The uses of health systems research

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Preface

Research on the sources, organization, and accomplishments of health care has become both important and urgent. The global Advisory Committee on Medical Research (ACMR) of WHO and the six WHO regional Advisory Committees on Medical Research have given very high priority to this kind of research. Several countries have set up new institutions or organizational arrangements to channel research funds and scientific effort into studies focusing directly on ways of improving health care.

Health systems research should be so closely linked to field realities that the results can be directly and rapidly applied. As part of worldwide efforts to promote primary health care, a special need has been recognized for simplified and practical problem-solving that contributes to a general understanding of the process of moving from research to implementation. This process cannot, however, be expected to emerge spontaneously, since it is not unusual to discover that the best scientific expertise working in cooperation with regular health services is needed to find the simplest and most practical approaches.

In order to illustrate the uses of health systems research, this publication presents a spectrum of research approaches, each of which is valid in certain circumstances. The main aim is to provide an understanding of the range of possible options in general approaches, to help in the choice of appropriate methods of investigation, and to encourage the realization that research can be done in any work setting.

A critical consideration is behind the shift in terminology from health services research to health systems research. The first efforts in health care research focused on problems encountered in government health services. As it became apparent that health depends to a large extent on variables outside the health services, it became necessary to study the health system as a whole. Causal variables responsible for health problems may be found in the life-style or the social and physical environment. Primary health care depends especially on a community-based approach and solutions can often be best applied through other development sectors. A major responsibility of health workers is to increase the capacity of people and communities to solve their own problems through promoting self-reliance rather than dependence.
Most health services research has been carried out in developed countries with well-established health services. The focus has been on improving the functioning of hospitals and on such concerns as quality assurance and cost containment. Because there is a far greater need for health systems research in the developing world, this book is mainly concerned with primary care in poor countries, citing a range of examples from community, regional, and national sources. To illustrate applications in more advanced health systems, a few examples of hospital problems are also included.

A major shift has occurred from past approaches in biomedical research in determining who should initiate the choice of research questions. We should not assume that creative ideas will spring solely from the inspired thinking and investigations of scientists working on their own, who produce findings that can then be turned over to health officials for application. It is now realized that a new pattern of cooperation is needed between those who conduct studies and those who will use the results. Both should be involved in choosing the area of research, in carrying out the investigations, and in interpreting the findings.

In view of the severe limitations in research capacity and resources, especially in developing countries, studies should be focused sharply on high-priority everyday problems identified from field experience. For many priority problems valid scientific knowledge is available, and the obvious need is for research on the ways in which to apply that knowledge within local cultural and resource constraints. When the priority problems have no ready scientific solution, then research should turn to laboratory and clinical studies. A new appreciation is emerging of the need for an easy, mutually stimulating, and supportive flow of research questions and findings between field, clinic, and laboratory studies.

At the Alma-Ata Conference on Primary Health Care (1) it was recognized that success in implementation would depend greatly on health systems research to adapt the general principles to local realities. Since then, many advances in policy, planning, and political commitment have been evident in the national plans of action that have been formulated in over 140 countries (2). WHO has worked with Member States to develop global and regional strategies. Basic documentation for the various elements of what is now called the "managerial process for national health development" provides a conceptual framework within which health systems research fits naturally (3).
1. The need for health systems research

First and foremost, research to improve primary health care must be useful. The usefulness of research is determined by the importance and relevance of the questions asked. Asking the right questions is the starting-point of all good research, as it is of any productive effort to improve health and the quality of life. Health systems research can be distinguished from basic research mainly by its direct focus on solving practical and relevant problems. It will quickly be discredited if it merely results in repetitive or irrelevant studies and evaluations that simply endorse the status quo or accumulate data that are of no avail in producing a tangible improvement in health.

Background

There is now a broad consensus that health systems research is important, but there is little general agreement as to what it actually is. Various groups of research workers tend to frame their own definitions and incorrectly assume that other people mean the same things as they do when they use particular terms. A gradually evolving synthesis of experience leads to the expectation that there can now be rapid learning from an exchange of information between groups.

Health systems research is concerned with the strengthening of health care. It begins with real field problems and uses a variety of research disciplines to apply practical scientific knowledge for improving health care and health status. It remains in the realm of research because it uses methods that yield: (1) reproducibility (i.e., solutions applied to similar problems and conditions elsewhere would produce similar results); (2) the ability to identify the key elements of a problem (i.e., the characteristics that make research approaches from one setting applicable in another setting); (3) an understanding of causation (i.e., relationships between actions and impact can be organized in concepts and theories that may be usefully applied to the prevention or modification of health problems generally). The fundamental principle is that the questions studied should be relevant to the everyday concerns of policy-makers, administrators, or anyone responsible for health care.
Appropriate research methods that fit those problems and situations should then be applied.

Health systems research goes beyond the kind of health services research that has been limited to a narrow concern with government programmes, and—as it is defined here—comprises the private sector, indigenous health practitioners, the efforts of the community itself, and intersectoral influences on health. It focuses particularly on primary health care, including the integration of treatment and control of disease, nutrition, family planning, and environmental safety; it also includes problems of referral. It is especially concerned with discovering ways in which the health system and the community can together increase people’s capacity to solve their own problems by creating self-reliance rather than dependence. It involves learning how to work with other sectors in a wide range of development activities that may prove as important for health as the tasks undertaken in the health sector per se.

Continuing delays in the application of scientific knowledge to improve the health of most of the world’s population have led to widespread commitment to more definitive action. The ambitious goal of “health for all by the year 2000” has gained acceptance because it represents the convergence of many different interests. Frustration with gross deficiencies in health care, growing gaps between expectations and performance, and the increasing realization that there is not enough money anywhere to meet the escalating costs of medical care have made it evident that major changes are needed in most health systems. Multiple projects and programmes under diverse social, economic, and political conditions have shown that scientific knowledge can be better applied to solving major health problems while maintaining a reasonable balance between the needs and resources of any country. Although most of the specific examples given in this book are drawn from developing countries, the problems and principles are also relevant to most industrialized countries.

Because straightforward efforts to implement primary health care in national programmes have met with less than uniform success, some people seem to have excessive expectations that health systems research will be a panacea. A common difficulty has been the tendency to take a pattern of services evolved in a special project or as part of a centrally designed detailed plan, and then attempt to apply this model generally in a health system. The frequent lack of local adaptation and flexibility usually results in such a model having little impact.

Current experience indicates that the implementation of primary health care can be facilitated by evolving realistic programmes and approaches to find local solutions to local problems. Because the problems are diverse, the approaches should cover a wide range of methods and disciplines. The multiple uses of health systems research will be illustrated by the examples given below.
Examples of the Diversity of Need for Health Systems Research

A review of the uses of health systems research must start with a consideration of how research questions relevant to priority local needs can be most readily identified. This section will present a series of composite, hypothetical examples taken from everyday experience in primary health care to represent the types of problem that may be encountered. The diversity of circumstances in which health systems research can be performed is indicated by vignettes ranging from community-level to international situations. In the next section, research approaches and methods that can be used in each of these situations will be discussed. As an exercise, it is suggested that while reading the vignettes the reader might write down research approaches for later comparison with the approaches suggested in section 2. Those who wish to turn immediately to the methods suggested for each example will find the appropriate page reference at the end of each vignette. Because of the conviction that the most urgent and difficult need for most readers is a better understanding of the process of defining research questions, a solid basis for this crucial first step has been provided at the end of this section in the form of a conceptual framework encompassing the major areas within which research questions may be specified.

Example 1. Primary health centre doctor trying to define health needs in his area

The only doctor in a rural health centre has become progressively more bored during the first year of a two-year assignment. He has been spending all his time attending to the multitude of patients who crowd his waiting-room and has let the health centre staff do whatever they had been doing previously. His boredom has arisen mainly from the fact that 90% of the illnesses have been diarrhoea, anaemia, and infections of the upper respiratory tract. He suspected that the anaemia was due to hookworm, but his laboratory equipment was limited to an old microscope, no technician was available, and the health centre had no flexible funds. On a vacation he had a chance to go back to his medical school and talk with his teachers about ways in which he might make his work in the health centre more productive. (See section 2, pp. 23–24, for suggested approach.)

Example 2. Primary health centre doctor trying to persuade a community to express its perception of needs

A health centre doctor has been working in a peripheral health centre for five years. Because of his good record, he was selected to attend a workshop funded by WHO and UNICEF as part of the development of a regional strategy for health for all by the year 2000. At that workshop he was impressed with case studies reflecting the success of private voluntary agency projects in getting community participation. He had
been warned that this had been much more difficult to achieve in
government programmes, but decided that he would make an effort. He
had also been told that the first step would be to persuade the
community to express its own needs and then to compare this statement
of opinion with epidemiologically derived information in order to
develop a suitably balanced programme. On arriving home, he arranged
meetings with the village councils in his area. The only response was a
series of complaints about the long waiting time at the health centre and
the chronic lack of drugs. The council members also said openly that the
health centre staff was not paying enough attention to the families of
village leaders and was spending too much time organizing family
planning, immunization, and nutrition programmes among the poorer
members of the community. The doctor realized that this kind of
superficial conversation with the local elite was unproductive and that he
would have to find a better approach to get the whole community
involved. (See section 2, pp. 24–25, for suggested approach.)

Example 3. District health officer concerned about the misallocation of
drugs

In an area undergoing rapid industrialization, with expanding trans-
port and communications networks, there had been a significant
growth of health care facilities. The recently constructed hospitals and
health centres were potentially capable of providing complete coverage
for the whole population. The concern of officials in the Ministry of
Health was now that, in spite of all the investment in health facilities,
they had received numerous complaints that these services were still not
reaching the people. A district health officer had been newly appointed
with specific instructions to improve the functioning of the health
facilities. In making her initial round of visits, the district health officer
was informed by the health centre staff that their efforts were paralysed
because of a chronic lack of drugs and other supplies. The common
charge in all these complaints was that the hospitals were siphoning off
most of the drugs, especially antibiotics and other expensive medica-
ments. Her initial review of the reported problems suggested the need to
resolve a complicated series of management issues concerned with the
distribution of drugs. In the rapid expansion of services, no time had
been taken to plan logistic arrangements. A related problem was the
chronic antagonism between the staffs of health centres and hospitals,
which resulted in little interest in cooperation. (See section 2, pp. 25–26,
for suggested approach.)

Example 4. Local health officials trying to persuade communities to
provide voluntary labour for the installation of water systems

In a mountainous country it was generally agreed that the most
prevalent illnesses were waterborne infections. Streams were used as
latrines as well as sources of domestic water. Morbidity surveys showed
an extremely high prevalence of diarrhoea and chronic infections with intestinal parasites. The people believed that water had a purifying power and that anything dissolved in the streams could not possibly be dangerous. UNICEF had offered to supply free plastic pipe if the villagers would provide the labour to install community water systems from protected springs. However, because of the rocky terrain, it would take a great deal of labour to dig trenches in which to lay the plastic pipe. Burying the pipe had been shown to be necessary since it was common practice to cut into exposed pipe to obtain water. For instance, if a shepherd boy wanted to drink, he simply made a nick in the plastic pipe and had an immediate drinking-fountain. A number of demonstration projects had shown that this kind of community work project could be mobilized if the necessary stimulus were provided by an outsider. In attempts to expand the effort district by district, no way had yet been found to induce village leaders to attend the training programmes that had been set up to demonstrate how they could develop and maintain their own water systems. (See section 2, p. 26, for suggested approach.)

Example 5. State director of training programmes trying to reallocate roles and introduce community health workers into primary health care teams

In a rural province of a developing country it had been decided that, in implementing primary health care, the training unit in the Ministry of Health should make special studies of the reallocation of roles in the primary health care team. Two years and moderate funding had been allowed for initial studies, with the provision that continuing field studies could be conducted for an additional three-year period while the implementation of new team relationships was proceeding. Doctors were now carrying out most of the curative care of acute cases and auxiliaries were handling preventive services. A policy decision had been made to integrate curative and preventive services, with responsibility for both shared by all members of the health team. Another policy decision was that there should be much more outreach to homes with the aim of increasing health care coverage, since only 20% of the population had recourse to the health services in any one year. A third policy decision had been to promote the use of community health workers in whatever pattern could be shown to fit local circumstances. The need now was to set up relevant and practical research to test these alternative approaches. (See section 2, pp. 26–27, for suggested approach.)

Example 6. National policy-maker deciding whether and when to integrate services

Because funds had been available from international donors, a country had developed four national vertical programmes for the prevention of three specific diseases and for family planning respectively. Each programme had its own staff, providing a few well-organized
services at community level. Each separate hierarchy was controlled by a central board with considerable autonomy under the Ministry of Health, and its staffing extended to the periphery. These programmes had access to most of the effective management expertise of the Ministry. Because of the influence of foreign advisers, their workers had been getting special incentives and had been excused from the usual bureaucratic constraints and government rules. The general health infrastructure was rudimentary and provided only the simplest kind of curative and preventive services, which were accessible only to an estimated 15% of the population who happened to live within a few kilometres of the scattered health facilities. At first, the vertical services had tended to work in separate districts, but now they had expanded and were covering the same areas. Complaints from the village people about multiple visits to homes and the increasingly evident duplication led policy-makers to request studies of how services could be integrated without losing the benefits already achieved in each programme. (See section 2, p. 28, for suggested approach.)

Example 7. Director of a national immunization programme deciding on the age at which children should receive measles vaccine

A measles immunization programme for all the children in a poor country is to be set up. The population density and local ecology encourage frequent epidemics, so that most children have had the infection by three years of age. Statistically it seems that immunization would have the greatest impact on the high mortality if given before one year of age. Studies in industrialized countries have shown, however, that the immunological response to measles vaccine is greatest after the age of 15 months. Local research is needed to decide at what age the mass programme can produce the maximum impact on measles incidence and mortality. (See section 2, pp. 28–29, for suggested approach.)

Example 8. Developing a national policy on whether to use specially prepared packets of electrolytes or the sugar and salt already available in homes for the oral rehydration of children with diarrhoea

A developing country has made the policy decision that a major emphasis in primary health care will be to provide oral rehydration for diarrhoea in children of weaning age, since this ranks as the first cause of death in the country. A sharp polarization has developed between the scientific advisers of the Ministry of Health, who tend to be professors of paediatrics in medical schools, and the administrators responsible for maternal and child health programmes. Academic paediatricians are concerned that a sugar and salt preparation mixed at home might produce hypernatraemia, which is dangerous for infants. They strongly recommend using only carefully measured electrolyte mixtures that provide both potassium and sodium, and glucose instead of sucrose, because these preparations have given optimum results in studies on
paediatric services in medical college hospitals. Maternal and child health administrators, on the other hand, are more concerned about the logistic problems of distributing the special packets of electrolytes to village homes in order to induce mothers to start treatment early. They cite field studies which show that mothers can learn how to use a pinch of salt and a scoop of sugar, and that the biggest measurement problem mothers have is to remember to use a water container of the right size. Even with the electrolyte packets, there is danger of hypernatraemia if the water container is too small. Both sides have agreed that the most important issue is whether and how the local population will respond to the two methods and that a field trial is necessary to test the alternative approaches. (See section 2, pp. 29–30, for suggested approach.)

Example 9. Mass therapy for leprosy in a situation where bacilli show increasing dapsone resistance

In a country in which leprosy is endemic but highly localized in seven clearly defined geographical zones, a long-standing and fairly effective programme for case-finding and home treatment has been maintained by leprosy auxiliaries attached to health centres. Hospital admission is limited to bacteriologically open cases, especially those that are lepromatous, those with erythema nodosum and other complications, and those requiring surgery on account of neural problems. In three of the areas in which therapy has been carried out most persistently, it has been found that 15% of cases are resistant to dapsone, the standard drug on which the mass therapy programme has been based. Policy-makers are reluctant to return to the isolation of cases in special institutions because of their sustained effort to remove the stigma of leprosy. Leprosy specialists have recommended that routine mass treatment should now be combined with rifampicin to reduce the rate of appearance of dapsone resistance in leprosy bacilli. Rifampicin is extremely expensive and such mass use will greatly increase the costs of the leprosy programme. An alternative proposal is to treat with rifampicin only those cases that are shown to be drug resistant. (See section 2, pp. 30–31, for suggested approach.)

Example 10. Regionalization of hospital referral services

As part of a plan to regionalize health care on an island with a population of one million, a policy decision has to be made on where to increase hospital-bed capacity. The population is evenly dispersed and mainly rural, without a great deal of poverty. Transport is, however, difficult. A reasonably equitable distribution of health centres provides primary care services with which people seem relatively satisfied. A large specialized hospital in the capital city is always crowded. Small hospitals in two of the six smaller towns seem under-utilized. They are staffed by general practitioners and have no functional relationships with the city
hospital, even though they are all supported by the same department in the Ministry of Health. The planning body has to determine how many beds are needed and whether they should be part of a major expansion of the crowded urban specialized hospital or whether smaller hospitals should be built in the four remaining rural towns that now have only a health centre. Political pressure is being exerted by city residents for the adoption of the first alternative and by town residents for the adoption of the second. (See section 2, pp. 31-32, for suggested approach.)

Example 11. Mass nutrition campaigns

A nutrition institute in a developing country had defined several areas with a high incidence of vitamin A deficiency and blindness from xerophthalmia. With international assistance, two years earlier, staff from this institute had set up a mass campaign for distributing vitamin A capsules to all children every six months. The first round of the mass campaign was well publicized and almost 80% of the children were reached. At the second round the participation of the village people was somewhat less enthusiastic and only 55% of the children received the capsules. A third round had just been completed and the proportion of children reached had dropped to 30%. Surveys for xerophthalmia and Bitot's spots had shown some improvement in prevalence rates. Nutrition education to change child feeding patterns had not, however, been notably successful.

Publicity about the declining participation had been released to the newspapers by officials in the Ministry of Health responsible for integrated health services who had initially objected to the mass campaign approach. Specialists at the nutrition institute were concerned because negative reactions to the blindness-prevention programme might jeopardize their plans to start a similar mass programme for the injection of iodized oil in an area of the country with a high prevalence of goitre and cretinism.

During this time, the nutrition unit in the Ministry of Health had independently been making a systematic effort to train community health workers to weigh and measure children in order to determine the need for supplementary feeding with the aim of reducing the generally high prevalence of protein-energy malnutrition. The effort had been made in collaboration with the Ministry's efforts to develop integrated primary health care services. (See section 2, pp. 32-33, for suggested approach.)

Example 12. Field trial of contraceptive implants

Several years of research had resulted in encouraging laboratory evidence of the contraceptive effectiveness of hormonal preparations introduced subcutaneously in a Silastic implant. Research and development activities showed that the implants had a slow release time that promised to produce an appropriate level of contraceptive protection.
Phase I, II, and III clinical trials indicated that, in healthy volunteers in a developed country, the implants maintained a hormonal concentration in the blood that would have ensured contraceptive effectiveness for well over five years. The product had been cleared for larger-scale field trials to determine whether it could be recommended for mass use. (See section 2, pp. 33–34, for suggested approach.)

**Example 13. Reducing an excessive number of diagnostic tests while maintaining the quality of care in teaching hospitals**

To achieve cost containment without reducing the quality of care has become a major concern in most hospital systems. A major teaching hospital which had prided itself on providing advanced, scientifically sophisticated care now faces the reality that complaints about increasing costs require urgent attention. A careful analysis of where the cost increases have been occurring has pinpointed the enormous increase in the number of laboratory and radiological tests being carried out almost routinely on all patients. The main reason for this seems to be that junior physicians think they should order all possible tests so as to make sure that on ward rounds no one will ask for the results of a test that has not been performed. The pressure to maintain quality has led to a general obsession that all possible confirmatory tests must be performed to reduce uncertainty about diagnoses. Patients have been complaining not only about the increase in costs, but also about the inconvenience and risk associated with the multiple tests. Senior physicians wish to change these practices without diminishing the high standards of care. They have expressed a desire to set up a standard system that would recognize and reward junior physicians who can arrive at a correct diagnosis with the most direct and efficient sequence of tests. After considerable high-level discussion, the decision has been made to conduct an operational research project to determine the most efficient sequence of tests for general use in arriving at a particular diagnosis. (See section 2, p. 34, for suggested approach.)

**Example 14. Public health nurse/midwife concerned about the organization of maternal and child health and family planning**

In examining the records of eight maternal deaths in the preceding year, the new public health nurse/midwife in a district health centre is concerned about the fact that only 25% of pregnant women are receiving prenatal care and only 50% are delivered by personnel of the health care system or by trained traditional birth attendants. In further analysing the situation, she finds that the pregnant women receiving prenatal care are those who live close to the health centre. The surrounding “dispensaries” provide no maternal and child health and family planning services, since their personnel are not trained in this field. They are, however, literate, and could learn to perform some of the basic tasks involved.
Five of the eight maternal deaths were grand multiparae who did not practise family planning. In the district centre, guidance in family planning is only provided once a week, and not as an integral part of maternal and child health care. As she observes the patients coming to the centre, she realizes that care is given mainly to pregnant women who are better placed financially, and that those who are poor and at high risk receive little or no care. (See section 2, pp. 34–36, for suggested approach.)

Example 15. Large-scale government irrigation project in an area with endemic schistosomiasis

In an African country with high endemic *Schistosoma mansoni* prevalence, a multimillion-dollar dam and a multipurpose hydroelectric project are being constructed. There is to be an associated irrigation project that will open up a large area of savannah land to agriculture. Much of the funding comes from international agencies, which have imposed strict conditions directed at minimizing the negative impact on health and the environment. Preliminary analyses have resulted in the policy decision that multiple control measures for schistosomiasis should be introduced from the beginning of the irrigation project. Research funds are available to determine the appropriate mix of interventions. Because of a considerable amount of initial epidemiological and laboratory research, a rather clear pattern has already been developed for epidemiological surveillance, engineering to reduce snail harbourage, and regular mollusciciding. Considerable uncertainty persists about how to implement the mass treatment and latrine construction programmes that are also recognized to be desirable. (See section 2, p. 36, for suggested approach.)

Example 16. Environmental consultant for a multinational company advising on chemical hazards from new industry

A multinational company is planning to build a new plant that will necessarily produce a large amount of toxic chemical wastes. In the decision about where it should be situated, economic factors favour a developing country because the raw materials are available there and labour costs will be low. Regulations about the disposal of chemical wastes are less stringent in that country than in most industrialized countries. The company feels that for ethical reasons it needs to demonstrate that it has voluntarily followed all reasonable safety provisions. The consultant has been asked to identify research questions relevant to the decision about plant location. (See section 2, pp. 36–37, for suggested approach.)

Content and Boundaries of Health Systems Research

The vignettes presented above indicate the diversity of needs for health systems research. A systematic framework to conceptualize content and boundaries in defining research questions will now be outlined.
Health systems research is not simply a new branch of epidemiology, although it often uses epidemiological methods. The two can be simply distinguished by defining epidemiology as the study of the frequency and distribution of health problems, while health systems research is concerned with the study of problems in health care.

It is customary to think of the sequence of research and development as including a phase of technology development in which the results of basic research are applied through a process of practical technological adaptation. Health systems research then makes it possible to combine old and new technological procedures to ensure their best possible use in health programmes.

The most important single issue in health systems research is to learn how to ask the right questions, with the aim of improving understanding of the structure and functioning of the whole health system and identifying the particular problems in specific situations. A useful technique is to look for gaps and inconsistencies in the way health care fits health needs. Because health systems research has such an inclusive tendency, it is necessary to define its relationship to the planning process and its boundaries. WHO's efforts to conceptualize the process of improving health services began with promoting comprehensive health planning. Country health programming then evolved in order to place more emphasis on implementation at the periphery. More recently, further efforts to involve the whole health system have resulted in the broader approach illustrated in Managerial process for national health development (3). A series of publications have documented the components of the process in detail, including, for example, the guidelines that have been prepared on evaluation (4). Special importance has been attached to the role of political forces in policies and decisions.

Within the framework of the managerial process, health systems research has a special place. Planning and management involve applying existing knowledge to health improvement; health systems research contributes to obtaining that knowledge. Field projects tend to fall into loosely defined categories. Many research projects are carried out specifically to test new principles or procedures under natural conditions. Adaptive research in a pilot project may take findings that have already been established and adapt them to local conditions. A demonstration project may take procedures that are known to work under local conditions and apply them in such a way as to convince local decision-makers and community members that the method should be generally used. The first two examples are primarily research and the third is part of implementation, but all three fit together as part of a broad managerial process.

Some general content areas of health systems research will be described below to conceptualize further the scope of the term.

**Adaptive research for incremental implementation**

The main emphasis in health systems research should be to improve existing services incrementally. The innumerable obstacles and manage-
ment constraints that interfere with effective functioning need to be resolved in a progressive fashion through field studies. For every problem solved, others will emerge. This kind of continuing health systems research can be an integral part of improving regular health services. Following the general sequence of the planning process, the types of situation in which practical questions can be identified will now be presented.

Definition of priority problems

People working in the health system often do not have the time or perspective to define problems either in the system as a whole or in their own areas of responsibility. They may have strong feelings about general issues, but are so involved in routine daily activities that they do not possess the objective viewpoint or have knowledge of the specific methods required to determine where change is possible. People within a system tend to accept what has been done in the past as automatically right, even though they may complain about the results. A more intensive effort than the setting of priorities, which is part of planning, is often needed to identify underlying problems and their causes; it may be of greater importance to overcome these problems than to tackle the seemingly more obvious issues. In countries in which health needs are great, it is said that the problems are so obvious that there is no need for research to identify them, but this is often not true. In such situations the greatest need may be to focus limited resources where they can do the most good and it may be necessary to carry out research to find that focus.

Analysis of why current health care components are not meeting priority health needs

A methodology that makes it possible to balance health needs and resources is a useful research step, because what happens in health services is usually determined more by tradition and past practices than by attempts to meet the changing needs of people. Administrators tend to assume that when personnel and facilities have been provided, services automatically follow. The process of analysing what is actually happening in the delivery of peripheral services and what their impact is on priority health needs continues to be a neglected area of investigation. As part of a general review of the managerial process, two approaches can be used in finding out what is happening in the health system. First, deficiencies and gaps may be revealed, which may lead directly to corrective action. Secondly, problems may be identified that require more sharply focused and more specific research projects.

Reallocation of roles and adapting technology

In developing efficient primary health care services it is almost inevitable that a reallocation of responsibilities from previous health care
patterns will be needed. New understanding of what is possible may require dramatic shifts in customary team relationships. In most countries it will probably be necessary to give more responsibility to peripheral services if health for all and equitable coverage are to be achieved. Research is needed to attain an optimum balance between local health needs and available health personnel and to increase the capacity of people to solve their own problems.

A major objective is to make sure that scientific advances are used to simplify technical procedures and provide methods that can be used by relatively untrained personnel. Most scientific advances in the past have led to complicated procedures requiring more sophisticated and expensive equipment. In primary care the need is for the simplest, least expensive, and most widely usable and acceptable methods, even if this means a slight loss of effectiveness. This kind of technical development is important in its own right, but as part of health systems research special efforts must be made to develop practical and affordable technology which fits conditions existing at the periphery.

**Development of new training approaches for all categories of personnel**

People have to be prepared for their new roles. If responsibilities within the health team have been clearly defined and reallocated, a rational and relatively straightforward process of changing training content and methods can often follow as part of health programming. There are many situations in which a practical research approach can test alternative options. To make the training practical new methods may be developed based on learning by doing the newly defined tasks under supervision. Training modules need to be developed in which learning consists in problem-solving rather than rote memorization. The particular needs of each region and educational system vary greatly and adaptive research will be required to find out what is locally appropriate. A major deficiency of past efforts has been the tendency to apply uniform solutions to widely different training situations because of excessive concern about credentials.

**Improving management**

Most research in health care will be devoted to specific management issues, since these are the most common blocks to effective and efficient services. Rather than thinking only about initiating new activities as part of improving primary health care, it is also necessary to make better use of the people and facilities that are already available. It is often possible to get the most rapid results by improving the way in which existing activities are carried out. When a whole programme grinds to a halt because of a particular bottleneck, the main need is for research on that one issue. Once the problem is localized, a continuing process of progressive approximation can improve management methods. In most administrative situations new trial approaches can be introduced and
confirmed or rejected on the basis of intuitive judgement. A simple experimental design and selective measurements may, however, result in more rapidly acquired and better focused data for decision-makers than the empirical trial-and-error judgements that have frequently wasted time and resources in the past. The range of management problems that can be improved by research is vast, including logistics, personnel, supervision, finance and budgeting, facilities, etc. Simple methods of operational research are useful in this kind of field study, especially when they concentrate on practical issues.

Policy analysis

One of the most necessary and least studied areas in health systems research is intensive practical policy analysis to solve underlying problems in the interactions among the various components of the health system. In a policy analysis the following components should be taken into account:

1. assessment of health needs;
2. production and distribution of health resources in terms of manpower, facilities, supplies, and knowledge;
3. broad definition of the organizational structure of the health system;
4. management of health services at community, primary, secondary, and tertiary levels;
5. economic support of both public and private health systems; and
6. evaluation and feedback of the results of health activities.

The research perspective is characterized by a primary concern with testing alternative goals and policies and the relationship between health measures and defined needs. An example is the functional analysis methodology that has been applied in field research in several countries. In efforts to make the best use of limited resources to meet programme objectives, a continuing problem is that health needs are measured with epidemiological data and resources in terms of budget and personnel. To relate the two sets of information, the functional analysis methodology collects data on both needs and resources as they apply to selected functions. A streamlined field approach provides a flexible means of matching resources to particular needs by gathering information in direct performance terms applied to each function.

A major consideration in policy analysis is the realistic testing of the ways in which priority health care problems can be made accessible to study and manipulation. The way things are done in a country depends mostly on sociocultural and political traditions, and these will determine the features most susceptible of change as well as the major obstacles to improvement. For example, political realities and national attitudes towards socialized services will be the primary influence on the balance between public and private health care. It may be that evidence from policy analyses will help to change attitudes, but even if it fails to do so,
knowledge of such attitudes will help other aspects of programming.

In every health system the rapid escalation of medical costs has increased the importance of research on efficiency and cost-effectiveness. Methods of financing need to be studied to guide efforts in cost containment and to improve health insurance coverage. This is a considerable change from earlier attitudes, according to which effectiveness in disease reduction was the sole criterion for judging the value of health interventions, and any cost was justified to obtain a minor improvement in impact.

**Fundamental Issues in Primary Health Care Requiring Field Research**

As the primary health care approach has moved into more active stages of implementation, several new and poorly understood issues have emerged that are in urgent need of intensive research. While most health services research should be concerned with the kinds of immediate activity outlined above, there are also good reasons to conduct more fundamental field research concurrently. Even a relatively small effort to clarify fundamental issues and contribute to basic knowledge can be important for both immediate and future application. Research on such fundamental issues will increase the scientific credibility of health systems research. While sophisticated methods should never be used where simple field trials and observations can provide the requisite information, an appropriate balance between simple methods and more intensive research on fundamental issues should be struck in research institutions. Systematic two-way feedback with the health system would ensure that this kind of fundamental research maintains relevance.

**Equitable distribution**

The phrase “health for all by the year 2000” is more than anything else a call for equity in health care. It is frequently misunderstood as implying a universal definition of health, something which has never been intended. Most countries have now made the political commitment that health care should be considered a human right, which is very different from earlier, elitist perceptions that care should be the privilege of those who can pay for it.

In addition to the more customary measures of effectiveness and efficiency, equity introduces a new parameter in measuring the outcome of health activities. Innovative approaches to gathering information are needed to monitor coverage in a way that will identify the groups whose needs are greatest. Some of the most intractable constraints are imposed by mechanisms of financing and long-standing cultural barriers. New definitions of adequate coverage will have to be developed and new measurement and surveillance methods devised. Little has been done to measure coverage and to define the means of achieving it, except in epidemic-control activities where there is concern about the hazards of
spread in population groups. As the focus of care has shifted to personal preventive measures in general, indices of coverage have become important in order to achieve an appropriate channelling of services. The new research should take us beyond definitions of social justice that emphasized equality of access to health care.

Depending on the social system and political commitment, new criteria are required to define equity according to need with the immediate implication of preferential care for the poor and deprived. If the definition of equity is founded on need, then some fascinating multi-disciplinary community-based research can be done on such issues as devising ways of persuading the community elite to recognize that it is its responsibility and in its best interests to make sure that the health needs of the poor are met. The arguments for equitable distribution can then be based on objective health criteria rather than political claims.

Community involvement

A primary responsibility of health personnel is to help communities to solve their own health problems and care for themselves. Similarly, a central objective of the modern primary health care movement is to encourage a shift away from activities that make people feel overly dependent on health services. Even though the general concept of community involvement has gained widespread support, there is little agreement on what the term means. Specialists from various disciplines are proceeding with their own definitions. There is little practical understanding of how community involvement can be achieved except in the case of small projects, where it seems to occur spontaneously. Health service professionals around the world, recognizing their failure to achieve adequate primary health care coverage, have tended to use this new emphasis as a convenient excuse for shifting responsibility back to the community. There is so much that is not known that a major field research effort is needed, applying the methods of anthropology, social psychology, and community development.

There seems to be a natural tendency in any health care activity to encourage dependence among those who use it. The problem is most openly recognized in psychiatry, where patients have difficulty adjusting to normal living when they have become dependent on emotional support from the therapist. Doctors frequently create dependence by fostering the impression that they possess mysterious wisdom in which patients should have unquestioning faith. Patients often seem to prefer such a relationship, because they are able to turn their worries over to superior expertise. Health education aggravates the situation by ending most educational messages with the exhortation “See your doctor”, rather than demonstrating how people can look after themselves.

Dependence is a natural consequence of the general trend towards greater complexity, technological solutions, greater specialization, and increasingly expensive hospitals. Whether health care is provided through public or private financing, patients are encouraged to use services just
because they are available. Supply creates its own demand. People are hospitalized for minor or nonexistent problems to satisfy the professional interests and convenience of doctors or because insurance coverage is limited to hospital treatment. Patients are subjected to unnecessary diagnostic and therapeutic procedures because hospitals and health workers do not want to be blamed for doing anything less than the maximum possible. To counteract these trends, research is needed to begin to demonstrate the relative cost-effectiveness and benefits of alternative means of meeting health care needs.

The new movement promoting community involvement requires a change of orientation in doctors and the health system as a whole. Research on such attitudes should start with respect for the strengths of the community and people's inherent capacity to solve their own health problems. A factor that contributes to the innate arrogance of physicians and related professionals is that they are used to working in hospitals and clinics, where they are in control. They seldom go into homes, where they would have to behave as guests. When community members are in control, health workers tend to react by an aggressive display of their superior scientific and technical expertise. Research is needed on how health personnel can experience gratification and satisfaction not only from short-term curative responses but also from new community relationships that produce long-term results. Communities cannot solve their health problems by themselves but it is a challenge for health personnel to learn new approaches to help them seek solutions.

In view of the foregoing considerations, it is important to define flexible principles, based on worldwide experience, to promote for each area a locally appropriate continuing process of community participation. Increasing numbers of health projects in many countries are demonstrating these general principles. The need for flexibility in adapting to local conditions is absolute, since the most important single principle is that the community must retain ultimate responsibility for any decisions made. The research challenge is to understand the general process in order to promote local implementation through adaptive studies.

Intersectoral cooperation

The fact that health depends as much on factors outside the health system as on health services is a basic dogma of the primary health care movement. Community involvement, intersectoral cooperation, and new approaches to the peripheralization of health services are the three pillars on which primary health care is being built. Just as with community involvement, recognition of the absolute need for intersectoral cooperation does not mean that we have learned how to promote this cooperation in national programmes. A research approach is indispensable because possible areas of cooperation vary according to local conditions and personalities; potential openings need to be sought with special diligence through focused studies. As long as there are difficulties in integrating activities within the health system, it may seem naïve to
think that integration with other sectors will be easily achieved. On the
other hand, experience is accumulating to suggest that perhaps the
jealousy and competition that interfere with integrated services are less
prevalent outside the health system than within it.

Many of the most important long-term determinants of health status
depend on changes in environment, personal life-style, and socioeco-
omic influences. Under conditions of underdevelopment, improvements
in education, water supply, housing, food supply, transport, communi-
cations, and the role of women produce important long-term health
benefits. Disease prevention and health promotion have far more direct
impact than curative activities, but specific mass preventive measures are
themselves most effective where general development is occurring. With
development, the chronic illnesses of affluence become the major health
problems and for these the trend has been to concentrate on increasingly
sophisticated and expensive curative measures. However, significant long-
term improvements can come only from changes in life-style, such as
reducing smoking and drinking, avoiding overeating, and taking more
exercise.

Better ways of collaborating with other sectors have not been easy to
define because they are so diverse, especially at the upper levels of
government. The greatest successes in intersectoral cooperation have
been at the community level. Here people naturally work to fulfill their
priority needs without regard to sectors, and become impatient with
artificial bureaucratic distinctions that they cannot understand.

Within the service hierarchies two major problems need to be studied.
One is the straightforward organizational issue of how people whose
careers depend on performance within their own hierarchy can be
brought to see that it is in their best interests to work with other sectors.
Current efforts to solve this problem concentrate on bureaucratic
questions such as where joint boards or commissions should be located
and what kind of joint staffing will provide the continuing patterns of
communication and shared responsibility that are needed. More
important is organizational research on new approaches to working
together on specific problems within the constraints of local conditions.
The context of interrelationships usually determines what is feasible, and
we do not yet know how to define the parameters of such problems.
Innovative research should begin to define types of conditions to provide
a perspective within which local issues can be understood and decisions
made.

The second problem is more diffuse and mainly motivational. Bureau-
cratic jealousy and exclusiveness lead almost uniformly to feelings of
territoriality and protective rigidities within each sector. Incentives for
cooperation are not spontaneously evident in most political or economic
structures. In modern complex societies communication has become
increasingly difficult, and the first need is to create awareness of potential
communication channels. Health systems research should be able to help
to develop the means and incentives for better communication and
mutual understanding between systems and sectors.
Integration of services within the health system

Because of the way in which health services have developed in most countries, a major problem has been created by the tendency for separate vertical programmes to become firmly established and to resist integration. The initial justification for a focused effort in a vertical programme eventually runs into problems when there is duplication of coverage and costs. As the need for an intensive attack on a highly focused health problem declines, vertical programmes tend naturally to expand their activities, leading to inefficiency and overlapping with other programmes. Some of the most politically acute problems have emerged because once separate services have been set up the greatest obstacle to integration has been the territorial defensiveness of their personnel, who actively resist changes in their accustomed comfortable patterns of working on a single activity. Tightly managed vertical programmes usually do not permit local flexibility to implement primary health care according to local preferences, and usually the concept of community participation is expressed mainly in terms of inducing the people to cooperate with central decisions. The people do not understand the reasons why a succession of workers visit their homes, or why they have to attend a variety of clinics based on disciplinary distinctions that do not fit their own classifications of problems. All types of contraceptive practices are dealt with together in family planning programmes in spite of the variations in the location of services, the complexity of methods, the personnel providing them, the target age groups, and the purpose of the procedures—whether for spacing or preventing births. Similarly, the combining of, say, six vaccines for essentially immunological reasons makes no sense to village people, when the illnesses, age groups, methods of administration, logistic mechanisms, and cold-chain requirements vary so much. Most health systems would not have separated vertical services into categorized programmes if the decision had not been imposed on them by international donor agencies.

It is generally agreed that eventually all primary care services will have to be integrated. The need for field studies on how to integrate them has become urgent in many countries.

Inclusion of the private sector

Implicit in the philosophy of community self-reliance is the need to include private services as part of the health system. In past thinking about health services research in developing countries, the focus was almost exclusively on public sector activities. It is now evident that health for all in most countries will depend greatly on the private sector. In many countries that claim to have socialized health care the private sector is well established. Health professionals in developing countries often mistakenly assumed that as public services expanded they were moving into a vacuum of health care. This has never been true, because there is invariably some kind of indigenous health care that people have developed to meet their acute needs. In many countries the continuing
resistance to scientifically based practices demonstrates the need to learn about these indigenous systems and make use of the knowledge thus acquired. A major research area is to test ways in which the various health systems can work together using anthropological and other social science skills.

Numerous efforts to incorporate indigenous health systems into government services have generally met with resistance. One problem has been the attitude of health officials, who wish to use traditional practitioners but show their disrespect for what the practitioners are doing or want to do. While government commissions and conferences have studied the subject, the traditional practitioners in many places have gone ahead and spontaneously integrated scientific methods and medicines into their practices. In accordance with the pattern of pragmatic eclecticism on which traditional systems have been built, they have found it empirically useful to incorporate the procedures and drugs that seem to work best in Western medicine. Research initiated in several countries has shown that over 75% of the medicaments now being used by traditional practitioners may be Western drugs (5). A principal determinant of which drugs will be preferred is whether they work more rapidly than traditional treatments; this may lead to the hazardous use of potent substances.

A promising approach in research on the use of traditional birth attendants is to start from the basic premise that it is wrong to try to transplant hospital practices into village homes. At the outset, a definition is required of what traditional birth attendants are doing in their home deliveries and routine care. These activities are classified on scientific grounds according to whether they are beneficial, harmful, or neutral. A careful review of the practices of traditional birth attendants usually reveals remarkably few that are bad (such as care of the umbilical cord), more that are good (such as massage and persuading the mother to adopt the squatting position during delivery) and most that are neutral and ritualistic. The training of traditional birth attendants and efforts to establish a cooperative relationship with them can then start from the straightforward perspective of changing only those few practices that are bad, encouraging those that are good, and not tampering with those that are neutral.

The situation with regard to the private practice of physicians and other health personnel acquainted with scientific medical procedures is as confusing in most countries as that pertaining to traditional practitioners. Many doctors in full-time private practice in urban areas compete vigorously to serve anyone who has the money to pay for both the reality and the image of special attention. In most public medical care systems, doctors in government employ also manage, in one way or another, to practise privately. There are many arrangements whereby a government doctor can see patients in his own home, the obvious incentive being to divert patients from the government facility to the private setting. Controlling such practices is usually difficult when the role models are medical college professors who manage to maintain
extremely lucrative private practices even when they are ostensibly working full time for the government services. Modelling their activities on those of physicians, other categories of health personnel commonly engage in private practice. These people are often labelled quacks, but until adequate alternative services are provided, the government can scarcely eliminate them. There is an obvious need for research in balancing the advantages and disadvantages of private sector activities at all levels of health care.

One of the remarkable features of private practice is that, even though government facilities in most places are chronically short of drugs and other supplies, the private sector invariably manages to purvey basic medicaments, even in remote areas. It has become evident that people often prefer to pay for their own medicines because they feel that this will ensure good quality. An obvious lesson is that public services should not attempt to provide free medical care unless they are prepared for the heavy costs involved. Free medical care is a favourite promise of politicians because of the obvious political benefit to be gained from providing something for which there is an ever-present demand. They do not seem to have learned that their promises will backfire if good medical care is not forthcoming.

The public sector can often make the best use of its resources by focusing on those areas and needs that have not been provided for spontaneously by the private sector. A major research question is to work out funding arrangements whereby people are allowed to pay for items that they wish to purchase privately and public money is reserved for preventive and other programmes, such as family planning, which people are not usually prepared to pay for individually.
2. The choice of methods

Health systems research is inclusive in its approaches, and methods are being borrowed from many disciplines. Since the field is still evolving, it would be unproductive to be restrictive in specifying which methods should be used. The current borrowing of methods will presumably lead to productive syntheses and adaptations. Multidisciplinary teams will always be needed, but there should also be an increasing evolution of health systems specialists, integrating skills from the main disciplines that prove to be useful.

This book makes no claim to being a manual of research methods. If such a manual is required, the research worker is referred to the publication prepared 10 years ago by Grundy & Reinke (6), which is still valid. Details are given there of how specific methods from operational research and other disciplines can be adapted to the particular conditions of health care. The present volume is concerned mainly with conceptualizing the field and presenting practical examples of how health systems research may be useful. This process of starting with practical problems stands in contrast to the inappropriate borrowing of methodology that occurred when highly mathematical operational research and computer simulations were first applied to health services. When technical specialists armed with sophisticated methods look for a problem to which such procedures can be applied, the results tend to be useful only in highly structured situations, such as hospital milieux.

In focusing on the uses of health systems research, the approach here will be to identify methods that are appropriate for specific types of problem, beginning with the vignettes presented in section 1. A classification of approaches to health systems research will then be presented. Some special methodological problems and innovations will also be discussed.

These descriptions of what can be accomplished through research may appear unduly optimistic on a first reading. Anyone who has done field work knows that a series of success stories such as are described here would never happen in real life. On the other hand, the aim is to show what is possible, so positive outcomes have been stressed.
Research Approaches that Might Be Used in the Hypothetical Situations Cited in Section 1

Example 1. Primary health centre doctor trying to define health needs in his area

When the doctor talked with his medical college professors, he received most help from the professor of community medicine. In college the teaching in community medicine had been boring, but now it seemed exceptionally relevant. The professor told him that he must go beyond the basic clinical orientation that he had been taught in medical college and realize that instead of thinking only in terms of individuals, he now had to consider the whole population in his area as his patient. This immediately imposed a set of responsibilities that went far beyond just treating patients in his clinic. In order to know what was going on in the population, he would have to make a community diagnosis. Instead of just diagnosing an anaemic patient as either having or not having hookworm, he needed to study the relationships between the stool parasite rate, the prevalence of anaemia, environmental conditions, and behavioural patterns in the various communities involved. He would have to use rates in the same way as doctors on wards use temperature, pulse, and respiration to follow individual patients. The professor of community medicine helped him to review statistics so that he could do the simple calculations necessary for a community diagnosis and train his clerical staff to provide him with summary tables from the health centre records of the age, sex, seasonal, and geographical distribution of the highest priority problems.

The primary health centre doctor was encouraged by his professor to carry out a research project on the cause of anaemia and the control measures appropriate to his area. In the parasitology department, he found a laboratory technician who was willing to demonstrate the laboratory methods for stool surveys and simple means of measuring haemoglobin in the community. He spent some time reviewing what the various parasitic ova in stools looked like.

On returning from his vacation, the doctor turned over to his pharmacist the health centre's afternoon clinical treatment sessions, with provision for complicated cases to be seen when the doctor returned from the field. He personally initiated systematic village surveys of stool parasites and haemoglobin levels, sampling children from various socioeconomic and ethnic groups in the villages from which cases had been coming. The easiest groups to test were schoolchildren, but the poorest children were not in school, so he had to go to their homes. Hookworm proved to be common, but it had a patchy distribution which was highly correlated with anaemia.

The doctor now began his health systems research effort, which was to work with the community to develop a long-term control programme. In the health centre he put up spot maps showing the distribution of hookworm infection and anaemia in the various parts of the villages.
The village councils also made copies of the maps for display in the villages. He took his microscope to schools and village council meetings to demonstrate what the worms and ova looked like while discussing their transmission. Working with the people, he plotted the special characteristics of the parts of the villages where infections were the most common and showed that the prevalence of anaemia and that of hookworm were highest in damp, shady areas, especially bamboo groves, which were used for defecation. A comparative analysis of survey data from various villages demonstrated a general relationship between ecological conditions and infections; it showed where efforts should be concentrated in a programme for the construction of latrines.

The approach of using survey data to promote community participation in research and implementation attracted the attention of the district public health officer, who promised to provide an adequate supply of anthelmintics for treatment, iron supplements, and free concrete squat plates to any family that would put in a latrine. Groups of families worked out cooperative means of providing the labour needed. Because of the community interest resulting from involvement in research, families without a latrine began to be looked at askance by their neighbours. The anaemia rates dropped.

Example 2. Primary health centre doctor trying to persuade a community to express its perception of needs

The doctor was respected for his five years of clinical work and care of acute medical needs. This had caused the people to have a solid set of expectations to which he was no longer conforming. They expected him simply to tell them their health needs and were baffled when he asked them what they thought their problems were.

As a compromise approach, the doctor suggested that the village leaders should work with him in conducting surveys of village needs. Largely not to disappoint him, most of the villages agreed to cooperate. To start with, he pointed out that the health centre did not have the staff to carry out such surveys and suggested an approach that would enable them to work together. He asked the leaders in each village to propose the names of educated young people, including women, from whom they together selected several to do the survey work. Questionnaires were worked out in discussions with the leaders, focusing on simple data adapted to local perceptions. This immediately induced people to discuss their impressions of local needs. Great difficulty was encountered in persuading women to express their opinions, which were quite different from those of the men; eventually separate meetings were required. When several villages were ready to start the surveys, the doctor trained the interviewers as a group. As the data began to come in, he helped the interviewers to do simple analyses. The data were then discussed in detail with the village leaders and interpretations jointly worked out that fitted their understanding as well as the doctor’s scientific judgements. This led naturally to systematic efforts to mobilize village people to act on the
problems identified. Although this example scarcely fulfills the usual concept of a careful research design, it does provide an example of the way in which community involvement in research will probably have to start and the need for flexible innovations to learn how to work with communities.

Example 3. District health officer concerned about the misallocation of drugs

The district health officer faced a situation in which fairly rapid action was indicated. She knew that her supervisors expected her simply to make the necessary administrative decisions to redirect the drug flow, but she was not sure what the appropriate distribution pattern should be. She was also not sure how to handle the underlying mutual resentment between the hospitals and health centres.

As district health officer, it was relatively easy for her to obtain complete reports on the flow and use of drugs. She found that, as the services had expanded, earlier patterns of direct drug distribution to health centres had changed. As part of a general regionalization effort, each hospital had been assigned logistic responsibility to support the health centres in a defined area. This included the obligation to distribute drugs in accordance with local needs. Hospitals were also supposed to send out teams to work in each health centre for one day a month, set up training programmes, and provide special attention for referred patients. The directives requiring these increased regional responsibilities had come at the time most of the hospitals were doubling their bed capacity. Hospital pharmacies had always been chronically short of medicines. To the pharmacists in charge, the needs of the health centres seemed of much lower priority than those within the hospitals, especially since hospital personnel were convinced that all the really sick patients would end up in hospital. The appropriation of health centre drugs was easily justified. The requirements that they provide other support for the health centres were considered a nuisance and ignored.

Since the district health officer had no extra funds, she had to find a solution through the better allocation of very limited resources. She believed in the concept of regionalization and wanted to continue arrangements for hospitals to support health centres in their area. As a first step, it was apparent that a standard list of essential drugs for the health centres should be worked out and a more complete list for hospitals. Patients were expected to pay for anything not on these lists.

She arranged for the statistical assistant on her staff to be freed from his usual responsibilities to carry out a comprehensive analysis of the amount and types of drugs being used in each facility and the cost implications. The data showed considerable differences between hospitals in the manner in which they were transmitting drugs to health centres. She appointed a committee of hospital directors, chief pharmacists, and health centre doctors to work under her own chairmanship, with the statistical assistant providing staff support. They obtained the services of
a consultant from a local management institute, who worked with them in applying standard operational research techniques to studies of the drug flow. Particularly useful were a simplified inventory model and a predictive linear programming exercise to optimize distribution and standardize the handling of supplies (6). Even though the members of the committee did not understand the mathematics involved, they did have the opportunity to discuss the data used in the analysis and the findings. As a result, they were able to win general acceptance of the new implementation plan that resulted from the analysis. The intensive discussions between the hospital and health centre staffs over this issue began to improve relationships.

Example 4. Local health officials trying to persuade communities to provide voluntary labour for the installation of water systems

Most of the practical engineering and technical and organizational experimentation needed to provide safe water to the mountain villages had already been done. Current difficulties consisted entirely in learning how to mobilize people to provide voluntary labour for the installation and maintenance of the systems; the need was mainly for social science research. Educational efforts had previously concentrated on the health justifications for safe water, but these were having little impact because people were convinced that anything dissolved in water was immediately purified. An anthropologist from a local university carried out field studies and showed that a better approach was to emphasize the convenience of eliminating the need for one person in each family to spend half of every day just carrying water. This research also showed that it was always women’s work to carry the water and it was men who were being asked to help to dig the trenches in which to bury the pipe. A new project was initiated to try to involve women’s groups in organizing the digging of the trenches. Because of the great amount of labour involved, the women organized the children to try various ways of policing exposed pipelines to warn people not to cut into them. After the local families were convinced of the need for protecting the pipes, it was apparent that the only places where the pipes needed to be buried were in sections near paths along which strangers to the community would pass. The research started out using mainly anthropological methods, but moved into a study of general community organization. Publicity about this study was then widely circulated to support the national programme and encourage other communities to adopt the same approach.

Example 5. State director of training programmes trying to reallocate roles and introduce community health workers into primary health care teams

Whereas most health systems research has to be done under great time pressure, the arrangements in this instance permitted a more systematic
approach. The state director of training arranged for a nearby school of public health to take primary responsibility for conducting the research, with the provision that it would work in close collaboration with health officials to keep the studies focused on real situations. The first stage was to conduct a functional analysis, including work sampling, to find out precisely the work distribution in the health system. The findings showed several organizational changes that could be made to improve efficiency within the existing work patterns. These improvements resulted in greater cooperation among the people in charge of services, but considerable unease among health centre staff who found that their traditional roles were being changed. There was concern about the proposal for community health workers to provide simple treatment because they were considered to be little more than quacks. Rumours were also circulating that home visiting by middle-level health centre staff was going to be required to maintain supervision of the community health workers.

Detailed studies were done of several demonstration projects run by private agencies and academic institutions in which community health workers had been more or less successfully used. In these pilot studies, however, the following problems had emerged. Community health workers were eager to get appointments, not only because a small salary was provided, but especially because they hoped that this would eventually lead to a secure government job. There was doubt about the plan for community leaders to select the community health workers because they tended to appoint close relatives. The greatest problem was that in many villages a strong antagonism between village factions resulted in situations in which heads of households were refusing to admit community health workers from a rival faction into their homes.

Because village antagonisms proved to be so serious, three possible models of community health worker distribution were designed for field testing. Three areas were selected with reasonably good comparative representation of a statistically valid number of health centres; one pattern of services was introduced into each area in a flexible design permitting progressive modification. Careful records and rapid analysis were to be maintained. The following experimental design was proposed: model 1 was to have a community worker from each of the major village factions, even though this more than doubled the total number that had to be trained; model 2 would have a community health worker from a neighbouring area brought into the village so as to minimize factional stresses; model 3 continued the original pattern of one community health worker from each village to see if they could dissipate the factional antagonism over time.

Regular meetings and workshops were held to keep all personnel informed of results and to introduce progressive changes in field activities. The fact that all levels of health workers were involved in the planning, execution, and interpretation of the research removed their initial resistance and resulted in good cooperation within the health system.
Example 6. National policy-maker deciding whether and when to integrate services

The national policy-maker realized that competition between the directors of the various vertical programmes would make it very difficult for an independent team to conduct the research. As the chief medical officer of the country, he was able to provide moderate funding and resources from regular services. Each of the four vertical programmes claimed that it should become the central focus for primary health care and that its hierarchical system could simply take on added responsibilities. Each had certain districts in which it could demonstrate how well its services were functioning. Rather than conducting his own systems analysis and then imposing his decisions, the chief medical officer brought the directors of the vertical programmes together to work out a mutually satisfactory solution. He urged them to cooperate in a study and made them talk together until a research design emerged to which they all agreed. They decided that each vertical programme would choose its three best districts and integrate into its services the key activities of the other vertical programmes as well as the functions of the health centres and subcentres. In a fifth cluster of districts the regular staff of the health centres and subcentres would serve as the coordinating group, bringing together the staff and responsibilities of the vertical programmes. The special incentives introduced by international donors were equalized at the level of the highest benefits so that no one lost anything in the process of integration. Each group was expected to reallocate responsibilities so that rather than having several people visit homes, activities were combined in such a way that each worker covered them all but had many fewer homes to visit.

A local academic institution with appropriate field experience was given funds to collect and analyse data independently on comparative performance in the five clusters of districts. Since there was already so much competition between programmes, this requirement to work together produced a great deal of effort among groups to line up support for their own interests. Where staff initially refused to cooperate, those in charge of vertical programmes were able to convince them that the only way they could get cooperation in their own study areas was to work with the other programmes. As the staff of the vertical programmes began to understand the roles and contributions of the other service programmes, their own perceptions began to change. Through regular meetings to exchange experiences, each learned from the others and the programmes converged. The analysis and feedback from the academic institution guided this process of mutual learning and the comparative analysis provided insight into the problems and potentials of integration.

Example 7. Director of a national immunization programme deciding on the age at which children should receive measles vaccine

Although it seemed at first to be essentially an epidemiological question to balance the age of highest mortality risk against the age
when immunological response to the vaccine is greatest, a series of health service issues emerged that also had to be considered. It was easy to get the children under one year of age together for vaccination because the national maternal and child health programme maintained regular contacts throughout infancy. Immunization at this time would provide protection for some children and a booster could be given later to ensure solid immunity, but the country was poor and two doses of measles vaccine seemed expensive. One issue that required special study was whether vaccine given only during the second year of life would reduce prevalence among siblings and therefore exposure of infants, but this proved to be unimportant because mothers constantly carried babies on their backs as they went to market and to visit neighbours. Savings in not giving vaccine to all children in infancy plus a subsequent booster had to be balanced against the costs of setting up a new immunization programme for 1½- to 2-year-old children, as well as the cost of illness and death among unimmunized infants. It would take considerable time to sort out these variables through field trials. The basic information was already known and the process of fitting together the various elements was resolved most rapidly through a computer simulation. The balance of evidence favoured early immunization with booster doses later as more evidence on the distribution of subsequent prevalence became available.

Example 8. Developing a national policy on whether to use specially prepared packets of electrolytes or the sugar and salt already available in homes for the oral rehydration of children with diarrhoea

In setting up a field trial to compare home use of electrolyte packets and home-mixed sugar and salt solutions for the rehydration of children with diarrhoea, it was evident that a research design needed to be developed that met the specifications of both academic paediatricians and maternal and child health administrators. Health education had not yet succeeded in changing the general cultural attitude that when diarrhoea occurred all fluids should be stopped. Both groups agreed that to obtain maximum coverage it was important for mothers to begin rehydration in the home as early as possible. In the case of severe diarrhoea the child should be referred to the health centre. The variables that had to be measured were: (1) safety—mainly whether mothers using one or the other preparation were more likely to prepare a solution with too much sodium; (2) acceptability—whether mothers would take more seriously a plastic packet of electrolytes, which would be considered a medicine, or whether they would prefer to use materials that were available in all homes and that they were used to handling in cooking; (3) relative cost—those favouring electrolytes said that the health services should be willing to pay for enough electrolyte packages to make them readily available in every home, while maternal and child health administrators were more concerned about the logistics of maintaining supplies in each home; (4) interrelations between these variables—for
instance, although there might be a slightly greater danger of excessive sodium intake with the sugar–salt solutions, this might be compensated for by the better coverage obtained with the home-made mixture, especially among the poor, for whom the diarrhoea problem was greatest. Obviously these variables depended primarily on local sociocultural and economic factors. Although research in other places provided some help in decision-making, the final determination depended on local possibilities of implementation.

It was decided that a fairly straightforward field trial would be adequate. Three areas, each with a population of 50,000, were defined as being essentially comparable in the variables influencing diarrhoea and dehydration. In one area, five packages of electrolytes were provided to every home prior to the diarrhoea season, with instruction and demonstration in their use by an auxiliary nurse midwife from the health centre. Every three months the auxiliary nurse midwife went around to all homes to resupply packages, and to collect information on deaths and diarrhoea episodes in the previous two weeks (how long children had been sick and whether rehydration was used). In the second area the same schedule of visiting and instructions by the same level of personnel were applied. The only difference was that the health worker made sure that salt and sugar were available in the homes and gave a careful demonstration of the preparation of the rehydration solution. Mothers in both areas were told that if a child did not respond to therapy it should be taken promptly to the health centre. The third area was used for purposes of comparison. Electrolyte packages were provided liberally at the health centre and through commercial channels. It was apparent that commercial pharmacies tended to discourage the use of electrolyte packages because this reduced their sales of patent diarrhoea medicines and antibiotics, but health centre staff in all areas persistently tried to educate them and get their cooperation. After the experimental design had been agreed on by representatives of both groups—the academic paediatricians and the maternal and child health administrators—the responsibility for implementing services was turned over to the local health authorities and health centre staff in each area. A local research group in a school of public health was assigned responsibility for developing a monitoring and information system, for maintaining quality control of the data, and for carrying out the final analysis. The main criteria for outcome were child mortality, the duration of diarrhoea (calculated from quarterly morbidity surveys), and whether rehydration had been used and why.

Example 9. Mass therapy for leprosy in a situation where bacilli show increasing dapsone resistance

A two-phase research process was defined to decide whether routine combined dapsone and rifampicin therapy should be used for all cases of leprosy, or whether the combined therapy should be used only in cases in which resistance had been demonstrated. The mouse-footpad method
of laboratory testing for dapsone resistance is expensive, results are slow in arriving, and specialized laboratory facilities are needed. Other potential testing methods are not widely available. A simple option is to rely on clinical judgement and commence rifampicin therapy when patients are no longer responding to dapsone treatment. It was thought that carefully specified indices of clinical improvement, and the numbers and appearance of bacilli on smears, could be used to indicate when dapsone was no longer effective.

The first phase of the research would involve preliminary analysis of projected costs and relative effectiveness of the various options. From this analysis a decision would be made about local determinants of the balance between clinical and laboratory methods to be used for determining dapsone resistance in the field. To test the validity of the selective clinical approach, a preliminary study would be conducted on a sample of cases in comparison with mouse-footpad testing to determine how much delay occurred by using the clinical criteria. The second phase would require the setting up of a comparative field trial of the two approaches in different endemic zones with comparable conditions. Since cost considerations are specially important, the savings in using rifamycin only for selected resistant cases would have to be balanced against the greater hazards to patients and the possible additional cost of laboratory testing. The final decision would use criteria based on both relative rates of progression of the disease in the two areas and cost-effectiveness judgements of the impact achieved by the two approaches. It would be important to refrain from dismantling the existing programme while waiting for the research results to reach the levels of confidence where they could rationally guide decision-making.

Example 10. Regionalization of hospital referral services

The political demands for expanding hospital-bed capacity in the city or in the four towns are essentially balanced, so that the choice between the two options can be made on technical grounds. There is agreement that the most important information needed to make a decision is to what extent the two existing small town hospitals are bypassed by people from those areas going directly to the urban specialized hospital.

The planning unit started with a series of surveys. First, they reviewed the records of each hospital to define its catchment area. The small town hospitals were drawing patients mainly from the immediate areas in which they were located, but not from the neighbouring rural areas. The city hospital was attracting patients from all over the island. Calculations showed that on an average it took people one and a half hours to get to the city hospital from the various parts of the island, whereas in a regionalized plan people would be able to get to one of the town hospitals in about half an hour. Random samples of inpatients and people waiting to be seen in the clinics of the three hospitals were interviewed to find out why they had chosen the hospital they were
using. At the city hospital the reasons were:

(1) The health centre doctor had referred them.
(2) They preferred to be seen by a specialist at the city hospital.
(3) Given that they had to undertake travel for referral care, they were willing to travel one and a half hours if the care was better.

At the small town hospitals the reasons were:

(1) Convenience for families and friends to visit inpatients.
(2) Local reputation of doctors known in the community.
(3) Feeling that care was more personalized.

Analysis of the alternative approaches favoured the compromise that it would be better to bring care closer to the people by building four additional small town hospitals, but that each of them should have more specialized services and a secondary referral arrangement. Preliminary projections of the cost of building an additional wing in the city hospital as compared with four small town hospitals were essentially equivalent, but detailed financial projections would take at least six months to complete. While that was being done, the planning unit arranged an experimental trial by assigning specialists in surgery, paediatrics, and obstetrics to each of the existing small town hospitals, upgrading their facilities, and making effective arrangements for more complicated cases to be referred to the city hospital. They also held a workshop for health centre doctors in the areas around the two small hospitals to familiarize them with the relative benefits of various patterns of referral and the advantages of developing closer working relations with their local hospital. They also arranged weekly visits of senior specialists from the city hospital to the small town hospitals and from the town hospitals to the health centres.

A second review of patient flow from the catchment areas was done at the end of six months and showed a sharp shift to greater use of the small town hospitals. Since cost differentials between the two alternatives proved not to be great, the final decision was to build the four additional small town hospitals.

Example 11. Mass nutrition campaigns

The vitamin A programme staff of the nutrition institute felt that adequate publicity given to their successes in reducing xerophthalmia would justify the continuation of their mass programme. The director of the institute felt, however, that to ensure the long-term continuity of nutrition programmes, they would have to improve relations with colleagues in the Ministry of Health. He was able to arrange a joint field research project, involving both the nutrition unit of the Ministry and nutrition institute staff, which conducted comparative field evaluation of all current nutrition activities. Detailed data were collected on the outcome and cost of the various approaches where they were being best implemented, as well as under more average circumstances.
Household surveys of representative sample populations in the vitamin A programme areas showed that the decline in participation in the mass programme took place largely because parents did not see obvious and immediate health improvement from their children taking the capsules. The need to link the programme to activities for which there was a more continuing demand emerged as a reasonable objective. Further analysis developed two alternative approaches: first, that attempts should be made to integrate these activities into general primary health care, and, secondly, that a separate nutrition programme should be set up combining the protein-energy, vitamin A, and iodine programmes. The concern that the nutrition programme would not receive adequate attention in primary care led to detailed analyses of the relative cost-effectiveness of a separate nutrition programme as compared with that of adding field staff and supervisors with nutrition expertise to the primary care teams.

Costs and programme results were then compared in field trials in two areas. In one area nutrition educators, supervisors, and field workers were added to the primary care team so that the population to be covered by each field worker in the integrated programme could be reduced to compensate for the greater range of responsibilities. Workshops for all staff stressed the need to maintain an emphasis on nutrition. It was agreed that every six months the whole staff would be mobilized to distribute vitamin A capsules and conduct a focused programme of nutritional education. The second trial was in an area where the vitamin A programme was already under way. New surveillance activities for protein-energy malnutrition were introduced, including the regular weighing of all children by community volunteers and intensive nutritional education about both vitamin A deficiency and protein-energy malnutrition.

Example 12. Field trial of contraceptive implants

Several questions needed to be answered in further field trials of the Silastic implants. A principal concern was how frequently the implants should be inserted. Preliminary tests showed some variation in tissue response to the implants, and there was a question about whether differential long-term absorption would lead to long-term complications. Another practical concern related to the relative cost-effectiveness of alternative means of insertion. A rather simple method of inserting the implants through a large needle was adapted to mass use. However, if some women continued to release the hormones for considerably longer periods than others, the repeat implantations would have to be timed to adjust to this variability—i.e., they would have to be done at the shortest time interval found rather than when most women would be showing declining hormone levels. To prevent complications from cumulative dosages, it would be necessary to remove surgically a previous implant before introducing a new one, considerably increasing the cost and professional skill required. Accurate record-keeping would also be needed to ensure that the timing of the reimplant was right and that multiple implants were not being inserted. Uncertainty about these relationships
would lead the international donors providing the contraceptives to conduct cautious large-scale comparative field trials in several countries with different socioeconomic and administrative conditions.

**Example 13. Reducing an excessive number of diagnostic tests while maintaining the quality of care in teaching hospitals**

The operational research team assigned to work on reducing costs by developing a standard sequence for diagnostic tests approached the basic problem through "decision-tree analysis". Test results were analysed for their contribution to diagnosis and the consequent choice among treatment options.

In epidemiological terms, the research approach was to balance the sensitivity and specificity of each laboratory or radiological test. Sensitivity reflects the ability of a test to give a positive result when the person tested really has the disease and to minimize the number of false negatives. Specificity reflects the ability of the test to give negative findings when the person tested is free of the disease and to reduce the number of false positives. The cost of each test was judged in relation to savings from avoiding treatment of false positives and reductions in the costly treatment of false negatives.

The standard procedure that was developed was to examine hospital records for 1000 examples of each of the most common and important diagnostic problems for which exhaustive diagnostic studies had produced a definitive diagnosis. Recognizing a degree of redundancy in diagnostic tests, a computer programme was developed to ascertain the unique contribution of each test to the diagnosis. The least costly set of tests needed to achieve satisfactory levels of sensitivity and specificity was then derived. The sequence of tests finally recommended for routine application was established from the pooled judgement of clinical specialists.

**Example 14. Public health nurse/midwife concerned about the organization of maternal and child health and family planning**

The public health nurse/midwife realized that the continued expansion of the present organization of standard MCH FP care, which had been in use for 15 years, would not be satisfactory for much longer. During a staff meeting organized on the occasion of the visit of the Director-General, she explained the situation in her district. During the discussions, the Director-General stated that the same problem was faced by practically all the health units located away from the capital city. He hoped that the district would cooperate with the Ministry of Health in a study based on the risk approach. After three months, the district was visited by a group from the research and development unit of the Ministry of Health to start planning for a risk study in the district. A joint Ministry and district steering committee was set up, including representatives of the local administration and two local organizations representing women.

A working group was established and developed a protocol outlining
the study. First, they reviewed available information on the functioning of the present health care system and the main policies that might be affected by any change. In collaboration with community groups, they reviewed the reasons for the lack of care during delivery and identified the following problems: high fertility rates, very short stature of the pregnant women, and delivery care by untrained persons. In spite of the fact that there was little or no hope of providing MCH/FP care exclusively by nurse/midwives in the near future, the Ministry had, seven years previously, decided that TBAs should no longer be trained.

Using the available MCH cards, the study group prepared a simple checklist to divide pregnant women into higher-risk and lower-risk groups. In reviewing the records it was found that few women from the higher-risk groups were provided with health care. In consultation with the nursing and MCH divisions of the Ministry and with community representatives, a new MCH/FP strategy was prepared. An intensive programme was started for training TBAs to apply the appropriate delivery techniques and diagnose the main danger signs in pregnancy.

The existing nurse/midwife would visit each village once a month to see all the newly pregnant women identified by local TBAs. On the basis of the checklist, these women would be divided into high-risk and low-risk groups. Those in the low-risk group would be cared for by the local TBA and arrangements would be made for those in the high-risk group to go to the health centre for delivery. The nurse/midwife was retrained to assume her new functions of screening and looking after those at risk, and also to provide continuing training and supervision for TBAs.

The new strategy was tried in three villages and monitored for a year. Modifications were made during the year; in particular it was found that the village women's groups were most helpful and willing to organize the monthly MCH/FP visit. Another important modification was that motivation for family planning became an element of all sessions devoted to the care to mothers and children, whether sick or not. Distribution of condoms and oral contraceptives was included in all MCH sessions.

After a year it was found that the coverage of "supervised" delivery had increased to 85%. Only two maternal deaths had occurred. Family planning acceptance had increased, particularly among women who had had more than four pregnancies. Most important, the community expressed its satisfaction and declared interest in further participation in health development. The activities were extended to the entire district.

The report of the study was then presented at a national meeting of MCH/FP workers. The Ministry of Health decided to reopen the national programme of training for TBAs, and issued instructions that family planning information should be provided at all health care sessions and not be limited to a special session once a week. A larger epidemiological study was started to follow the implementation process and to obtain more detailed knowledge of risk characteristics in MCH/FP care, particularly those relating to other sectors, such as educational and nutritional policies.

The example shows how a study of national importance can be triggered from district level and the importance of community
participation. It is an example of how a composite study, using some of the methods of epidemiology, social science, and management science in a planned sequence, can provide results which are useful not only locally but also for developing national policy.

Example 15. Large-scale government irrigation project in an area with endemic schistosomiasis

The planners responsible for the irrigation project brought together a research group headed by an epidemiologist and including a statistician, a health services research specialist, an economist, and a malacologist. Two of these were foreigners provided by an international agency and the others were from the Ministry of Health. Consultants were available when particular skills were needed, such as for anthropological studies of acceptability. After collecting such information as was available, the team developed an experimental design for pilot studies to be carried out in the first areas likely to be involved in the phased irrigation programme. Sampling for epidemiological monitoring was to be based on villages which would continue to be centres for projected population growth due to immigration. Snail control and mollusciciding in the canals and irrigation ditches would be done in all villages.

The two variables that need to be tested in a simple comparative experimental design are latrine use and mass treatment. Two comparable areas were selected in which the most promising ideas in these two fields could be field tested progressively and systematically. Intensive monitoring of the results permitted rapid feedback to the planners. To promote latrine use, the project would start by providing all the materials and by covering the installation costs, the people being asked only to help by digging the latrine pits. In the past, the compliance rates in accepting treatment had not been high because people seemed concerned only about the late stages of the illness. Two new drugs were now available for testing and these might prove to be more acceptable. In both types of activity, extensive health education would obviously be necessary. The economist planned to maintain a careful record of costs in order to be able to analyse the cost/benefits of the various approaches, including the mollusciciding and engineering activities. The major analytical effort would be to calculate summary data each year on the effectiveness and cost-effectiveness of each programme component. As soon as any result seemed definitive, the information would be promptly fed back to the health service personnel for rapid implementation in the whole irrigation area as it expanded. All activities would then be integrated into a single programme.

Example 16. Environmental consultant for a multinational company advising on chemical hazards from new industry

Political and ethical concerns were as important as economic considerations in the preliminary decision by a multinational corporation
to build a new factory in a developing country, even though there would be potential hazards from chemical wastes. The company wanted to demonstrate that the reason for choosing this site was because of the availability of raw materials and because they would be providing local employment. They were especially anxious to protect themselves from possible charges that they were choosing this site because of the lack of regulations about disposal of chemical wastes. If they could not ensure safety, they said they would not proceed with the factory and they were prepared to meet the safety standards of any industrialized country. Rumours about the plant had already been picked up by radical newspapers and articles about the local population being used as guinea-pigs were beginning to appear. The long-term investment involved in building the factory meant that no short cuts in preliminary research could be allowed and therefore that research funding should be adequate. Some data could be gathered from reports of other industries which had over the years investigated various approaches to the long-term disposal of similar toxic chemical wastes. The only way that conclusive research could be done, however, was to visit all the similar sites where the various means of disposal had been used and to test carefully for toxic hazards. Because any long-term effects are so difficult to predict, additional safety factors should be introduced when considering potential control measures. In collecting these data and making recommendations, it was essential to involve objective and impartial international scientists to reduce the chances that charges of commercial exploitation of the poor would be made.

**Approaches to Health Systems Research**

The diversity that is apparent in the methodological approaches described above can be either a strength or a weakness. It is a strength in that it provides flexibility and enables the search for solutions to be undertaken without the constraints of rigid disciplinary boundaries. It is a weakness in that the range of possibilities is confusing and research workers may not know which of the methods to use for particular problems. Although this book does not pretend to be a manual of research methods, it does seem appropriate at this stage to categorize the available approaches to health systems research. They are presented here, not in order of importance, simply to illustrate the range of methods available. When a complex method needs to be used for a problem, it is best to turn to a specialist in the appropriate discipline for help.

**Simplified systems analysis of health care situations and policies**

Simplified systems analysis is one of the most useful methods in health systems research, as it is in managerial processes generally. It should be done whenever major changes are planned in the health system, in either macro or micro health planning, and also periodically to review results
of new interventions. For example, as demonstrated in examples 2 and 4, the analysis may start by defining health needs as viewed by both the professionals in epidemiological terms and the community. It may review the causal processes and variables influencing the frequency and distribution of health problems. The analysis may then identify the resources available in both the health system and the community, how they are being used, and their potential for expansion. It will usually summarize the available technical interventions in terms of suitability to local needs. Most important is an understanding of the critical working relationships among groups and individuals in the health system and community, especially in terms of organizational and management capabilities. A fundamental objective is to identify the gaps and inconsistencies in health care and the options for change. Although this process may appear complicated, the simplified functional analysis approach referred to in section 1 of this book permits a highly selective synthesis of relevant information. The set of functions for each analysis should be selected according to local needs. This kind of systems analysis is also useful in evaluation.

Functional analysis as a research method goes beyond systems analysis as used in planning and evaluation, when it does more than a routine balancing of achievements against objectives and includes a deliberate effort to derive general principles and add to knowledge of causation. In improving the data collection needed for systems analysis, it is important to distinguish clearly between (1) inputs from health services and community resources, (2) outputs in terms of the utilization of services and community resources and related process indicators, and (3) outcomes in terms of the changes achieved as a result of the utilization of services and community resources. For example, in the methods described in example 6 for integration of vertical programmes, the major research component (which goes beyond the straightforward demonstration aspects of setting up pilot districts run by each of the vertical programmes) is the comparative analysis carried out by the academic institution. Its analysis would identify the variables that seemed to have most influence on the way that the various programmes functioned.

Operational research for incremental improvement of management

The quickest way to improve services is often to make better use of what is already available and being done. For progressive improvement of health services a cluster of simplified operational research methods can be adapted (6). The process involves maximizing output or minimizing cost by progressive modifications in services to improve technical efficiency, use of resources, and elimination of bottlenecks and management constraints. This is illustrated in example 3, as regards the allocation of drugs. Other practical research issues include studies of logistics, transport, communication, personnel management, training, supervision, and the appropriateness of techniques. Any health system has to work within innumerable constraints that are poorly understood.
As one problem is resolved, several others emerge that need attention. A kind of “all or none” principle operates, in which any one of a long series of constraints can interfere with the functioning of the whole system. These constraints must be identified and overcome in sequence for effective functioning of the managerial process.

Modern computer and mathematical techniques have introduced new potentials for testing options without going through a field trial. This is especially true where alternative quantitative relationships are complex and multifactorial. Examples are found in example 7, concerning the age at which measles vaccine should be given, and example 13, concerning diagnostic tests and quality assurance in a teaching hospital. These approaches have attracted attention partly because their sophistication makes them seem scientific. Caution must be exercised to be sure that the research worker is starting with a realistic problem.

Field projects to test alternative interventions and management procedures

Focused, small-scale, practical projects to test specific interventions or altered management procedures should constitute the great majority of health systems research efforts. Several of the examples examined earlier illustrate such efforts. As critical problems are identified for which there is no ready solution or accepted management procedure, then it is appropriate to set up a small-scale project to test alternative options under conditions that permit quantitative comparison. This can often be done by simply adjusting the way that services are provided in different localities. One important objective of such studies is to attempt to define a threshold at which the simplest effective technology and management procedures produce maximum results and appropriate ways of assembling packages of services.

In primary health care much attention has recently been given to the search for appropriate technologies that may be slightly less effective but which will be more widely applied and accepted than standard hospital procedures. Any analysis of these technologies should balance cost, feasibility, practicality, access, cultural predisposition, and local legal and ethical concerns (see example 8 on oral rehydration). Programme impact will usually be greater if a method results in greater coverage, even if it is slightly less effective. This is demonstrated in example 9 on leprosy; if it can be shown that using rifampicin for clinically resistant cases is effective, then a larger population can be served for an equivalent cost. All aspects of management of services, ranging from training and supervision to financing and evaluation, need attention to make them as appropriate as the technology being applied. Where community involvement is being emphasized, it is important that the preferred approaches are those that can be used by the people themselves.

Finally, small-scale projects can also be valuable in situations where an intervention or management procedure has been shown to be effective
elsewhere, but requires local adaptation by the policy-makers and the public to make the new programme relevant to their needs. In examples 1 and 2, for instance, the decisions about which approach to use depended on community involvement and the response of the local population.

Because the findings of many field projects are not widely implemented, research on the implementation process itself has become urgent, and must be built into project planning from the beginning. A systematic effort needs to be made to improve understanding of the transition from the project stage to implementation in primary health care. This should be seen as part of learning how social change can be initiated and maintained, and should be built into all research efforts, as is demonstrated in several of the examples examined.

**Phase IV field trials**

Research and development of new drugs and technical innovations typically go through three phases of clinical trial before they are released for general use. Phase I involves intensive testing for safety and effectiveness, mostly in the laboratory, all possible tests being done on a few individuals to identify major problems and define the possible long-range complications. Phase II moves into a more routine clinical situation, still in a teaching hospital, intensive surveillance of the case being maintained, but involving larger numbers of cases. In phase III, the number of patients is increased still more, and usually comparative trials involving many research workers are carried out under more routine conditions and with a smaller range of tests being monitored. These three phases have been used in free-enterprise situations, in which general use of the new drug or method was then regulated by demand.

For organized health systems which have assumed responsibility for the application of mass measures for either prevention or treatment, there is a need for phase IV field trials. New interventions should be taken through a testing process under actual conditions of field use by regular practitioners in the health system in order to measure their impact under natural conditions. Direct measurement of the relative cost-effectiveness of various approaches will ensure consideration of the appropriateness of the technology and its efficiency in use. A monitoring and surveillance system to assess acceptability and utilization and to identify complications during large-scale application is important in order to be able to identify administrative and iatrogenic problems at an early stage. For example, phase IV trials could be included in example 12 concerning contraceptive implants and example 15 concerning the process of testing mass treatment of schistosomiasis.

**Natural experiments and comparative analyses**

Sometimes one is fortunate enough to find a natural experiment in which two or more areas are similar except for crucial variables linked
to services or to specific health outcomes. These situations can be analyzed carefully to examine relevant associations. More often, instructive generalizations can be drawn from comparative analyses of different health systems or organizational experiences. Some standardization of measurement techniques is essential, because the range of uncontrolled variables is so large that generalizations are risky. New measures or service approaches which consistently show significant impact in several different situations may help greatly in elaborating a convincing definition of general principles. This approach is illustrated on a sub-village basis in example 1 on hookworm, and on a more general level in example 16 on toxic wastes.

Field experiments for testing total health packages

Usually the most complex and expensive but, also, potentially the most productive types of health services research are field experiments conducted to test new and innovative approaches. Prospective and longitudinal studies in which interventions are introduced under controlled conditions are usually needed, since existing data and field conditions almost never fit scientific requirements. Examples are found in examples 5, 9, 11, and 15 (concerning community health workers, leprosy trials, nutrition campaigns, and schistosomiasis, respectively). These projects are sometimes long, because new procedures must be worked out and implemented locally for some time in order to show results. Because the investment in effort and resources can be great, these projects should be extremely carefully planned and conducted. Years of rigorous field work can be wasted by something as simple as a wrong calculation of sample size. Control groups are usually necessary, because long-term trends of health improvement in most situations can make interpretation difficult. Considerable care is needed to work out the ethical problems associated with collecting data from control populations without providing them with full services.
3. Organization for health systems research

In creating an organization to conduct health systems research, the first need is to bring together the diverse disciplines required to form effective working teams. It is not easy to get scientists with appropriate technical knowledge and skills to work with health officials who know what the problems are.

When the mass implementation of primary health care proved not to be as easy as some decision-makers had assumed, it seemed appropriate to turn to health services research for solutions. Funds were made available and attracted research projects. However, early efforts to do health services research often did not meet initial expectations. A mistaken assumption was that this kind of research would be simple. Some of the people who undertook projects had never actually worked under field conditions and were inadequately prepared to identify worthwhile problems.

Further experience has led to a new conceptualization of the problems, as implied in the use of the term health systems research rather than health services research. Some organizational principles have been defined to make studies more relevant. The underlying shift in orientation is to broaden the scope of concern beyond health services to a much wider range of issues which influence health systems generally.

Who Should Do the Research?

The simplest answer to this question is that many different groups should be involved. As indicated by the examples given in sections 1 and 2 of this book, the range of problems and possible approaches is so great that no clear limits can be set. Health systems research should ordinarily be a team activity. Among the variety of technical specialists that should usually be available for active involvement or consultation are the following: statisticians, economists, epidemiologists, social scientists, operational research specialists, etc.

The greatest difficulty is that the people who know the problems and would recognize a meaningful solution if it were discovered usually do not have the skills, resources, and time to do the research or, more
importantly, the confidence to try. We need to find ways of bringing together these people who know the problems and are responsible for implementing solutions with those who can apply appropriate research methods.

Of the six categories of research approaches listed in section 2, the first three can best be done within the health system; the rest are more likely to need special studies by an academic institution (Table 1). It would be desirable for research to become part of regular activities in the health system, but for this to happen technical skills should be developed or consultation made available so that any health or community worker can carry out or participate in appropriate studies. Similarly, research and academic institutions need to maintain a solid working contact with field realities in order to ensure the relevance of their research projects.

Table 1. Classification of types of health services research

| 1. Descriptive analysis of health care situations and policies | Groups closely associated with health services |
| 2. Operational research for incremental improvement of management | |
| 3. Adaptive research to test alternative interventions and management procedures | |
| 4. Phase IV field trials | Special studies by educational or research institutions |
| 5. Natural experiments and comparative analyses | |
| 6. Field experiments testing total health packages | |

Organizational Arrangements

Within the health system

For health systems research to make a continuing contribution to the progressive improvement of primary health care, a positive attitude to research should be stimulated throughout the health system. Personnel at all levels should be encouraged to identify problems and develop research projects.

A number of relatively simple devices would motivate health workers to undertake studies. Those who do so should be rewarded and commended, and should have opportunities to discuss the results with others and present their findings formally at conferences and in journals. One simple and inexpensive means of stimulating interest and providing recognition would be to give annual awards for the best projects conducted by health workers or community groups.

Even more practical would be to provide technical support for anyone involved in health care who wants to do a study. To encourage such a process, it would be desirable to set up teams at various levels in the health system with specific responsibility for epidemiological and health systems research. A strong research unit might be part of the planning
unit in the ministry of health or in a national medical research council. Branch units could be established at provincial and district levels. In addition to carrying out studies themselves, the main responsibility of these units would be to stimulate and support research throughout the health system, providing technical consultation and assistance in analysis. If someone were to present a good research proposal, there should be small amounts of flexible funding available on a competitive basis to pay for field work and statistical analysis. In addition, people who undertake studies should be given time to do the research by being relieved of some of their regular responsibilities. Innovation occurs most effectively when workers are not excessively overloaded with routine tasks. Research should become recognized as a significant and legitimate responsibility of everyone involved in the health system.

It is frequently difficult to reconcile pressures from decision-makers for rapid results with the particular requirements of scientists that are necessary in order to obtain valid results. Obviously it is important never to use a complicated or lengthy procedure when a simple and rapid one would give adequate information. A real expert will suggest the simplest approaches. Once decisions have been made about methods for data collection, it is necessary to make sure that the findings are accurate, otherwise the whole research effort will probably be wasted. Rapid studies often require special attention to ensure that meaningful information of adequate quality is gathered. It is also important to be able to cut off data gathering when enough results have been obtained, because excessive scientific precision can be wasteful and delay implementation. Common sense is necessary in the interpretation of research results to ensure that inaccurate data will not lead to wasteful and even dangerous health system expenditures.

Community participation in research

Ordinarily it is assumed that only health professionals will be involved in health systems research. A new area that requires exploration is community participation in various parts of the research process. Actual experience is limited, but it is a subject that deserves serious research in its own right. Community participation in research can occur at any one of the following stages.

Asking the right questions

Research is only as relevant as the questions for which answers are sought. While it customarily requires some outside objectivity and professional understanding to ask relevant questions, community perceptions of what is important and what hypotheses are worth testing can bring valuable insights and suggestions of promising approaches and procedures. In the past, one problem has been that research workers have not bothered to consult with knowledgeable community members.
There has also been no organized research policy for getting community involvement in defining objectives and allocating resources.

Choosing acceptable methods

Public acceptance of research methods often determines whether the results of field studies will be valid. Community members can often give a good indication of possible problems that might arise if people's concerns and preferences are not taken into account. Instead of the usual attitude of scientists, which is that in order to maintain objectivity and unbiased results they should share as little information as possible with those being studied, greater cooperation and more valid information may be obtained by letting these people participate. Confidentiality may be required in social science research on attitudes, but it has limited relevance in more practically oriented health systems research.

Data gathering

Limited experience suggests that communities can themselves gather some kinds of data very effectively. In continuous community monitoring, in particular, they can work out inexpensive approaches that have high validity. This is especially true for objective information on items of common knowledge in the community or for standard surveillance. Other issues relating to subjective or sensitive issues, such as attitudes to family planning, are more likely to require neutral observers or interviewers from outside the community. Communities that have shown that they can collect data can also usually carry out simple analyses. They may require help initially, but will carry on with great consistency if the information is useful.

Interpretation and feedback

One of the most rewarding parts of community involvement in research is that the people can share in interpreting the results. This has proved to be the best way of getting prompt feedback of results to encourage general participation in implementation. The insights that can be provided by village people are usually unique and often innovative. If a community starts by helping with the interpretation of results, then it may gradually learn the value and methods of research and eventually play an increasingly important role in the rest of the research process.

New ethical criteria for informed consent of the community

Ethical criteria for field research will necessarily be different if community involvement is to be encouraged. Standard provisions for protecting individual rights now have added to them issues of community consent. In developing countries especially, where hierarch-
cial relationships dominate decision-making, misunderstandings may arise. For instance, a chief may have given permission for a survey in a village, but it is still important for individuals to be able to choose not to participate. Once the community begins to be aware of its rights and takes participation seriously, then the research method must be kept sufficiently flexible to permit unexpected deviations. It is especially important to protect the interests of the most deprived and least articulate members of the community.

National networks of centres for health systems research

A pattern of organization that has special promise is to establish national networks of centres for health systems research. The basic idea is to select perhaps half a dozen academic or research institutions in a large country or a single institution in a small country linked to institutions in other countries. Each should have the technical capability and expertise to serve as a regional centre for conducting and promoting health systems research.

The most important distinguishing characteristic of this plan is that each centre should formally assume responsibility for a geographical area to be used as a field laboratory for research and training. Problems identified in health care would be studied in this area. As solutions are worked out in practical field studies, they would be promptly fed back for application and adaptation in the regular service.

The concept of research and training areas was pioneered over 50 years ago in China by Dr John Grant at the Peking Union Medical College (7). Since then it has been modified and tested under many circumstances, with specific arrangements obviously being adjusted to local determinants (8). Some principles that have been found to work well are:

(1) The field practice area should conform to a governmental administrative unit, such as a district, and should be representative of the region. In a large country, the general experience has been that a population of about half a million provides the best opportunity for both teaching and research. Within such an area many smaller projects can be organized, with the sample size adjusted to the specific purposes of each study.

(2) Routine service activities in the area should be at per capita levels of expenditure that can be funded by regular health services. Teaching, research, and innovative programme development should be separately funded and channelled mainly through the academic or research institution.

(3) Responsible staff should have joint appointments in the academic institution and in the health services. They should be nominated by the institution and approved by the health services.

(4) The director should be responsible to the institution for teaching and research activities and to the health system for service activities.
(5) Overall activities should be determined by policies set and reviewed by an advisory board representing the community, the health system, and the institution. An executive committee of appropriate specialists should review the technical work and approve budgets.

(6) Routine procedures and operating manuals should be adapted to local conditions by technically competent academic departments with direct experience under field conditions.

(7) The location should be as close as possible to the institution for convenience in teaching and research. The institution should also be able to serve as the planning and research laboratory for the local region of the health system.

International network of centres for health systems research

To support the national networks and provide a mechanism for sharing international experience, the need has become evident for an international network of research centres with in-depth expertise in the various aspects of health systems research. The main function of these international centres would be to stimulate the formation of national networks and to increase their capacity for research and training by conducting training courses, workshops, and seminars, and by continuing assistance in the problems of research design, field methods, and analysis. The international network would also assist in facilitating funding, arrange for long-term training in particular research disciplines, and promote the long-term institutional collaboration that is desperately needed in this rapidly developing field.

Mechanisms for collaboration with other sectors

A fundamental principle of primary health care is that health depends as much on what goes on outside the health sector as on what happens within it. The discovery of innovative ways of solving health problems requires willingness to experiment with fundamental changes in many aspects of living. The need for improvements in food supply, housing, education, transport, and especially in the role of women, should be studied in the same realistic framework as the various aspects of health care.

The major problem in conducting such research is the development of collaborative mechanisms with other sectors. This is usually rather easy to do at the periphery, but very hard to arrange within government administrative hierarchies. This is one reason why community-based studies are so attractive, because collaborative mechanisms present no problem for the people. Things that fit together naturally from the perspective of the village home are normally carried out together in the community. If it can be shown that health and agricultural workers, for instance, are effectively collaborating in a community project, then a natural and strong case can be made for the more difficult process of getting this kind of cooperation approved by the various sectors of the government bureaucracy.
Research Training

The main reason for the current lack of health systems research is the shortage of trained people with appropriate technical skills and field experience. This is not surprising, since it is essentially a new field which is still drawing together the multiple disciplines that can contribute to it. There will also be a continuing need for workshops for political leaders and administrative decision-makers who will make use of and provide funding for health systems research to acquaint them with its potential. They can contribute especially to providing appropriate direction concerning the choice of relevant research subjects.

The tremendous need worldwide for competent research workers means that a major educational effort is needed, which must be carried out through several parallel mechanisms.

Institutional capacity

One of the greatest problems for individuals trying to conduct health systems research is a sense of isolation, because there are few people with whom they can associate. Even in a well-established institution there are usually only a few health systems researchers. A good field worker with sound ideas is in an ideal position to raise relevant questions, but will probably not know the multidisciplinary research approaches that should be tried and the range of skills that might be needed.

A concept that must be stressed is the need to develop a certain degree of competence in at least one research group or institution in each area to ensure a significant change in current practices. This means that experts in the key disciplines should be brought together on either a full-time or a part-time basis to work together as a team in continuing field projects. Over time, their interactions should become increasingly productive in relationships with other groups. When no one is available in a needed discipline, somebody should be trained.

Special preparation in relevant disciplines

To make any progress, the first need is for research scientists with the expertise to think through problems, define methods, and conduct the pioneering studies that will open up this research field. This requires considerably expanded training of technical specialists in the necessary scientific disciplines under circumstances that will expose them to field realities.

Health systems research will probably evolve into a new and major research discipline. Obviously there will then be training programmes for specialists in this area and its various subcategories. Because it is a multidisciplinary effort, there will also always be a need for teams to bring together the relevant disciplines. This can best be accomplished by getting those with the relevant disciplinary skills to work together, share expertise, and learn from each other in field studies. This is not easy,
because, in addition to the difficulty of having to learn each other’s professional language, it is even more difficult to learn the value systems and ethical norms of other disciplines. For instance, economists and health personnel often have problems in learning to work together because they start with different sets of values: very simply, economists view health workers as being sentimental and interested in short-term benefits, while health workers consider economists to be more interested in the economy than in people.

Field level in-service training and practical learning by doing

The simplified research methods useful in the approaches in examples 1–3 in section 2 of this book can be taught in workshops and in-service training programmes. These training methods should be standardized and made widely available to interested health workers and community representatives. A major effort is needed to develop standard approaches that can be adapted to the particular conditions of each area.

No project should be carried out without a research/training component. The only way to learn how to do research is to do it under guidance. The few research workers who have demonstrated their capacity to do field research should never do field studies alone, but always with more junior health professionals who can thus learn both scientific skills and the intuitive art of working with people.

One of the main advantages of the concept of research and training centres is that people can be brought into a field practice area from other institutions and from health services generally to gain systematic, practical, field research experience together with technical training in subjects such as statistics, epidemiology, and operational research. At present this is even more important than to use these training areas for students in regular academic programmes, which should be a longer-term objective.

Conclusion

The ultimate determinant of whether this kind of research will be useful is to consider the relative costs and benefits of doing or not doing health systems research. Tremendous sums of money are currently being invested in primary health care and even more in hospital care by the people, by health systems, and by international health agencies. Money is also being spent on nutrition, family planning, and environmental health activities that should be integrated with primary health care. In comparison almost nothing is being spent on health systems research. Rigid plans that are not flexibly implemented and the resulting waste that is now evident could be greatly improved by appropriate research. Even a small percentage of primary health care funds allocated to the kinds of research that have been outlined here would be highly cost-effective in improving the effectiveness, efficiency, and equity of the whole health system.
References