

WORKING PAPER 337

COSTS AND MODELLING IN HEALTH SERVICES -
A BIBLIOGRAPHY

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INTRODUCTION

Over recent years economic recession in Britain has been accompanied by a decline in most sectors of public expenditure. The National Health Service (NHS) has not escaped this and health authorities can now no longer assume steadily increasing real growth in their funding. Increasing emphasis is being placed on efficient use of resources available and strict financial targets are being imposed. Under such circumstances the need for information on how much health services cost to provide, their efficiency and their effectiveness (by no means easy to determine given the nature of this industry's "output") becomes of paramount importance. This is particularly the case in the field of forward planning and the allocation of resources among various services in different locations.

A research team at the School of Geography, University of Leeds, is currently investigating planning and resource allocation problems in health service provision. This bibliography arises from part of that work in relation to the costs of providing services and in modelling their planning and allocation.

A NOTE ON CONTENT AND CLASSIFICATION

The content of the bibliography arose from research interests in the Leeds project; hence its focus on health economics, costs and planning and resource allocation models. Sections 1-3 concentrate on the former topics whereas Sections 4 and 5 have planning and modelling as their main theme. However a link between those themes is made if it is considered that modelling often needs to know the costs of providing services to represent the system accurately and be of use in planning and resource allocation.

There is, of course, a very wide range of literature available on the subject and it has been impossible to be sure of including every last reference. It is hoped, however, that omissions are not major. Additional material would be appreciated for future reference.

The classification of the bibliography is a division into five main sections and a series of one or more subsections. Cross referencing has been done by quoting the other sections and a reference may be found in the parentheses after its citation. The classification system adopted is, hopefully, adequate for this version of the bibliography despite its shortcomings and suggestions for its future improvement would also be welcomed.

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LIST OF JOURNALS

Many journals contain articles on health economics and planning and are worthy of regular consultation. They fall into three main categories and these are listed below together with some of the relevant journals.

1. Economics

American Economic Review
Applied Economics
Economica
The Economic Journal
International Journal of Social Economics
Journal of Political Economy
Oxford Economic Papers
Review of Economics and Statistics
Scottish Journal of Political Economy
Socio-Economic Planning Science

2. Medical and medical administration

British Journal of Surgery
British Medical Bulletin
British Medical Journal
Health and Social Services Journal
Health Trends
The Hospital and Health Services Review
Hospital Management
International Journal of Epidemiology
International Journal of Health Services
Journal of Chronic Diseases
Journal of Epidemiology and Community Health
Journal of Nursing Administration
Journal of the Royal College of General Practitioners
Journal of the Royal College of Physicians
Lancet
Medical Care
Nursing Research
Social Science and Medicine

3. Operations Research/Modelling

Environment and Planning A
Geographical Analysis
Health Services Research
Inquiry
International Journal of Operational Research
Journal of the Royal Statistical Society
Management Science
Operations Research
Operational Research Quarterly/Journal of the Operational Research Society
Social Science and Medicine

1. ECONOMICS AND HEALTH

There are two subsections under this heading. The first contains references which serve as an introduction to the use of economics in the field of health care; the second examines the results of empirical work in applying the economic tools of cost-benefit analysis and cost-effectiveness analysis to health services.

1.1 Health economics : general references

For general economic principles the reader is referred to standard economic text books (Lipsey 1979; Samuelson, 1980) but as health services have established their own niche in economics so has grown up an extensive range of literature on that subject. These cover British (Cullis and West, 1979) and American (Feldstein, P.J., 1968) viewpoints and many are edited collections of papers often from conference proceedings (Perlman, 1974). Some references are on specific economic factors affecting health services (Fuchs, 1967; Crossman, 1972).

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1.2 Applications of cost-benefit analysis and cost-effectiveness analysis to health care services

Much of the empirical work done here has been in connection with treatment of disease (Klarman, *et al.* 1968), but it has also been applied to estimating the usefulness of preventative measures (Allsop, 1972; Chamberlain, 1980).

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2. COSTS AND COST MODELS IN HEALTH CARE SERVICES

Beginning with some statistical sources, the following subsections examine work which has been carried out in estimating the costs of individual treatments, in hospital costs and also at the national level of the N.H.S.

2.1 Some British Statistical Sources

The N.H.S. routinely gathers a large amount of data, much of it generated as a result of case load (see the D.H.S.S. annual returns on Health and Personal Social Services Statistics for example). However they are not always presented in a useful form and their accuracy is also in doubt (Alderson and Dowie, 1973):

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2.3 Valuing human life

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2.4 Hospital costs and cost models

Under the general umbrella of economics and health there has been a lot of interest focussed on hospitals - the most expensive and complex components of any health services system. These studies range from investigations into individual factors affecting running costs such as duration of stay (Acheson and Feldstein, 1974) to economic analysis of an entire hospital or hospital system. Into this category comes work by Feldstein (1967) which was one of the first thorough studies of British hospitals.

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2.5 Costs and finance in the N.H.S.

References concerning costs and finance in the N.H.S. as a whole make up this final subsection. These span 25 years (Guilleband Committee, 1956; Royal Commission Report, 1979) and show that since the inception of the N.H.S. interest in the costs of running it have always been high.

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3. INDICATORS OF HEALTH SERVICE EFFECTIVENESS

Use of economic analysis in the health services is handicapped by, amongst other things, the difficulty in relating inputs (essentially money) to outputs (a change in the health status of an individual or community). Indicators of the effectiveness of health services form a large part of research into ways of improving the efficiency of those services. Indicators of demand for health services by use of waiting lists or health status indices are also included under the heading of this section as by working to reduce or improve them does (crudely) count towards increasing effectiveness.

3.1 Waiting lists

The use of waiting lists as a surrogate measure of demand or output efficiency is not a foolproof method (Yates, 1980). However, it can give some indication of demand pressures.

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3.2 Health status indices

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3.3 Measures of output and effectiveness

This forms an important area of research in health economics. Trying to devise methods of measuring the output of health services is imperative if improvements in service provision are to be evaluated. Some researchers in this field have looked at fairly general output measures (Dowie, 1970; Doll, 1974; Roberts, 1974). Others have concentrated on examining output measures for a particular group such as the elderly (Isaacs and Neville, 1976; Challis, 1978) or service such as primary health care facilities (Clark and Forbes, 1979). Linked with this is the idea of value for money and a number of studies focus on efficiency in health services (Abel-Smith, 1976; Cochrane, 1972).

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4. PLANNING AND RESOURCE ALLOCATION IN HEALTH

In this section are presented references which cover the topics of planning and resource allocation in health. The first subsection deals with these subjects in general; the second takes a closer look at planning and resource allocation methods used in the N.H.S.

4.1 General concepts in health planning

Some general problems are examined by Ahumada et al. (1965) and Phillips (1981). A view of the utility of economics in health planning is given by Mills and Lee (1979). Using cost and efficiency criteria for planning is one method (Elkin and Cornick, 1970) but for the politician role in planning see Parston (1980).

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4.2 Planning and resource allocation in the N.H.S.

Although there have been planning documents in the N.H.S. for many years (Ministry of Health, 1962) it was in the 1970s that 'planning' really began to emerge as an important concept linked to the availability and distribution of resources (D.H.S.S., 1975). The Resource Allocation Working Party Report (R.A.W.P.) (1976) has been influential in stimulating planning (D.H.S.S., 1980) and in the inequalities in resources available to different parts of the country (Snaith, 1978, Akhurst, et al., 1979).

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5. OPERATIONS RESEARCH AND MODELLING IN HEALTH SERVICES

Mathematical modelling and other analytical techniques to increase understanding of the health system and to enable the consequences of decisions taken about it to be more accurately evaluated have been a feature of health services research over the past 25 years.

Some are based on simulation modelling and there is an extensive range of literature on public facility location and resource allocation modelling. Examples of modelling access to health services and of accident and emergency service provision are given to show how these techniques can be applied to specific problems.

5.1 An overview of OR in health

Boldy (1976; 1980) and Barber (1976), offer reviews of mathematical programming and operations research as applied to health services. Other general work in this field includes that by Feldstein (1963) and Duncan and Curnow (1978).

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5.2 Simulation models

England and Roberts (1978) demonstrate applications of simulation techniques in health care generally. Others (Evens *et al* 1974; Baron and Rising 1973; Bernard *et al* 1977) use these methods with regard to particular problems in health care.

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5.3 Location/allocation models

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5.4 Other modelling techniques

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5.5 Modelling applications I : access to health services

This and the subsequent subsection 5.6 list references associated with applications of modelling to particular research problems in health care provision. Access to medical care is examined in this section. Aday and Andersen (1974) offer a framework for study in this subject. Other researchers concentrate on the accessibility of particular health services; Ingram et al (1978), Knox (1978).

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5.6 Modelling applications II : accident and emergency services

This includes location of emergency stations (Bergman, 1971) and ways of deploying emergency services (Fitzsimmons, 1973).

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