Health systems research: approaches and pitfalls

In recent decades there has been growing interest in health systems research, reflecting the increased complexity of services, the evolution of alternative options, mounting budgetary pressures, and rising scepticism about public programmes. The methodological and operational challenges encountered in this field are reviewed below.

Health systems research involves the collection of information about services, programmes or systems with a view to assessing the need for them, examining their design and operation, and evaluating their efficiency, effectiveness and impact. It is part of the process of service development, aiming primarily to improve services or their components.

Before the institutionalization of health systems research, health planning was largely based on tradition, advocacy and intuition. It was hard to convince administrators of the need for research to demonstrate that an immunization programme would reduce the incidence of specified diseases, or that a family planning programme would lower fertility. There is no reason to reject such propositions a priori, but we now know that not all programmes reach their goals, that they work better in some areas than in others, and that there may be alternative approaches which are more effective, more feasible, more culturally acceptable or more cost-efficient. In essence, the results of programmes as intuitively anticipated by administrators are but questions to be answered or hypotheses to be tested through research.

Some topics that can be handled by health systems research are:

- needs assessment for services, including community diagnosis;
- service factors affecting health practices and behaviour;
- community factors affecting health provision, including community participation;
- comparison of different outlets for service delivery;
- comparison of different categories of personnel in health care provision;
- cost-benefit analysis of health services;
- time and motion studies;
- functional analysis.

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An illustration is provided by a recent WHO-sponsored study on variation in
family planning acceptance in rural Java. Indonesia’s National Family Planning Board had noted that the acceptance rate of family planning methods ranged from 20% in some areas of central Java to 60% in others. It was reasoned that, if the determinants of success in high acceptance areas and the constraints in low acceptance areas could be identified, beneficial replanning or modification of services or approaches would be possible. The research and intervention steps proposed by the present writer in 1981 are indicated in Fig. 1.

Methodology and rigour

Health systems research requires expertise in several disciplines, including a working knowledge of epidemiological methods,
statistical concepts, and the operation of health services with respect to policy analysis, management principles, and political and financial considerations. It is also necessary to adopt a systematic approach to research design for the development and realization of scientifically sound projects (1, 2).

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There is some disagreement about the level of scientific rigour to be maintained in such research. There are those who insist on the application of scientific methods with the same rigour as in other fields. Other people believe that scientific method is often adopted unnecessarily in health systems research, when simple techniques based on logic, intuition and experience are sufficient. In practice both approaches are used, with flexibility in accordance with the purpose in view. Flexibility should not, however, be equated with inadequacy of approach or taken as a licence to violate basic scientific principles. Clearly, the level of rigour should rise when causal inference is to be drawn, i.e., when it is crucial to ask whether the favourable outcome of a programme is due primarily to the service itself or whether it could have occurred without the programme? In other words, was the cost of the programme justified? Alternatively, it might be asked whether the failure of a service was due to the worthlessness of the approach or whether other factors nullified or confounded its impact?

Strategies

Descriptive strategies are commonly used in health systems research, among them the following:

- needs assessment and community diagnosis;
- case studies of programmes;
- characterization of target populations or acceptors of a service;
- compliance and utilization studies;
- attitudinal studies;
- surveys of popular knowledge, attitudes and practices, regarding contraception and innovative programmes;
- study of dropouts;
- exploratory studies.

These strategies are classified as descriptive because they are not intended to test etiological hypotheses or to be the bases for causal inferences. However, they help in generating hypotheses that can then be tested by analytical and/or experimental etiological approaches.

Descriptive strategies are not necessarily without structure or organization. They are of greatest value when performed on representative samples or when they use cross-sectional approaches (of the descriptive variety). There should be proper development and pretesting of instruments, including questionnaires; interviewers should be trained; data collection and analysis should be correctly carried out; and reliability and validity provisions should be maintained.

True experiments represent the opposite extreme from descriptive studies. They require:
— appropriate control groups for comparison;

— randomization or random allocation of the independent variable, i.e., the service component to be evaluated;

— control of all extraneous variables to assure internal validity.

While true experiments are used routinely in laboratory research, they are extremely difficult to apply in most health systems research. Some design flexibility is usually exercised, making for a quasi-experimental approach.

Quasi-experimental designs are viable alternatives to true experiments in most health systems research because, under certain circumstances, randomization may not be feasible. Not all the extraneous variables can be controlled in the design, although some may be handled in the analysis. Parallel controls should not be omitted, otherwise one has only a pre- or pseudo-experimental study, which is unsuitable where one wishes to investigate causes. However, this kind of study is very popular in health systems research, notably when an administrator wishes to evaluate an existing programme or when a funding agency sends a consultant to evaluate a programme for which no parallel control exists. The worst designs are those where no pretesting measures are available; they are called “one-group after only designs” or “one-shot designs”. If pretesting measures are available they are called “one-group before and after designs”.

The basic problem with one-group designs is that the outcome measure cannot be assumed to be due exclusively, if at all, to the input of the programme. A parallel control would help in this connection, especially when pre- and post-tests are available. Non-parallel controls from the population or from a previous study can be constructed but are much inferior to parallel controls.

The flow of events in one-group design can be as shown in Fig. 2.

It can be seen that the change in the outcome measure may be influenced by:

— pre-existing conditions and the type of people being served;

— pretesting, e.g., impact of a pre-programme questionnaire survey on a post-programme survey;

— extraneous variables (1-3).

Some analytical approaches may be applied to health systems research.

- Cross-sectional studies, e.g., repeated or comparative opinion surveys, may help in testing some hypotheses.

- The case-control approach can be used when units with favourable outcome (cases) are compared with ones of unfavourable outcome (controls), in order to identify determining factors. The odds ratio can then be calculated as an estimate of relative risk.

Fig. 2. Flow of events in one-group design

![Flow of events in one-group design](image-url)
A historical cohort approach is feasible if enough data are available to permit reconstruction of circumstances existing before the programme began.

The cohort approach is also applicable but the experimental nature of the research means that this is closer to time-series quasi-experimental design.

Considerable time is required before meaningful results can be made available, and consequently administrators may have to make decisions on other grounds.

The following special techniques may also be used:

- life-table approach in use-effectiveness and continuation rate studies or inquiries into dropouts;
- cost efficiency analysis;
- modelling;
- functional analysis.

Common pitfalls

Regardless of the level of scientific rigour required, the following pitfalls should be avoided in health systems research.

- Drawing causal inferences (linking the end-results to programme inputs) from descriptive or pseudo-experimental studies.

- A common flaw in the analysis of evaluative research is the comparison of the levels of the outcome measure (such as post-programme attitude) in the test and control areas as an indication of impact. This introduces assessment bias.

The correct approach is to compare the amount of change or the difference between the pre-test and post-test for the group with the specific input and for the group without it.

- Failure to satisfy sampling requirements. Sampling errors can seriously affect the acceptability of results.

- Absence or inappropriateness of controls.

- In evaluating a new procedure it is wrong to assign it only to those who consent to be included in the trial while assigning routine services or standard treatment to those who refuse, since this causes assignment bias.

- Poor quality control in collection, storage or handling of data. This includes poor coverage, loss of information, and incomplete or deformed information. The resulting non-sampling errors are no less sources of bias than are sampling errors.

- Inefficient handling of missing data (including non-response, refusals, dropouts, losses to follow-up, and incomplete records). The worst approach is to exclude the missing records and use the response data as the total study population, without indicating the percentage response or coverage. There are methods for handling missing data, but the basic requirement is to report the amount and possible impact of missing information.

- Changing the design, questionnaire, strategy or target areas during a study without discarding the information obtained before the change took place, or without considering the impact on the internal and external validity of the study.

- Performing consistency checks and cleaning of data only when findings do not agree with existing knowledge or the underlying hypothesis, but not when they are in agreement.
• Omission of inconvenient or inconsistent data or of outlier data (values at extremes of range).

• Selection of inappropriate instruments for measuring service input or its end-results. This includes the use of instruments that have not been pretested or ones whose reliability and validity have not been determined. The consequence is measurement bias.

• Incorporating a health service study into a demonstration project. The results of the study may not be replicable in other areas because demonstration projects have relatively high concentrations of talent, zeal, and political and financial support.

• Wrong choice of statistical tests and methods and delay of statistical consultation until after data have been collected.

• Failure to plan and budget for in-built evaluation or at least to anticipate and allow for evaluation in the design of the service.

• Failure to admit the limitations of a study and/or to consider their impact on analysis, interpretation and conclusions. The limitations may relate to sampling, coverage, selected strategy, comparison groups, missing data, and biases (selection, information and confounding).

• Failure to report negative results of important and properly conducted research. If a full-length paper cannot be produced, at least a research note or a letter should be published so that guidance is available for others attempting similar work.

• Considerable time is required before meaningful results can be made available, and consequently administrators may have to make decisions on other grounds.

• Administrators may, for political reasons, modify service provisions during a study or introduce changes in test or control areas which confound research results.

• Administrators may cancel parts of research projects before completion, for financial or political reasons.

• Because health systems research is rather costly, the associated needs should be anticipated and allowed for in the service provision budget. This may be politically difficult, especially if the cost is high and if administrators cannot appreciate the value of the research. It is most unwise to take the funds for research from those allocated for service provision.

• It is often difficult to quantify the independent and/or dependent variables in health systems research. The input being a set of programme activities and the output one of programme end-results, precise measurement may be difficult.

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Furthermore, the measuring instruments may not be sufficiently sensitive or efficient to detect early change.

• Representative samples are often unobtainable. For political and administrative reasons, random selection of units for programme intervention is
often limited. This impairs the external validity or generalizability of research results.

- It is also common for only one unit (a community or a village) to be used per intervention approach. This may appear economical but is inadequate if the community chosen is found to be atypical or if an epidemic, disaster or administrative change occurs.

- In comparative studies, which should be the rule, it may be difficult to allocate units at random to different treatments. If a politician or administrator decides which units should receive services, the results will be confounded.

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The pitfalls and constraints outlined above clearly present a great challenge to those engaged in health systems research. Imagination, personal experience and teamwork are essential if the difficulties are to be overcome. Wherever possible, the experience of others should be drawn on when work is being undertaken in this field.

References


Personnel management problems

Since the management of human resources is an integral part of general health services management, managerial issues differ significantly from country to country according to the nature of the health care system. However, an analysis of the issues in different countries indicates that, overall, the main problems are maldistribution of personnel, shortages or surpluses in one or more categories, poor utilization or low productivity, unsatisfactory career structures and promotion systems, ineffective continuing education and supervision, and poor living and working conditions.