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I INTRODUCTION - TERMINOLOGY AND OBJECTIVES

The purpose of this paper is to give a short account of the applications of a range of relatively new analytical techniques in the realm of "health practice", a question of growing importance which was reviewed recently by a WHO consultant group in Geneva[1]. Reference will also be made to WHO's activities and role in promoting research in this field.

For the last decade or so techniques such as critical path analysis, systems analysis, work study and management by objectives have been widely used for planning and managerial purposes in large-scale industry and commerce, government, military affairs and space exploration. In all these areas they are used to assist decision-making about the adjustments needed in complex, changing situations (i.e. in current management and planning for the future), which until recently were largely subjective, intuitive processes often based on relatively crude data. The employment of these methods amounts, in effect, to the application of the scientific method to logistic, managerial and planning problems. It is common knowledge that the planning, organization and administration of health services have benefited greatly in recent years from the application of such methods, and it is increasingly evident that they are necessary in many large health administrations.

It would be superfluous to discuss what is meant by research, but it is necessary to refer to the kind of research to which attention is especially directed in the present paper. The paper deals with the use of the scientific method in health practice, or to elaborate a little, with the establishment of precise, verifiable relationships between particularized sets of events in defined circumstances, expressed as far as possible in numerical terms or other quantitative form; and as a corollary, with the rigorous criteria - precise definitions, parameters, indices and validated techniques for the collection, collation and interpretation of data - on which all scientific inquiries depend.

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[1] Consultation on Research in Public Health Practice, Geneva, December 1968.

Descriptive studies, case studies and historical and documentary researches also have a place of value in health practice, and properly conducted may be research activities of a high order, but as they are well established and familiar procedures they are not referred to here.

It is well to be clear at the outset that the methods to be discussed are important not only to research workers, but no less to administrators and planners in the health field; and much of the paper might have been presented under the title "Analytical methods in the management and planning of health services". Excepting the more sophisticated techniques, the methods employed by research workers are the same as those needed for executive purposes. Evaluation procedures, for instance, which are an accepted part of good administration, depend on the same techniques as research - the research worker's special contribution is to provide validated methods for use at the administrative level.

Up to December 1968, the area of research we are considering was usually referred to as "Public Health Practice Research" and this was an appropriate title if the definition of Public Health was wide enough.

The first WHO Scientific Group on Research in Public Health Practice (1960) described public health as the organized health and medical care of a community and its members - a definition which embraces organized personal health care services (including medical care) as well as the surveillance of community health, and their definition of public health practice research was correspondingly wide.

The relative uncertainty that has existed about the character and scope of Public Health Practice Research compared with most fields of biomedical research is evidenced by the fact that it was thought necessary to offer a definition in the Director-General's Report on The Medical Research Programme of the World Health Organization 1958-1963. In this report "public health practice research" is said "to denote the study of methods and procedures to

be used to ensure that scientific knowledge is utilized to the fullest extent for the improvement of the health of the maximum number of people at the lowest possible cost", and the text goes on to say that "this type of activity is variously known as operational research, administrative research, etc. and is concerned with administrative, economic, organizational and social studies designed to improve the provision of health services".

The title "Health Practice Research" was preferred by the consultant group (1968) on the ground that the expression public health is not universally understood as including the organization and administration of personal health services and this title, i.e. "Health Practice Research" has been adopted in the present paper.

Of greater importance than the name, however, is the recognition that health practice (or public health practice) comprises both community health care - disease control and environmental sanitation and the organization of personal health care services - personal preventive services, health surveillance and screening, diagnosis and treatment and other restorative measures, whether provided in hospitals or in the community. Health practice in this interpretation includes the delivery of health care in all its aspects, and is a large-scale operation which depends on a complex organization and management.

Health Practice Research can, then, be defined as the use of the scientific method in investigating problems of planning, organizat on and administration (including management and evaluation) of health services. Its broad purpose is to ensure the optimal use of an organizational system for the delivery of health care and other health services, to indicate where and how improvements may be made, and to support health service planning.

Health practice research is not laboratory research, it is not clinical-pathological research, it is not directly concerned with the applications of biomedical science in individual patient care, and though, as we shall later indicate, epidemiology is among its basic disciplines, etiological studies to

which much epidemiological research is devoted, also lie outside its province. Whatever elaborations are introduced, it is essentially a method which appeals to the facts (as distinct from the intuitive approach) in order to establish verifiable relationships or associations between specific service programmes and other events in defined circumstances, and whose aim is to formulate generalizations which can be compared with an hypothesis, or an operational research model.

In some respects, however, the method differs from the scientific method as applied to biophysical investigations. It is predominantly observational, rarely experimental; the situations it studies almost always involve a large number of interdependent variables; much of its data cannot be presented numerically; the systems it studies are less deterministic, in a practical sense, than physical systems; the relationships it establishes are usually relationships between indices of primary factors which cannot be measured directly. Health practice research also differs from many other kinds of scientific research in that it is interested in the way its conclusions are applied and the resulting consequences, both at the level of objectives and operations.

The scope of health practice research is wide. As medicine is a social science, much health practice research lies at the interface between biomedical science and medical care services on the one hand, and wider sociological considerations on the other. A beginning has barely been made in defining the contribution it can make in areas such as the balance between the functional relationships of various health personnel, the social objectives of health planning, centralization, decentralization and regionalization and the integration of curative and preventive services.

Like scientific research in general the objectives of health practice research are partly substantive or question-answering, and partly devoted to refinements of the instruments or tools it uses. The refinement of indicators

of levels of health, adequacy of medical care provisions and quality of medical care, and the definition of need/demand relationships in medical care for instance are among its foremost present preoccupations.

For most purposes, the methods used in health practice research in different countries differ according to the level of national development; and whereas in the highly developed countries they are largely employed with the aim of making marginal economies or increasing service effectiveness marginally, in the developing countries their purpose is usually to indicate how limited resources can be used to the best advantage.

The value of operations research and other analytical methods in the health care field has become more and more apparent as health care has increasingly involved organized, large-scale operations and particularly the introduction of comprehensive health planning, mass campaigns for disease control and the provision of health-care coverage for whole populations. But, for a number of reasons, their introduction has been somewhat slow. Co-operation between executive health departments, academic departments and departments in control of statistical services and electronic data-processing resources has hitherto been relatively rare, teaching programmes for doctors specializing in public health and health administration have hitherto given little attention to analytical research methods, and incumbent health administrators without experience of the newer methods have not unnaturally been slow to appreciate their possible applications.

Their value is undeniably great, but it should perhaps be stressed that no information system or analytical technique can ever relieve the manager or administrator of the ultimate responsibility for making decisions about what should be done in a given situation. Such decisions depend in the last resort on some aspect of human priorities, and explicitly or covertly are value judgements. In the health field as elsewhere questions of the desirability of a particular action and the priority it should have cannot be answered by any

conceivable application of analytical techniques. The purpose of the analytical procedure is to present the facts in a form which facilitates informed decisions.

II RESEARCH OBJECTIVES

The objectives of health practice research can be classified broadly under three headings:

1. To improve the efficiency of an existing health service: this is probably the commonest area of interest where the typical objective is to reduce wasteful activities, to improve timetables or to show if targets have been achieved.

2. To provide data on which policy decisions for adjustments can be made into such questions as priorities, alternative uses of resources, the identification of major gaps or imbalances in present services and the way in which these deficiencies might be remedied.

3. To improve the process of comprehensive health service planning this involves the provision of an information base about existing needs and services; the definition of trends by reference to epidemiological, demographic, survey and other data; the development of projections or forecasts based on extrapolations; and finally the infusion into the system of relevant socio-economic and cultural information.

When the optimization or "most for least" method is employed, the usual objectives are either to provide a given level of service in the most economical way, or to provide the best service from fixed resources, i.e. to indicate what service should be provided and how this can best be done from available allocations.

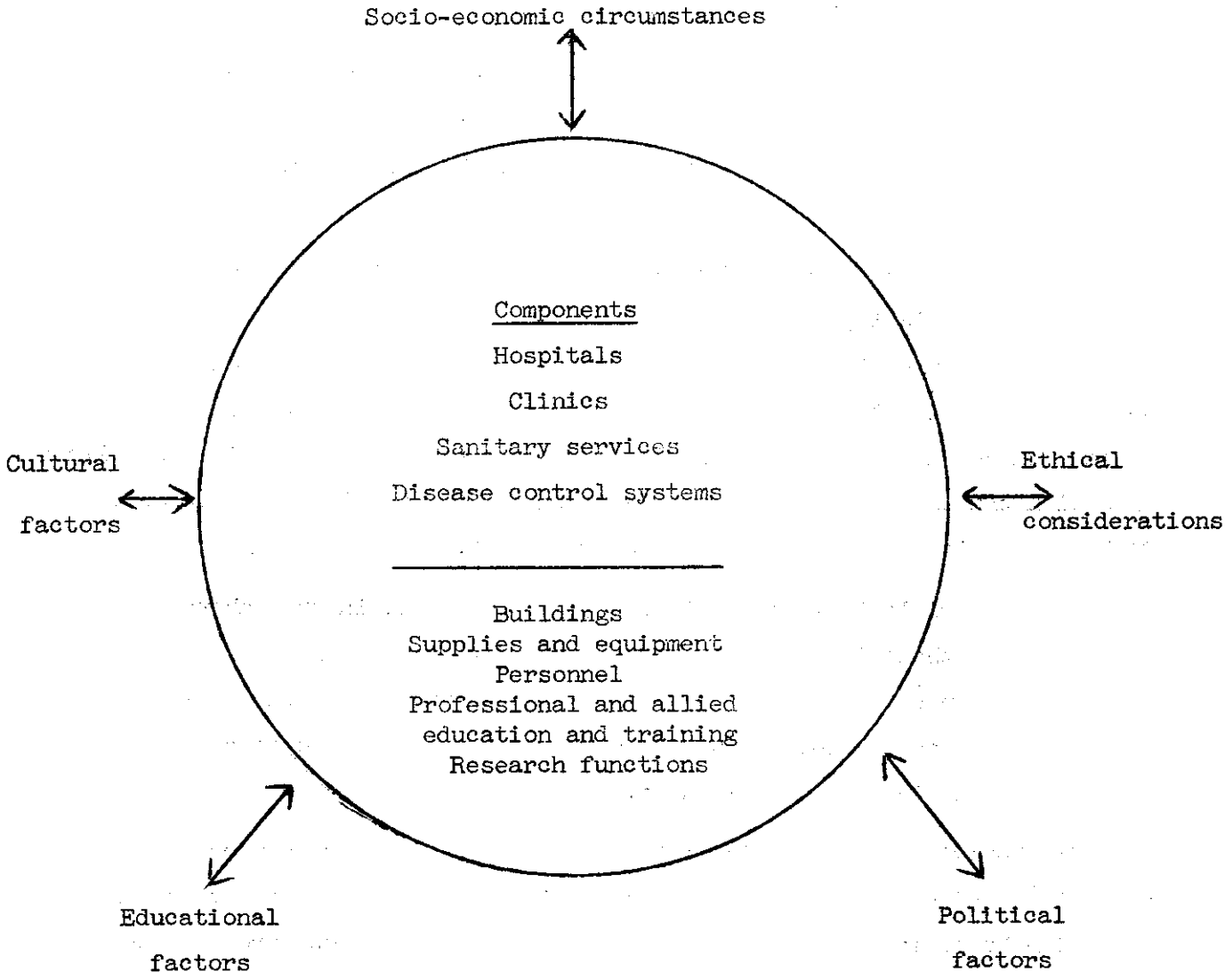
In ascending order of complexity, health practice research is conveniently classified as relating to:

i. the individual components of a health service or some of its particular aspects, e.g., hospital planning, bed utilization, personnel function studies;

ii. a health service in its entirety;

iii. a health service and its component parts in external relationship with socio-economic and other factors.

This is illustrated in the diagram in which the circle represents the health service in its entirety.



III MULTIDISCIPLINARY CHARACTER OF HEALTH PRACTICE RESEARCH

Health practice research is commonly multidisciplinary. In addition to biomedical science and public health, the disciplines which may be involved include:

- Epidemiology
- Demography
- The Behavioural and Social Sciences
- Economics
- Mathematics
- Administration and Management, and
- Computer Techniques.

The need to bring together the resources of health administrators, statisticians and specialists in these areas is now well understood at the academic level, but this development has proceeded slowly in all but a few executive health departments.

Epidemiology and demography are the basic disciplines of health practice research. Clinical-pathological factors and disease etiologies have, of course, to be taken into account in health administration, in planning health services, and almost every problem involves a study of the distribution of disease in communities, but while epidemiology is one of the basic disciplines of health practice research, it has many applications which lie outside this field, where it is a discipline in its own right.

The epidemiological method is used, for instance, in the laboratory and in clinical-pathological research which lies outside the province of health practice research. It is also used in studying the evolution of rare diseases which are not, as a rule, of sufficient numerical importance to be taken into account in practical health planning.

The behavioural and social sciences include sociology, anthropology, psychology and human geography. These sciences are concerned with the factors effecting human motivation and action, particularly as these are affected by

cultural background and by interpersonal communication. These sciences are, therefore, implicated in studying the behavioural response to illness, expectations concerning health and medical care, factors affecting willingness to accept medical advice, social factors affecting the functioning of health services and the relation of health services to other aspects of social organization.

The field of economics has a number of areas in common with health practice research. First is the economic justification of health programmes as contributors to social well-being in comparison with possible alternative programmes in other sectors of the economy. This aspect of health economics is limited not only by difficulties in measuring the effects of health programmes, but also by the question of the range over which it should, in principle, be applied.

Thus, while it can be demonstrated that the control of certain major diseases, especially certain communicable diseases, is justifiable on economic grounds the cost-benefit concept has obvious limitations in medical care. It cannot, for instance, be applied to much of the care of old people, the mentally subnormal and certain other handicapped groups.

The second role, typified by cost-effectiveness studies of possible alternative health service provisions, has proved to be valuable in many areas, and should be part of studies for identifying the most economical way of implementing agreed health programmes.

Thirdly, economics can contribute to the effective management of existing health programmes through the development of appropriate budgetary controls.

IV THE RESEARCH PROCESS

The starting point of every piece of research is "a question" which is potentially unanswerable by reference to ascertainable facts. This is followed by deciding what data are needed to answer the question, and the methods to be employed in the investigation proposed. Together, these steps enable the

research problem to be formulated. The necessary data are then collected and processed, that is to say rearranged, in a form suitable for the purpose in mind. Next, the results are interpreted conclusions drawn and in some instances, generalizations are formulated. Finally the validity of the conclusions or generalizations is tested.

1. Identification of specific problems for investigation

Problems inviting investigation occur to discerning minds in a number of ways such as, from:

i. day-to-day issues which arise in running services;

ii. anomalies or inadequacies disclosed by deliberate investigations;

iii. side effects disclosed in the course of health planning experiences which show inappropriate or inadequate management in particular areas of responsibility;

iv. the results of evaluation studies;

v. the spontaneous expression of dissatisfaction by public groups.

As the number of questions which might be asked in any situation is unlimited, it is only through an informed hunch or intuition that the 'right' question is selected. It arises, in other words, out of a knowledge of general principles and a consideration of a spectrum of known facts. The probable answer can usually be foreseen and the investigatory process is often undertaken to confirm what is expected and to give precision to an issue. Thus, for example, in health centre practice it is assumed that a more economical use of staff and other resources is possible. The broad question is obvious, but requires to be refined if precise answers are sought. In some instances an exploratory project may be needed to provide information for structuring a research process which leads to a clearly defined question, or in formal terms the general question has to be

conceptualized to structure the problem for investigation, an hypothesis formulated, or a model of the real situation constructed by using analytical methods.

2. Inquiry methods

As we have seen, health practice research often involves the use of multidisciplinary teams for investigating different aspects of a problem concurrently, their work being subsequently brought together; or sequentially, when further work is done by different disciplines on a problem raised in the first instance within a single discipline. Each discipline has its own background of theory and preferred methods of collecting and abalyzing data, and any particular project has to be conceived and conducted within the framework of the theories of the disciplines involved.

A decision has often to be taken whether to depend on studies of total populations or on samples. When sampling methods are employed, it is essential that the data are representative. This is especially difficult to ensure in developing countries where there is rarely sufficient information to define stratification.

A choice has also to be made between longitudinal studies and studies relating to a particular date according to the objectives of the investigation and questions of feasibility.

3. Sources of data

The facts needed for testing an hypothesis or providing an answer to a formulated question are obtained in a variety of sources, including:

- naturally-occurring situations, which occasionally have the character;
- naturally-occurring experiments;
- comparisons of existing systems;
- controlled field trials in which variables are manipulated;
- evaluations relating to programme assessments.

In designing any particular project, the most suitable, feasible way of obtaining data has to be chosen.

Fundamentally, all data are obtained either from documentary sources or from observations. In many health practice research projects both sources are used in combination.

Documentary sources include:

i. demographic data, health statistics, data from existing record systems routinely compiled, and case records;

ii. documentation of an historical character;

iii. data obtained from structured surveys including questionaries interviewing techniques, structures records systems and self-recording or diary methods. Sociology has an especially important contribution to make in some of these methods because it is within this field that interview techniques have been developed especially.

Observational methods range from the descriptive approach of the anthropologist to quantified time and motion studies and the use of standardized testing procedures such as physical and psychological tests, e.g. respiratory capacity, Hb level, I.Q. estimation.

4. Processing the data - analytical methods

Health practice research relies mainly on the following types of methods:

i. descriptive reporting;

ii. the rearrangement of numerical data by tabulation, the compilation of indices and other familiar statistical methods;

iii. epidemiological and demographic methods including projection techniques;

iv. systems analysis and other analytical methods;

v. economic and accounting methods, including the preparation of costed inventories of health care;

vi. medical social analysis, which often introduces factors which are not easy to quantify and are even less easy to interpret.

The terminology used to describe these methods is still somewhat ambiguous and it would go beyond the present purpose to discuss them in detail. Many of the techniques or procedures used are referred to collectively as "operations research", which can be said to be the use of the scientific method to provide solutions to problems involving the control of a system, a system being defined as:

> A network of related procedures together with the organizational structure, policy, personal skills, equipment, buildings and layout involved as an integrated whole, which are necessary to accomplish certain stated objectives.

They include: systems analysis; work study; network analysis; programme planning and budgeting; cost-benefit and cost-effectiveness analysis; evaluation procedures; and simulation (see Glossary, Annex II).

5. Interpretation

The final stage in every research project is the interpretation of the results, in the light of previous knowledge of the subject and in relation to theory related to the study. In health practice research this usually leads to proposals for redesigning or modifying an existing system, and later to trial applications for validation purposes and evaluations of the results obtained. In this stage, referred to as "systems design", experience, insight and imagination are needed, and as in selecting the right questions, there is usually a considerable intuitive element.

The principle analytical procedures employed to facilitate decisions about what should be done to improve the situation disclosed by an enquiry are:

i. The use of deterministic or inventory mathematical model methods using optimization criteria, e.g. linear and other programming methods for personnel utilization, transportation inventory control.

ii. The use of stochastic or statistical method which takes account of variability in the existing situation.

iii. The use of methods introducing a dynamic element (Markov), which takes account of how decisions will affect or be affected by future states. These methods take account of the way in which the implications of the proposed programme might affect, for instance, population structure and other components when the programme has been in operation for a period of time.

iv. The methods of decision theory (Bayer) which take account of subjective evaluations and data obtained indirectly. Under this heading use is made, for instance, of consensus methods and morphological analysis. In many of these procedures, computer simulation is used. This and mathematical modelling may be employed either for descriptive or for predictive purposes.

6. Certain practical considerations

In applying the research process to specific problems certain general considerations have to be borne in mind. Research workers and administrators must understand each other. The administrator needs immediate answers to complex problems often involving decisions on how to use resources to the best advantage. The research worker cannot guarantee results. Often complex problems have to be broken down into simple components before a question becomes researchable, and the kind of information the administrator requires may only be built up laboriously over a long period of time. The choice of subjects for research and their relative priorities depends to a large extent on the socio-economic circumstances of a particular country, and not infrequently countries where operations research is most needed are countries least equipped to carry them out. Certainly, in these countries relatively simple methods have to be used, and sophisticated techniques avoided. In many instances methods employed in highly developed countries have to be modified for use in developing countries. For most purposes, however, simple methods are adequate and are within the capacity of almost every health administration.

It is also the case that the quality of data available often does not justify the use of highly sophisticated techniques. The use of fine

instruments to process data which are inaccurate, unreliable or incomplete can be misleading by creating a false impression of precision. Careful consideration should therefore be given to the kind and level of research which requires the use of sophisticated analytical techniques. Surveys of medical care needs and health service utilization, for instance, fail more commonly because of imprecise definitions of terms and objectives, inaccuracies and incompleteness of records, shortage of adequately trained staff and difficulties in sustaining the necessary effort over long periods of time, than because specialized techniques are not available. It is generally agreed that methods for handling data are in advance of methods for their collection.

It is also important when employing mathematical techniques to recognize that much data in health practice research are not exclusively numerical in character. For example, indices of health care and fertility rates often have a hidden non-numerical content because they are derived partly from non-quantifiable variables such as human attitudes and behaviour and socio-economic circumstances. The problem of selection of the method to be employed in an investigation is best approached pragmatically, and often involves the development of a method especially for the particular purpose, or the modification of a tried general method. The choice should take into account all relevant circumstances - the character of the investigation, i.e. whether a field enquiry or highly conceptualized study, the degree of precision required, the quality of data likely to be available, the feasibility of using highly sophisticated techniques, and their appropriateness and justification in terms of cost.

In manpower studies especially, the country-wide or macro-approach, while in theory providing information of a more general validity, introduces many more variables than localized studies. It is therefore often the case that studies at village level furnish sounder bases for planning than country-wide studies.

As in most researches dependant on records, though occasionally information collected routinely can be useful for health practice research, as a rule the necessary facts have to be collected and recorded especially for the purpose of an enquiry in a form and manner decided when the investigation is being designed.

Unless full scale enquiries are preceded by trials of alternative methods followed by pilot or test runs, a great deal of effort can be made to little or no useful purpose. Pilot runs are necessary not only for testing the feasibility of survey procedures and records, but also in many instances for providing information which enables amendments or adjustments to be made before they are widely applied, and before resources are committed to a full scale enquiry.

V PRIORITY AREAS FOR SUBSTANTIATIVE RESEARCH

The following list of subjects cited by the consultant group (1968) as priority areas for research, without professing to be anything like complete, provides a good illustration of the kind of problem public health research has to do with.

1. Priority areas cited by WHO consultant group

1.1 Personnel utilization, including the optimal balance of doctors, nurses, auxiliary professions and other health workers in different health services especially in health centres. It is generally agreed that this item should have a high priority in developing countries, and because of the trend towards increasing home medical care, or care in the community, it is now also of great importance in highly developed countries.

1.2 The relative advantages of the separate provision of care of the sick and personal preventive services, compared with an integrated personal health care service.

1.3 Regionalization of health care services, including hospital system planning.

1.4 Hospital bed utilization and other utilization studies.

1.5 Community response studies.

1.6 Studies to identify the best lines of attack on major problem areas, such as nutrition, family planning, and specific diseases.

1.7 The evaluation of the quality of health care.

1.8 Systematic studies of the education and training needed by different categories of personnel in the health care team, when their respective functions and activities are rationalized. In particular the education required by the medical team leader ("managerial physician") and community physician.

1.9 The standardization of terminology for items of health care, categories of personnel, health care institutions, etc.

1.10 The development of indicators of levels of health, health care provisions.

1.11 The applications of mathematical methods and EDP in processing and analyzing health statistical information, and in the management of certain health services. The inadequacy of indices of efficiency and effectiveness makes them at present among the weakest links in the research chain in the health practice field. There is also a need for new indices with an economic orientation - for example related to productivity - in many areas of health practice research.

1.12 Cost-effectiveness and cost-benefit studies, e.g. the cost of certain categories of disease to the community; the cost of disease control systems. The elucidation of need/demand relationships.

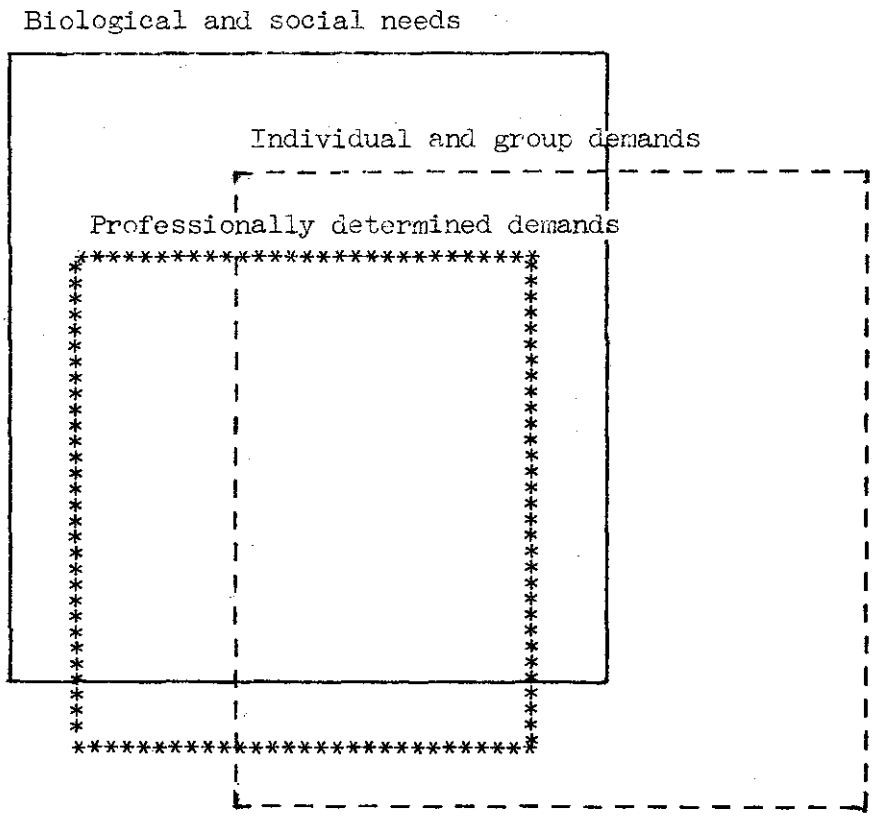
1.13 The improvement of information systems, particularly the development of methods to identify what is essential in medical records and other date systems with the object of simplifying enquiry procedures.

2. Note on the relationship of need to demand

Although indices of demand for medical care, based on patient contact, may be all that it is usually practicable to obtain, they are not wholly adequate for planning purposes because they do not take into account undisclosed needs which exist in all communities. The level of demand in a particular community is clearly influenced, for instance, by the character of the service available, the completeness of coverage offered, the cost of service to the patient at the time and the level of health and disease accepted as normal. To make an assessment of professionally determined demand, i.e. of need as judged by a doctor and for which medical care is technically feasible, medical surveys are used, thus substituting a professional estimate for a relatively uninformed demand or service utilization.

Popular demand and the availability of services are interrelated and both depend in part on socio-cultural factors. Consequently the present common concept of needs and demands fails to take into consideration many factors which are relevant. The quantification of needs and demands is among the developments urgently required for a better analysis of actual situations. The incongruence of need and medically determined demand is illustrated in the diagram.

Needs/demands

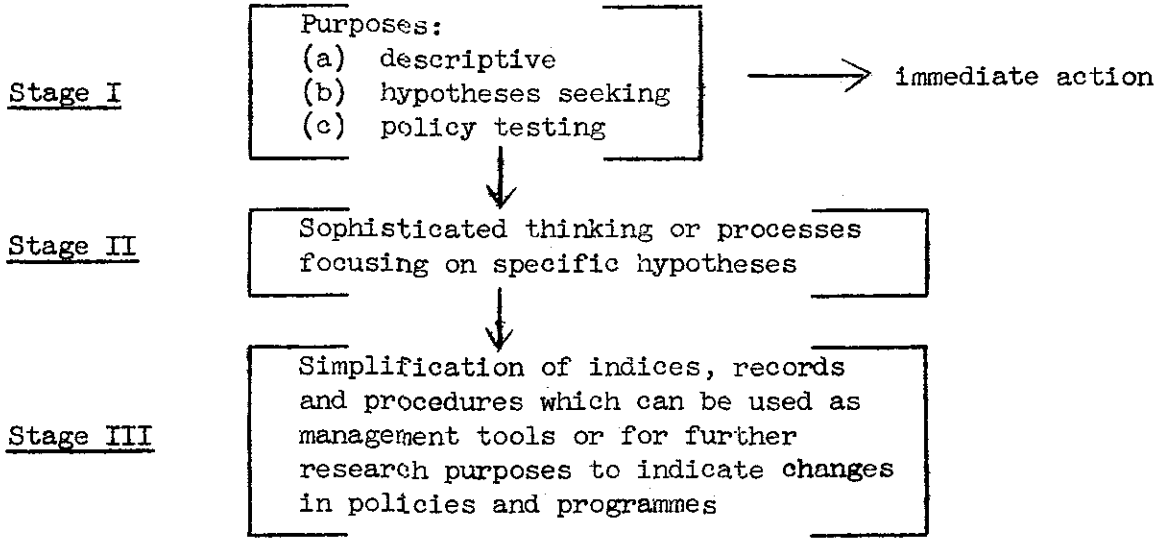


Population surveys conducted by medical teams, mass screening and health examinations have all shown an excess of need over demand, or in other words of people who could benefit from, but do not seek, medical care. In developing countries especially the area of congruence of need and individual demand may be small because of ignorance and apathy.

3. Note on the simplification of information systems

The items of information which are essential for a particular purpose can often be identified from earlier investigations by a systematic screening process, and the amount of information collected thus reduced. The relatively simple enquiry which does not profess to do more than describe an existing situation and provide policy indications is often a sufficient

basis for immediate action. It can also be the starting point of a complex research process which points to a specific hypothesis and leads finally to a new simplicity. In particular it can be a means of identifying simple but reliable indices and simplifying the records and procedures needed for routine administration. In the diagram, the process in Stage II is shown as a step towards simplification in Stage III.



Thus elaborate survey methods are sometimes a necessary step to simplification by the elimination of non-essentials, leading to the development of methods which can be used by almost any health administration. Also, because of the amounts of collected data that is commonly unsuitable for research purposes, further research is needed on the standardization of systems for collecting and handling health information at local levels to facilitate the extraction of data for research purposes from routine records.

VI EXAMPLES OF APPLICATIONS*

1. Determination of medical staff requirements (USSR)

Statistics of general morbidity together with vital statistics have been used to provide objective scientific bases for estimating the volume

*Based on the documentation programme for the WHO Cons. Group (1968).

of health care work needed and thus to determine personnel requirements. Sources of data included hospitals and out-patient departments and medical population surveys over one year to make allowances for seasonal variations. To make a projection of staff requirements of various categories it was also necessary to study the staff functions and work-load, as well as other data such as age distribution, specialities, etc. This enables projections of staff requirements to be made taking into consideration changes in the age and sex distribution in future populations. Expected change in the pattern of disease is also taken into account.

2. Work study techniques

Work study techniques have been used extensively in some countries to ascertain the work actually done by various categories of health personnel. Initially, their usefulness was highly specific to the situation in which they were carried out but as the individual studies multiplied they could be considered together. This led to general classifications of work which facilitated administrative decisions. For example, in studies of ward work, staff-centred and patient-centred descriptions enabled professional staff to describe what work done by nurses could be transferred to other personnel such as nursing auxiliaries and orderlies.

Not all work lent itself to activity sampling or continuous observation techniques. "Shadowing" of personnel was effective but expensive, and various methods of self-recording have been tried in the public health field.

For staff whose work lay more in administrative fields, interview techniques have been used to obtain job descriptions. The picture can be completed by questioning individuals about their expectations about the role of others whom they encounter in their work. This may be as important as information about the tasks actually performed.

3. Health Services Research (Department of International Health of Johns Hopkins School of Hygiene and Public Health)

Projects in several countries include the rural orientation of physicians, health manpower planning research, functional analysis of health centre activities, the use of auxiliaries at local health units under rural and urban settings, organization of health care services, and beliefs and attitudes of villagers about diet and disease. A great deal has been learned about the methodology of field research and a deliberate effort has been made to streamline the complex preliminary research procedures so as to develop routine administrative and field methods. Particular attention is devoted to trying to find ways of defining the relative proportions of different categories of personnel needed in organizational units. A common problem is the handling of data collected, and new computer techniques are being developed. Much of the information available from routine sources proved to be either irrelevant or unsuitable for research purposes.

Because of the need for testing under controlled conditions, field trials have been set up to focus on critical issues.

4. Inquiry into Local Health Services (Taiwan)

In 1966 and 1967 an inquiry was made into Taiwan's local health services by WHO at government request. The features of the study were:

i. it was done by data collection, interviews and time and motion studies;

ii. it was carried out by analysis of random samples of the health centre system over a wide area;

iii. the information used included general statistical data covering public health activities, information gathering in health centres and questionnaires completed by the general public and administrators. It involved multidisciplinary participation.

It was found that with such a comparatively simple method it was possible to reach certain conclusions which formed the basis of recommendations to the government for improving local health services.

5. Tuberculosis Control (India)

Research carried out to evolve a methodology for tuberculosis control programmes comprises the following steps:

i. formulation of the problem, including the definition of the objective;

ii. collection of information to quantify the problem;

iii. construction of a model to represent the system under study;

iv. derivation of solutions from the model and forecasting of the efficiency of programmes;

v. test-run of the optimum solution with evaluation and feedback to enable any necessary programme adjustments to be made;

vi. national application.

In defining objectives, stress is placed on taking account of epidemiological, administrative, economical and sociological requirements.

It was found that a great deal of useful information could be obtained from existing sources of information and be verified or supplemented through surveys in a representative administrative area. Field data of two kinds were collected; one relating to the response of the population to existing health facilities, the other relating to an inventory of health resources.

6. Experiences in Latin America

Since 1960, a methodology for health planning has been developed and tested in many Latin American countries, at local, regional and

national levels. The methodology is the product of a close interdisciplinary work, greatly influenced by the concepts and techniques of economists interested in planned social development.

There has been a parallel improvement in the national system of many countries for collecting data on service activities.

Specific studies have been carried out in several areas, on health manpower and training, measurement of "demand", patterns of urban mortality and regionalization. For instance, the methods and results of an elaborate multidisciplinary manpower study in Colombia have been used to check data on service utilization and related matters obtained in other countries from simple studies or routine health statistics. Surveys of nursing functions have been completed in several countries, and provide comparative data on service utilization.

The work of the medical profession in Chile has been the subject of interdisciplinary studies with an increasing participation of economists and social scientists. The studies include: a survey of opinions and attitudes of physicians who graduated in 1949 regarding the adequacy of the training they received for different types of medical practice; the effect of the doctors' strike in 1962 on medical care received by the population of Santiago, by means of a house survey of a sample of families.

7. Development of research methodology (WHO)

A WHO international study on hospital utilization has for its objective the eventual formulation of generalizations about the pattern of hospital utilization under different socio-economic conditions, which would be helpful to member countries in planning a hospital service.

Such studies also serve to test hypotheses on the methods of planning personal health services.

7.1 Field testing of methods - A WHO study is proposed in Tunisia to analyze the pattern of health services in the country, with the eventual aim of developing relatively simple survey methods for use in different situations.

8. Utilization studies of personal health care (WHO)

Studies had been carried out on population demands and trends of demands in developed as well as developing countries. From these studies standard curves of medical care utilization have been prepared.

It appears that the consumption of medical care is related to factors such as age, sex, distance, standard of living, family income, education, health insurance coverage, and it was found that patterns of medical care utilization can be related to socio-economic development. Should further studies support these views, the study of consumption of personal health care could be used for long-term planning by relating forecasts of demand trends to levels of socio-economic development.

VII THE ROLE OF WHO IN RESEARCH GENERALLY AND IN HEALTH PRACTICE RESEARCH

WHO does not itself usually undertake research. The main activities of the Organization in this field are to co-ordinate researches undertaken in different parts of the world, to help governments and other agencies initiate agreed research projects and to assist in the development of training for research workers. Notable exceptions to the general rule have included investigations relating to the Organization's own executive programme, e.g. malaria eradication; and research in areas where the primary material derives from the Organization's own activities, e.g. appraising different methods used in national health planning and studying the organizational relationships between basic health services and mass campaigns.

The general programme of research activities of the Organization falls, therefore, under four main headings:

1. Servicing research, i.e. the standardization of terminology, nomenclature, statistical indices, materials and equipment; the development of survey techniques and other methodologies and the design of questionaries and records systems.

2. Improving communications between research workers, e.g. through meetings, visits, publications, and information services such as WHOBRIS.

3. Assisting the training and exchanges of research workers through grants.

4. Encouraging, guiding and co-ordinating existing research programmes, including financial assistance on a limited scale for such purposes as meeting the cost of extra staff and items of special equipment.

Likewise, WHO's research activities in the field of health service organization and planning have also been primarily co-ordinatory and supporting in character. Typically, for instance, the assistance given by WHO is of the kind given in the global survey of maternity care carried out jointly by the International Federation of Gynaecology and Obstetrics and the International Confederation of Midwives[1].

When health care organizational studies were introduced into the programme, however, it quickly became apparent that the Organization often had to undertake a considerable burden of work which amounted to active participation. This was so because questionaries for the projects often had to be drafted at WHO Headquarters, their completion supervised in greater or lesser degree by WHO staff and the collation of data undertaken or assisted by headquarters units. In effect, in the field of health practice research, it is less easy to distinguish between "sponsoring" and "undertaking" than in the case, for instance, of laboratory projects. The report on a 'Community Health Study in

[1] Maternity Care in the World (International Survey of Midwifery Practice and Training) - Pergamon Press.

County Down', Northern Ireland[1], and the paper on 'An International Study on Hospital Utilization'[2] illustrate what is meant.

A second lesson pointed by the Organization's experience is that WHO's greatest contribution to health practice research is likely to be the validation of methodologies which can be used in inquiries conducted by governments and other agencies, whether for global, country or regional inquiries. WHO's contribution is, in fact, often in the nature of a trial to assess the feasibility of evaluative procedures and a step in defining methodologies and formulating norms which can be widely applied, e.g. relating to hospital beds, personnel, etc.

Distinguished according to the procedures and responsibilities for collating primary data, it appears that WHO will be involved in three broad groups of projects, namely:

i. Studies for which the data have already been collected by and under the control of WHO or could only be so collected.

ii. Studies in which the data have already been nationally collated and analyzed and reported in national and other publications, when WHO's task is one of collation.

iii. Studies in which the primary investigations are conducted by national governments and other agencies. This is a category of research in which the main function of the Organization is the establishment and standardization of definitions, indices and methods, or, more generally, the refinement of the instruments of operations research as distinct from engaging in investigations which are primarily substantive.

VIII WAYS IN WHICH WHO MIGHT CONTINUE TO ASSIST AND SUPPORT HEALTH PRACTICE RESEARCH

The following ways in which WHO might assist health practice research have been suggested:

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[1] Report on a Community Health Study in County Down, Northern Ireland conducted by The Down County Health Department.

[2] An International Study on Hospital Utilization by R.F. Bridgman, M.D., OMC/68.6.

1. Continued assistance in undergraduate training by:

   i. encouraging multidisciplinary research projects co-ordinated by Departments of Preventive and Social Medicine to stimulate clinicians to participate in health practice research in field training areas;

   ii. facilitating the teaching of social sciences at undergraduate training level;

   iii. encouraging the reorientation of teaching in biostatistics;

   iv. adapting public health training to meet the needs of different countries.

2. Encouraging and expediting the revision of existing courses, and the introduction of new specialized courses in research methodology.

3. Giving top priority to the training of teachers in countries where post-graduate and graduate institutions exist, by facilitating the training abroad of suitable national personnel in recognized institutions which provide training suitable for application in their own countries. Training would also profitably include new disciplines to be taught at post-graduate and graduate levels.

4. Supporting the training at various levels of non-medical research workers, and drawing the attention of governments to the advantages of having non-medical researchers of various disciplines in health departments and the need for offering attractive career opportunities for them.

5. Giving assistance to health workers to learn the essentials of related disciplines, including economics, the behavioural sciences, management sciences and demography.

6. Assisting Member States in rendering continuing education for all health personnel.

7. Assisting in developing centres for training on a regional basis.

8. Encouraging collaboration between institutions through the dissemination of information on training courses, research programmes, etc. as well as by sponsoring conferences and seminars.

9. Encouraging a recognition of the need for health practice research at governmental and high administrative levels, by drawing the attention of those concerned to the potentialities of the methods.

10. Continuing to contribute to the development of research methodology by conducting international comparability studies, the results of which will be of practical use to Member States, and making available the results of these studies, preferably in the form of publications to serve as a guideline for the planning of hospital and other health services.

11. By attending to refining the instruments of research, i.e. the development of norms and methods and indices, and the standardization of terminology, etc.

12. Encouraging the development of pilot and demonstration projects, especially in developing countries, which will serve as areas where research results can be applied on a test basis, assist in making adjustments to programmes and serve as field training areas in health practice research, not only for research students but also for administrators.

13. Advising Member countries of the advantages of attracting non-medical researchers of various disciplines such as social scientists into the health department and of the need for attractive career opportunities for them.

14. Encouraging and giving technical assistance to those engaged in conducting research projects.

ANNEX I

NOTE ON THE DEVELOPMENT OF WHO'S POLICY IN RESEARCH WITH SPECIAL REFERENCE TO HEALTH PRACTICE RESEARCH

The constitution of the World Health Organization states that one of its functions is "to promote and conduct research in the field of health" and the promotion of biomedical research has been one of the basic activities of the Organization from the earliest days.

In 1949 research into specific topics was recommended by Expert Committees. From 1950 onwards references to research, often on subjects related directly to public health are to be found in the Annual Report of the Director-General on the work of WHO. In 1955, with the acceptance by the Eighth World Health Assembly of the "Second General Programme of Work covering a specific period 1957-1960" came an approval of the principle that WHO should itself not be precluded from assisting research projects in exceptional cases. From 1957 onwards there was a succession of requests for consultant services in the field of public health practice relating, for example, to systems of financing medical care, the collection of statistics and epidemiological data and the study of prematurity in certain countries.

A new impetus was given to WHO's research activities by the Eleventh World Health Assembly (1958) which requested the Director-General to study the role of WHO in research and the ways in which the Organization might assist further in stimulating and co-ordinating research and developing research personnel. The Twelfth World Health Assembly (1959) took a further step by deciding to establish an Advisory Committee on Medical Research to provide the Director-General with scientific advice in relation to the research programme. Proposals submitted to the Twelfth World Health Assembly for an intensified international effort in medical research mentioned, inter alia, public health practice.

At its first session (1959) the Advisory Committee advised the setting up of a scientific group for each broad field of medical research, and at its third session (1961) discussed areas of research which might suitably be undertaken by WHO. Especially noteworthy is the Committee's conclusion that "problems relating to the logistics of the delivery of Health Services are considerable and warrant serious study" In the course of the Committee's discussions the effective organization of Medical Care Services was referred to as being complementary to clinical-pathological medicine in the field of personal medical care. The Committee also refers to the contribution the social sciences might make in the solution of health problems in the newly emerging countries and the collection of statistical and epidemiological data to promote the application of knowledge derived from basic studies.

The character and scope of research in Public Health Practice was further clarified by Scientific Groups which met in 1960 and 1961. The first group, which was mainly concerned with outlining a research policy in this comparatively new field, proposed certain definitions and a broad classification of areas in which research should be undertaken. This Group also proposed the establishment of "community health reference centres" with populations of 50-100 000 as part of national organizations for research in public health practice. The Group had in mind a centre specifically established for the purpose of collecting information according to agreed standards. The conclusions of the second group moved away from this proposal and advocated the use of existing health centres and other institutions which should be invited by WHO to undertake limited, specified research projects.

The reports of the two scientific groups were essentially concerned with broad policy without venturing into details of planning and proposals. They were not sufficiently definitive to serve as blueprints for actual research projects in public health practice. It is to the conclusions and recommendations of Expert Committees that we look for recommendations which have

influenced the selection of specific projects. The first report of the Expert Committee on Organization of Medical Care, for instance, suggested studies in ambulatory health care, the planning and organization of a general hospital, the cost and means of financing medical care services and methods for a qualitative appraisal of medical care services. Their references to what in fact are operational aspects of personal medical care services are noteworthy, as are references by other Expert Committees to various aspects of Public Health Administration, and the improvements of research training.

ANNEX II

GLOSSARY

Systems analysis

A system is an integrated assembly of interacting elements, designed to carry out co-operatively a predetermined function. The objective of systems analysis is to define the system, and analyze the system's properties so that the system can be improved or corrected. In the context of the problems that an operations research team may study, systems analysis is expected to make sure that the problem and a proposed solution will fit into a larger system and that, as a result, an overall improvement is achieved in the larger system.

Work study

Work study is the investigation and measurement of the elements involved in the performance of any work for their subsequent improvement.

Network analysis

Methods of planning the execution of a complex project in a logical way by analyzing the project into its component parts and recording them on a network model or diagram which is then used for directing and controlling the interrelated activities needed to carry the project to completion.

Programme planning and budgeting

PPB involves a careful specification and a systematic analysis of objectives of an organization; a search for relevant alternatives; different ways of achieving objectives; an estimate of the total costs of the alternatives, both monetary costs and those that cannot be measured in monetary terms; an estimate of the effectiveness of each alternative; and finally, a comparison and analysis of the alternatives.

Cost-benefit analysis

This involves an attempt to apply a systematic measurement to projects or programmes towards: (1) enumerating as completely as possible all costs and all benefits expected in monetary terms; and (2) recognizing that costs and benefits tend to accrue over time.

Cost-effectiveness analysis

This involves a complete listing of inputs and outputs, with recognition of time, for projects or programmes. However, under cost-effectiveness analysis, the enumeration of benefits need not be reducible to monetary terms as under the cost-benefit approach and may be restricted to stating certain results. Cost-effectiveness is employed when various benefits are difficult to measure or when the several benefits that are measured cannot be rendered commensurate.

Evaluation procedures

The process of assessing the achievement of the stated objective of a programme, its adequacy, its efficiency, its acceptance by all parties involved.

Simulation

The technique of setting up a probabilistic model of a real situation and then performing sampling experiments upon the model, usually with the help of a computer. Whereas a classical sampling experiment is most often performed directly upon raw data, a simulation entails the construction of an abstract model of the system to be studied.