR related to socio-medical and health services research? In what way does it assimilate the methods and theories from the biomedical and social sciences? Should PHR be oriented primarily toward solving practical problems, or should it concentrate on advancing knowledge and establishing a consistent body of findings and principles? And should research projects focus on local problems or on issues of international importance and comparability?

This article proposes a conceptual model for approaching some of these questions. It should be noted that this model has already been tried, since it has been used to guide the institutional development of the Center for Public Health Research, one of the constituent units of the new National Institute of Public Health that was created on 27 January 1987 as part of the Mexican Health Sector. The model has three main parts: (a) a classification system for determining the place of public health research within the general context of health research; (b) a conceptual framework to define PHR's sphere of operation, including the relevant disciplines involved and the subject areas to be studied; and (c) a procedure for using this conceptual framework to establish an organizational strategy that will stipulate the ideal institutional localization for PHR as well as its guiding principles.

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## BASIC DEFINITIONS

The development of a conceptual model for public health research should naturally begin with a definition of the three words that comprise this term: research, health, and public.

The word "research" has multiple meanings, many of them ambiguous. We do not intend here to make an exhaustive semantic analysis. However, distinctions should be made between three interrelated concepts: research, study, and inquiry—distinctions that parallel those proposed by White and Murnaghan (1) between data, information, and intelligence. Data are bits of reality, generally expressed numerically, that provide the raw material for information and intelligence. Many so-called "research" activities are really just data-gathering exercises that describe a discrete segment of reality. A better term for this kind of activity would be "inquiry."

"Information," in turn, can be defined as one or more sets of data related to a question or problem. Information is the product of an activity that can be called "study." In general, "studies" approach reality more closely than "inquiries" to the extent that they attempt to establish correlations between variables.

Within this framework, the term "research" is reserved strictly for the most complex level of integration, the purpose of which is to explain reality by producing intelligence. Intelligence, in turn, is defined as information analyzed to explain a problem, identify new problems, and generate opportunities for action. In other words, intelligence is information transformed into knowledge (2).

The concept of "health" is also broad and ambiguous. For our present purposes it will be sufficient to distinguish between two fundamental aspects of health: conditions and responses. Health conditions refer to the biological, psychological, and social processes that define the health status of an individual or population, regardless of any organized actions taken to improve such status. These actions will be referred to as "responses," meaning the external responses organized by a society to change health conditions rather than internal physiologic or pathologic responses.

The adjective "public" used to qualify the term "health" also requires some clarification. In the present context, "public" refers to phenomena that occur in human groups or populations. Thus, the distinction is between individual and population, rather than between public and private. At first, in some countries such as the United States, the separation between personal and nonpersonal services did correspond to the private and the public sectors, respectively. However, the modern concept of public health goes beyond concrete activities to improve the environment and includes the scientific study of health conditions and the organization of all kinds of services as seen from the special perspective of human populations in their physical and social ecosystems. If this interpretation is correct, a more appropriate term would be "population health," even though "public health" is the term that has gained general acceptance through usage.<sup>5</sup>

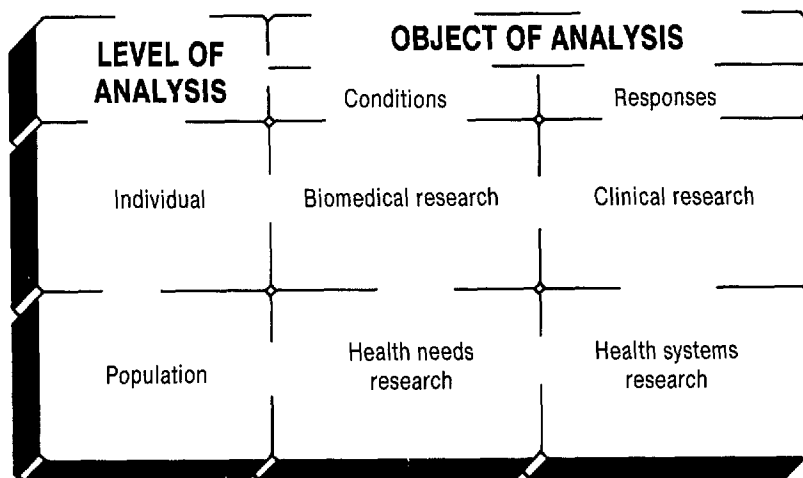
<sup>5</sup> In this regard it is worth noting that one prominent research group has coined the term "population-based medicine" (3).

Based on the foregoing definitions, we can classify the major types of health research as shown in Figure 1. This classification depends upon the interrelationship between the object of analysis, which is health, and the level of analysis. Regarding the object of analysis, the distinction previously made between conditions and responses is maintained. Regarding the level of analysis, we distinguish between the individual level and the population (or "public") level. Thus, most biomedical research is concerned with individual or subindividual processes that determine health and illness. Clinical research focuses on the therapeutic, preventive, or rehabilitative responses that can be applied to the individual. But health conditions and responses can also be analyzed at the level of the population. This is precisely what constitutes public health research, which is subdivided into two main types: research on health needs and research on health systems. As proposed by Donabedian (4), we will reserve the term "needs" strictly for health conditions requiring health care rather than for health

care itself. The organization of health care to integrate the social response to health conditions is the subject matter of what will be referred to here as health systems research.

Of course, this proposed typology is merely an abstraction designed to bring out differences that are never so clear-cut in real life. It is useful primarily for showing that PHR deals with the same matters as biomedical and clinical research, but does so at the level of the population instead of the individual. It also helps to demonstrate why the term "sociomedical research," which is sometimes used instead of public health research, is not altogether satisfactory. In the first place, the most important criterion for differentiating between types of health research is the object of analysis and the level of analysis, rather than the preferential use of biological or social disciplines. Even though population-based

FIGURE 1. Types of health research.



analysis is primarily rooted in the social sciences, it also encompasses important biological phenomena. This is especially evident in epidemiology, one of the basic disciplines in what we have called research on health needs. In addition, the term "sociomedical" indicates a special type of response to health conditions—the medical response—whereas "public health" includes actions that pertain to the health field but are not strictly medical. For all these reasons, the concept of public health research is broader, more precise, and more integrative than the concept of sociomedical research.

## THE SCOPE OF PUBLIC HEALTH RESEARCH<sup>6</sup>

The preceding analysis has allowed us to define PHR as a type of health research that studies the health conditions of populations and the organized social response to those conditions. Nevertheless, the wide scope of the concept of public health makes it necessary to define this research field more precisely. Instead of following a conventional approach focusing on the different scientific disciplines that play a role in the study of health, the model herein proposed is based on an innovative view of the scope of public health research. This view can be shown graphically by the three-dimensional matrix presented in Figure 2. The cells in this matrix result from crossing substantive areas, knowledge areas, and methodologic areas.

<sup>6</sup> This section is based, with slight modifications, on a portion of the article entitled "An innovative approach to public health research: The case of a new center in Mexico" that appeared in the *Journal of Health Administration Education*, volume 4, 1986, pp. 467-481.

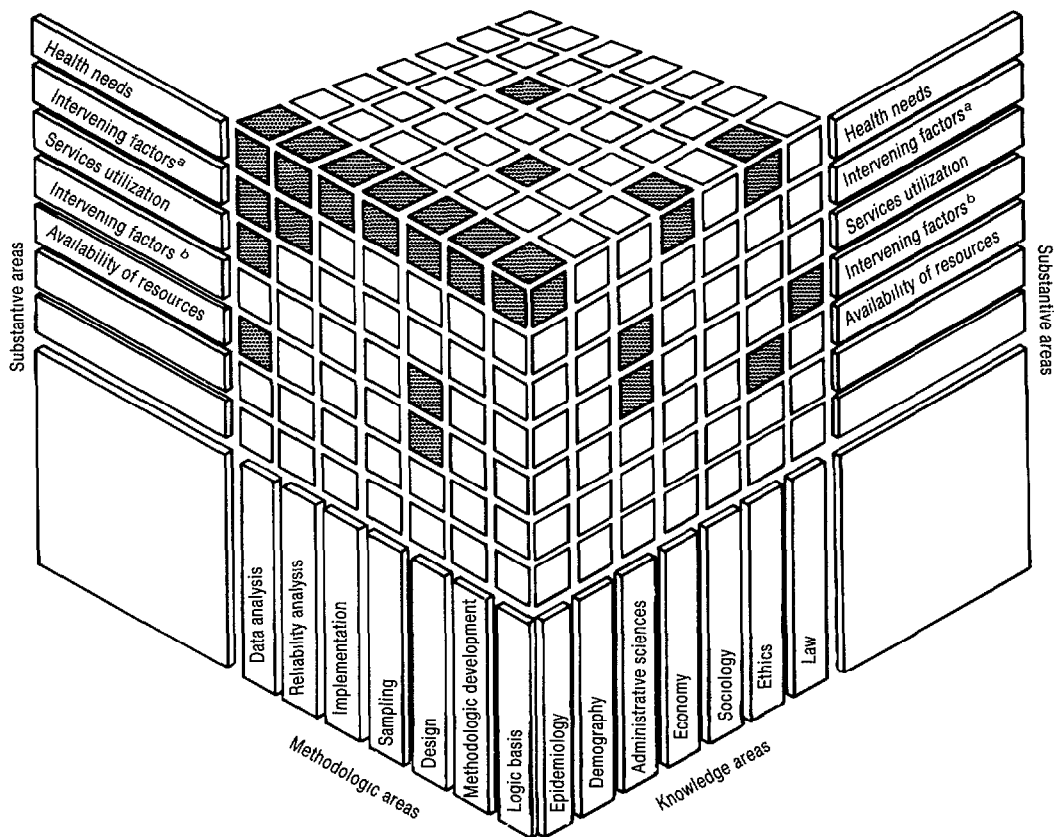
## Substantive Areas

The first dimension of the matrix lists the substantive areas, i.e., the phenomena that constitute the objects of public health research. The specification of these phenomena is based on the model presented in Figure 3. This figure shows the three basic concepts that delimit the health field: (a) health needs, (b) services to meet those needs, and (c) resources required to produce those services.

The direction of the relationships between these three factors depends on the particular phase of the planning cycle that is being considered. In the initial phases, we begin with the aim of satisfying certain needs—i.e., of dealing with those health and disease conditions requiring care, as defined by the providers of care or by the population in which those conditions occur (4). This specification of health needs then serves to establish goals for the production of services and requirements for resources. In the evaluation phase, the direction of these relationships is reversed. That is, we generally begin with the available resources in order to evaluate what services have been produced and the extent to which these services have satisfied existing needs.

These relationships are mediated by a series of factors that are also shown in Figure 3. Thus, the productivity of resources determines their capacity to produce services. The accessibility of resources intervenes between this *potential* capacity and the *actual* utilization of services. In turn, the effect of utilized services on health needs satisfaction depends on three other intervening factors: (a) equity in the utilization of services, defined by the degree to which their utilization corresponds to the distribution of health needs; (b) appropriateness and efficacy of the technology employed; and

FIGURE 2. A three-dimensional matrix of public health research modules.



<sup>a</sup> Between needs and services

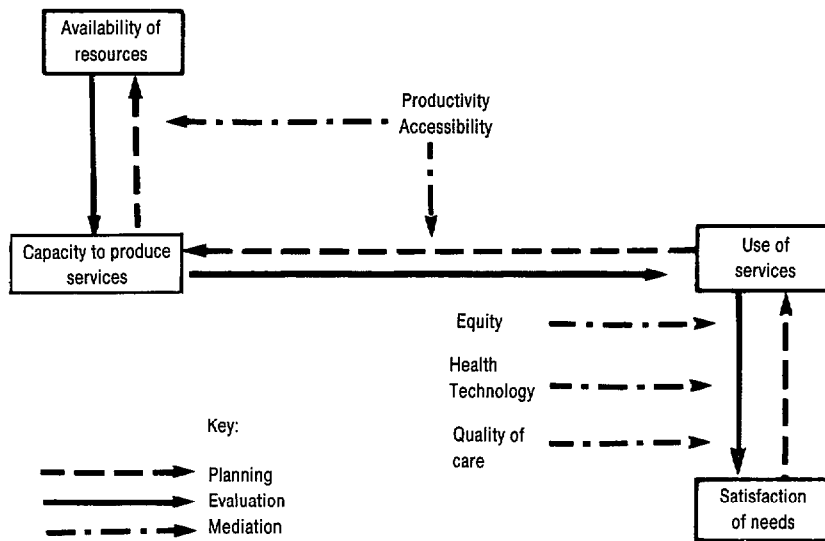
<sup>b</sup> Between services and resources

(c) the quality of care. An additional factor, which underlies all those portrayed in Figure 3, consists of the explicit and implicit policies that guide the specification of priorities among the legitimate needs to be covered by the health system, as well as the standards for producing services and the processes for developing resources.

A more detailed classification of the phenomena that constitute the objects of public health research can be derived from this general model, as shown in the Annex. In terms of the categories proposed in Figure 1, research on

health needs encompasses a broader set of phenomena than conventional epidemiologic research, since the former also includes the analysis of positive health (which is understood as something more than the absence of disease) besides the study of health risks and losses. Moreover, all living conditions that define a certain probability of negative movement along the health/disease contin-

FIGURE 3. A general model for defining substantive areas of public health research.



Adapted from A. Donabedian (4).

uum—in addition to biological, physical, or chemical agents—are included under the heading of socioeconomic risks.

The remaining substantive areas listed in the Annex (i.e., from the “intervening factors between needs and services” to “health policies”) are the objects studied by what we have called health systems research. Within this context, health services research is restricted to that subset of health systems research concerned with the study of the system’s primary products (which are precisely the services). The terminology proposed in this article contrasts with the more commonly used expression “health services research,” which usually encompasses all health systems research and even sometimes all public health research. This broader usage is not very fortunate, since

it emphasizes services when these services are simply the means to satisfy a health need. In addition, using the expression “health services research” loosely lumps together phenomena that, as shown in Figure 3, should be kept separate for analytical purposes.

### Knowledge Areas

The second dimension of the three-dimensional matrix in Figure 2 corresponds to areas of knowledge, which are the basic disciplines contributing to public health research. Among them are epidemiology, demography, administrative sciences (including operations research), economics, sociology, law, and ethics.

### Methodologic Areas

Finally, the third dimension of Figure 2 refers to methodologic areas, i.e., the methods guiding research in the public health field. These include, first,

analysis of the logical basis of a particular research project. Second, they include methodologic development in those cases where research methods are either insufficient or nonexistent, so that the research process must include actual development of methods. Third, they include the traditional research phases when adequate methodology exists (design; sampling, understood in the broadest sense as selection of subjects; implementation, which covers data collection, coding, and processing; data analysis; and reliability analysis).

The intersection of elements on the three axes in Figure 2 forms different configurations of cubes and parallelepipeds. Each of these cubic or rectangular configurations could be considered a research module. The purpose of a modular design such as this is to provide a high degree of conceptual and organizational flexibility. For example, the shaded area at the upper left of Figure 2 corresponds to an important area of PHR, which is epidemiologic research on health needs using all available methods. The three-dimensional matrix also permits a graphic depiction of interdisciplinarity. Thus, all research projects on, say, some aspect of health services utilization that cut horizontally across the different areas of knowledge are interdisciplinary projects. In contrast, other research projects encourage the development of certain specific disciplines. These projects concentrate on one area of knowledge while cutting vertically upward to deal with many different substantive areas. By graphically displaying all these possibilities, the matrix encourages one to view the formation of research modules as part of a dynamic process that can be adapted to shifts in research priorities and needs.

## JUSTIFICATION OF PHR

A complete conceptual model should not be limited to specifying the definition and scope of PHR. It should also take into account the particular conditions that give PHR an identity of its own and establish its existence as a legitimate field of scientific activity. In other words, we must explain not only *what* PHR is but also *why* it is.

According to McKeown (5), three circumstances give strategic value to public health research. The first is the rapid change presently experienced by morbidity and mortality patterns, a change that can be seen as a complex epidemiologic transition (6). In many Latin American countries, this process is characterized by a gradual reduction in the incidence and severity of infectious and parasitic diseases on the one hand and an increasing incidence of chronic and degenerative diseases, mental illnesses, and accidents on the other. Only through high-quality research can we elucidate the dynamics of this epidemiologic transition and anticipate its impact on the health system.

The second circumstance cited by McKeown is the rising cost of health care, due largely to the introduction of new and complex technologies. Hence, every health system that hopes to take advantage of the potential benefits of the technological revolution while minimizing its undesirable effects must have a research infrastructure capable of determining how new technologies are affecting the quality of medical care and assessing their economic and social repercussions (7).

The third circumstance is the growing acceptance of public responsibility for health. (In Mexico, where our model has been applied as previously noted, this acceptance has attained its

maximum expression in constitutional recognition of the right to health protection—8.) However, we must not lose sight of the fact that recognition of this responsibility also includes the potential for expansion of the demand for health services. Meeting this demand will require a rational organization of resources, which must be supported by a solid foundation of research activities permitting accurate documentation of the population's health needs, factors determining those needs, alternate ways to organize health care, and the outcomes of that care.

## INSTITUTIONS CONDUCTING PHR

PHR's potential for dealing scientifically with these three circumstances can only be realized if it finds its proper institutional niche. Therefore, it is necessary to consider *where* PHR should be conducted.

In answering this question, differences in the primary orientation of research must be examined. Although these differences are never categorical, two major kinds of orientation can be discerned. On the one hand, some research is primarily oriented to solving concrete health problems. This could be called research *for* health. On the other hand, some research is primarily oriented to advancing knowledge. This could be called research *on* health. Any type of health research—whether it is biomedical, clinical, or public health research—can have either of these primary orientations. The distinction between research *for* health and research *on* health would seem to offer greater analytical possibilities than the traditional dichotomy between basic and applied research, which

in any case alludes to something extrinsic to the research process.

The primary orientation of research is closely linked to the primary orientation of the institution where such research is conducted. In the health field, certain institutions, such as ministries of health and related public agencies, have as their central mission providing services. Others, such as universities, are basically oriented toward research. Of course, both research *for* and research *on* health can be carried out at both kinds of institutions, although the emphasis will tend to be different. The key point is that if those differences are taken into account, the false dilemma about whether research should be carried out only in universities or also in the public sector can be resolved.

One of the problems with public sector research centers is that the exact definition of their primary orientation depends on the perspective from which they are analyzed. When viewed from within the larger public organization of which they are a part, these centers are seen as having a primary orientation toward research. However, when viewed from outside they are seen as belonging to a larger organization whose primary orientation is toward service.

One way of resolving this identity issue is to maintain a balance between research *for* and research *on* health. In addition, another very important kind of balance should be maintained that is closely linked to the first one; that is, a balance should exist between relevance, excellence, and independence. In other words, research should be useful in decision-making; but



for this to happen, it should meet all scientific standards of excellence and must be independent of any kind of political pressure. These balances are especially difficult to achieve at government research centers and in fields such as public health that are concerned with processes closely related to decision-making.

## PRINCIPLES OF ORGANIZATION

Whether because of this closeness or for lack of long-standing academic traditions, PHR is vulnerable to what might be called an “*internal brain drain*” (9). This internal drain—which is perhaps more significant than “external” brain drain—occurs when a researcher leaves his academic career to work in administration. This in no way suggests that administrative work is inferior to academic work or that it requires less intellectual capacity. Nor does it imply that a researcher, especially one in the advanced stages of his career, should not become involved in the administration of research or practical application of his experience from an executive position. However, there are situations—and this is really what “*internal brain drain*” refers to—when a researcher, especially at the beginning of his career, must direct his energies toward administrative work because the system of incentives that he faces overcomes his career preference for research.

In order to counteract this trend, organizations should be designed specifically to meet the demands of research work. Specifying the characteristics of this design helps to answer the

question of *how* PHR should be organized. As a final component in our conceptual model, we propose that research organizations should be founded upon four governing principles:

- 1) the principle of parallel careers;
- 2) the principle of academic autonomy;
- 3) the principle of administrative sacrifice; and
- 4) the principle of inverted incentives.

### 1) The Principle of Parallel Careers

As a result of a tendency to generalize vertical organizational structures, it is commonly assumed that a hierarchy consisting of a director, associate directors, department heads, and finally researchers, in that order of importance, should exist in research agencies. But the governing principle (1) above states that the research career should be parallel to the administrative career, rather than superior or inferior to it. Researchers do, of course, work within an administrative unit and are therefore subject to its discipline. But what needs to be stressed is that the researcher must have a clear career path that encompasses the positions of assistant, associate, and full researcher. This career path must be clearly differentiated from the administrative career path, in order to permit upward mobility toward higher levels of research rather than toward executive positions.

In fact, these two careers operate under very different organizational premises. In the administrative career path, authority is exercised hierarchically and is derived from the position itself. In the academic career, authority comes from knowledge and scientific productivity, and is usually exercised horizontally between colleagues rather than between superiors and subordinates.

## 2) The Principle of Academic Autonomy

In theory, one way to satisfy the principle of parallel careers would be to differentiate between the two paths not only functionally but also professionally. This would imply that, just as career researchers hold academic positions, professional administrators would occupy executive positions. However, experience has shown that this approach to the problem is unsatisfactory. One reason is that academic work has certain peculiarities that cannot be appreciated by someone who has not been directly involved in it. Among these special characteristics is the fact that research requires a great deal of autonomy, since most of the intellectual processes that lead to discovery are unknown and, as such, cannot be codified or reduced to a routine.

In addition, quality research is usually a long-term undertaking and is incompatible with the situation-related pressures to which the administrator must respond. Perhaps the very complexity of academic work accounts for the fact that the principal authority recognized by researchers is that derived from knowledge and previous experience in the field. Consequently, when someone other than a researcher directs a scientific production center, there tends to be a great deal of mutual distrust between the researchers and executives, leading to the development of conflict. The only way to prevent this conflict is by respecting the researchers' academic autonomy, which necessarily implies that executive positions at research institutions must be held by researchers.

## 3) The Principle of Administrative Sacrifice

Obviously, a potential contradiction exists between the two preceding principles. One principle suggests that research and administrative careers should be kept separate, and the other demands that executive positions in research centers be held by researchers. The solution to this contradiction is the principle of administrative sacrifice, which asserts that accepting an executive position should not be regarded as a reward for the person doing research. Instead, it should be considered a sacrifice made as part of a commitment to one's colleagues and to the scientific community at large, for the purpose of preserving the principle of academic autonomy.

## 4) The Principle of Inverted Incentives

In order for the principle of administrative sacrifice to be more than mere rhetoric, it should have a practical corollary. This corollary is the principle of inverted incentives. The term "inverted incentives" derives from the fact that the usual system of incentives continuously drives researchers away from academic work and into administrative work. At its most basic level, such a system of incentives is expressed in the substantial salary differential that usually favors executive positions at the expense of research positions. The principle of inverted incentives consists precisely of reversing this state of affairs, so that the incentive to advance to the next level of the research career is stronger at each level than the incentive to transfer to the administrative path.

# CONCLUSION

The conceptual model presented in this paper has attempted to cover a wide range of issues relevant to public health research—from abstract specification of substantial study objectives to identification of concrete organizational strategies. We cannot disregard the fact that development of PHR has lagged considerably behind other types of health research. Nevertheless, current changes in prevailing conceptions about health systems offer enormous opportunities for strengthening the academic tradition in this field. If we can establish the modern concept of public health as population-based health, if we can strike a balance between research for and research on health, and if we can organize academic centers founded upon the four governing principles just mentioned, then it will be possible to produce high-quality research that will advance the frontiers of knowledge while contributing to better health for the population.

# SUMMARY

As currently conceived, public health research (PHR) is the application of the biological, social, and administrative sciences to the explanation of health phenomena in human *populations*. The feature distinguishing it from other types of health research is its *population* level of analysis. (More specifically, it is distinguished from clinical and biomedical research because these focus on an individual or subindividual level of analysis.)

Regarding the substantive areas of PHR, these encompass two large fields: (a) research on health needs, i.e., analysis of the population's health *conditions*, and (b) research on health systems,

i.e., study of the organized social *response* to health conditions. In turn, research on health needs includes examination of positive health, health risks, and health losses in an effort to unravel the dynamics and consequences of the epidemiologic transition. Research on health systems deals with analysis of health policy, health services, and health resources.

These substantive areas of PHR can be related to relevant disciplines and also to relevant methodologies by means of a three-dimensional matrix that permits different "modular" areas of PHR to be displayed graphically. This, in turn, provides a way of thinking about the general subject.

Another important point about PHR is that its institutional development requires organizations devoted to research, whether they are located in universities or in the health sector. It is also necessary to reach a balance between research *for* health (i.e., projects that are primarily oriented to the solution of problems) and research *on* health (i.e., projects that are oriented primarily to the advancement of knowledge).

Specific research projects should also have three attributes: *relevance* to decision-making, *excellence* in applying the norms of scientific research, and *independence* from political pressures. In addition, steps should be taken to provide researchers with strong incentives to continue their research careers, so that the "internal brain drain" of researchers who leave research to become administrators is limited.

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## ANNEX. Classification of substantive areas of public health research.

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1. Health needs
    - a. Positive health
      - Health indices
      - Biopsychological development
      - Nonmorbid conditions that require health care (e.g., pregnancy).
    - b. Health risks
      - Socioeconomic risks
      - Environmental risks
      - Occupational risks
    - c. Health losses
      - Morbidity
      - Disability
      - Mortality
  2. Intervening factors between needs and services
    - a. Equity
    - b. Health technology
    - c. Quality of care
  3. Use of services
    - a. Determining factors
    - b. Preventive services
    - c. Diagnostic and therapeutic services
    - d. Rehabilitation services
    - e. Social assistance services
  4. Intervening factors between services and resources
    - a. Productivity
    - b. Accessibility
  5. Availability of resources
    - a. Determining factors
    - b. Models of resource organization
    - c. Systems for programming and managing resources
    - d. Resource development
  6. Health policies
    - a. Policies for defining health needs
    - b. Policies for producing health services
    - c. Policies for developing and using health resources
-