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DEVELOPMENTS IN PLANNING MODELS FOR HEALTH CARE
POLICY ANALYSIS IN THE U.K.

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1. INTRODUCTION

Problems of spatial organization and associated planning issues in the National Health Service are currently attracting a good deal of attention from a variety of interested parties. However, until fairly recently, little prominence has been given to these problems either by health care professionals or academics. This has now all changed. Developments such as the RAWP formula for resource allocation (DHSS 1976) and the publication of the Black Report (Townsend and Davison 1982) have emphasised, first, the gross spatial inequalities in the provision and uptake of medical care in the U.K., and secondly, the need for careful and detailed planning of resource allocations across space. This was further confirmed by the publication of the first set of Performance Indicators for the NHS by the DHSS in 1983 which showed marked variations between health authorities on a number of fronts, such as cost per case, lengths of stay, occupancy rates and so on.

In the face of public expenditure cuts in general, many health authorities have faced real reductions in their resources : it becomes ever more important to plan effectively. Gone are the days when the Operation plan could be rolled forward every year and the Strategic plan every few years. Planning could once restrict itself to the design and implementation of new projects out of growth and the rest could be based on the historical allocation. Now there are major decisions to be made on almost every front - decisions having major consequences for levels of care in an authority.

What we attempt to describe in this paper is how computer-based models can help planners and decision makers in their analysis of policy, particularly those related to spatial issues such as the location of facilities and access to them. In the next section we examine some of the causes of the problems now faced by health authorities. This is followed in section 3 by an overview of some of the relevant models that have been developed in recent years. In section 4, we present two different types of planning model developed in Leeds. The first (subsection 4.1) is a district model based on micro-simulations methods; the second (subsection 4.2) is a regional interactive strategic planning model. We give examples of their use in both cases.

2. PROBLEMS OF PLANNING AND LOCATIONAL ANALYSIS IN HEALTH CARE SYSTEMS

In this section we examine the nature and scope of a selected range of planning problems in health care systems, focussing in particular on spatial issues. These are discussed in relation to the British National Health Service (NHS); but broadly speaking there will be equivalent problems in other countries. Emphasis is concentrated on acute or hospital-based health care since that is where the majority of resources are allocated. Other sectors are important, of course. In the longer run, similar methods can be applied to them; and this will facilitate exploring the interaction between hospital care and, for example, community provision.

The NHS, established in 1948, is centrally funded out of general taxation. Effectively, local health authorities have no powers to generate their own resources; their allocations come in annual revenue and capital budgets from Regional Health Authorities. Regions are allocated funds from the DHSS according to a formula known as RAWP - Resource Allocation Working Party - which we describe in more detail below.

The first form of administrative spatial organization of the NHS, which lasted from inception until 1974, consisted of 13 Regional Hospital Boards (RHBs) and individual hospitals were administered by hospital management committees (HMCs). RHBs saw their main planning responsibility as deciding where new hospitals should be built and responsibility was then passed to a new HMC. Little effective coordination of service provision emerged from all this (Bevan and Spencer, 1984) although there was considerable concern as to what constituted the 'optimum size' (in terms of numbers of beds) of hospitals. The Bonham-Carter report (MoH, 1969) made a number of suggestions as to the norms of service provision - such as the number of consultants in a given specialty per 100,000 population - but these were never fully implemented. And in any case, as we will see, such simple norms need to be carefully treated because of overlapping catchment populations. In 1974, there was a reorganization - a rather hasty one compared with the more carefully considered reorganization of local government at around the same time. The NHS now consisted of three tiers - Regional, Area and District. The first two formed Health Authorities and the third was a basic management unit. For the first time there was a statutory duty to produce Strategic plans for the Secretary of State's approval. This implied that planning at least had to be seen to be taken seriously. The Planning system became oriented towards service groups, such as the elderly, children, mentally handicapped,

acute services and so on. Although this was seen as an improvement over what previously existed there were considerable reservations about its structure particularly the overlap between these groups. For example 50% of acute beds are occupied by persons over the age of 65. The establishment of this system also coincided with the first phase of reduced growth in NHS funding, which implied that for the new developments in one area had to be paid for by cutbacks in another.

In 1982 there was a further reorganization: the Area tier was abolished and the Districts were made the focus of local planning and became the second tier of Health Authorities below the region. There are now 14 regions in England, and 192 districts with an average population of around 230,000.

A major problem in the planning and organization of the health care system is the diversity in the range of services provided. In relation to spatial scale, these typically can be divided into national specialties (e.g. heart transplantation), regional specialties (e.g. neurosurgery, plastic surgery), sub-regional specialties (e.g. urology, thoracic surgery) and the specialties which would normally be found in every district (general medicine, surgery, gynaecology, etc.). Although this hierarchical system implies that every facility cannot be provided in every location we can note that the actual spatial distribution is biased towards the main metropolitan regions, London in particular. In addition, the large teaching hospitals in the main provincial cities tend to be well endowed with specialised facilities; and rural areas and smaller towns less so. This may indeed be a sensible way to organize the service but to determine this we need to compare relative accessibility to services on a systematic basis. This turns out to be, not surprisingly, an example of the equity-efficiency trade off which is common in spatial policy analysis. This is further compounded by the observed relationship between the supply of services and the concomitant demand for it. Mayhew (1979) showed, that in London at least, hospitalization rates were positively correlated with service supply and accessibility, confirming Feldstein's (1967) findings in a more general context. The implications of this relationship are profound. It suggests that in areas of the country where provision of services is high (London and the major cities) more people receive treatment than the national average and in other areas, people who would be treated if they lived near to a hospital are not so treated. Given the increasing tendency towards the centralisation of services (particularly acute services) there is a potential danger of even greater differentials in treatment rates.

It was partly in relation to the problem of the inequity in the allocation of resources over space that the Resource Allocation Working Party was set up in 1975. Its remit was to review the arrangements for distributing NHS capital and revenue in an efficient and equitable way in relation to relative need. The report from the group DHSS (1976) has subsequently attracted much attention, a good deal of criticism and generated a new sub-discipline within the health care system devoted both to understanding how it works and how to take best advantage of it. The basic idea behind the RAWP method as it became known, was the calculation of resource targets based on the residential population of regional authorities and the expenditure the region would incur if it provided services at national average rates. The actual calculation of these targets is complex but in principle they take account of differences in the population structure of regions and variations in the morbidity rates as measured through variations in Standardised mortality ratios (SMRs). The idea is that existing revenues can then be compared with these targets and gradually actual revenues will, over time, move towards the targets. In general the London regions would face substantial reductions in their revenue allocations while most of the other regions would have targets somewhat higher than their existing allocations. The planning problems that now face the London regions are considerable because progress has been made in resource allocation and they imply the closure of large and prestigious hospitals, notably in central London. How quickly regions will move towards their target remains to be seen, but clearly instantaneous adjustment would not be feasible from either a political or administrative point of view.

Allocations from Region to District take a variety of forms, most common of which is a modified local version of RAWP. Because there is often much variation in the range of services offered by individual districts (some will obviously contain regional and sub-regional specialties), authorities are compensated for treating patients from other districts and vice versa. This leads on to the important concept of catchment populations, which can be considered as the actual population that a district serves, for a given specialty or all specialties. They are calculated in relation to cross-boundary flows. We shall return to the issue of catchment populations at subsequent stages of this paper and we also present a detailed algebraic exposition of the technical problems associated with calculating catchment populations in Appendix 1.

Given this background, what are the typical types of problems being faced by planners both at the Regional and District level? We offer the following list as being representative of some of the main problems;

(a) Changing patterns of demand

It is important to link the planning of health service supply to the changing social geography of regions and districts. Changing residential patterns - e.g. outmigration and decentralization - together with changing demographic structures, especially the growth of the elderly population, have different impacts on different types of regions and districts. For example, some RHAs, such as Oxford and East Anglia have experienced significant population growth in recent times, this largely being at the expense of the London regions. However, there tends to be a notable lag in the time it takes before the appropriate resource adjustments are made. Clearly this is an area where detailed models of demographic and social change could provide forecasts of likely future population structures.

(b) Hospital planning - new developments

Although the development of new district general hospitals on green field sites tends to be the exception rather than the rule these days there are still a sufficient number of new health care facility developments to warrant interest. These may include the expansion of facilities on a particular site or the establishment of new types of units, such as those specifically designed for the elderly and mentally infirm (e.g. ESMI units). In addition the planning of new specialties, particularly at the regional scale, often involves important location decisions. In all these cases location models have potentially a good deal to offer the health care planner, and we shall present examples of these in the next section.

(c) Hospital planning - rationalisation

More typically health authorities are faced with rationalising existing facilities and this may of course involve closing some hospitals completely. This too needs careful planning and there will usually be a wide range of options that should be examined. In many cases there will also be a need to look at the impacts on adjoining districts, as closure or reduction in the level of supply might imply the transfer of demand to other care centres. For this, the regional planning model we outline in section 4.2 may be particularly useful.

(d) New technological developments

As technology advances new types of treatment and diagnostic facilities become available, but at a cost. On average the rate of increase in the cost of new technology is considerably above the rate of inflation. How can these new developments be funded and where should they be located?

(e) Alternative forms of care

There is a growing tendency to move from hospital-based to being community-based. In addition the development of day care in relation to the surgical specialties in terms of costs, organization and client groups also needs to be assessed.

These, then, form some of the issues. We can now turn our attention to the two models we have developed.

3. THE APPLICATION OF LOCATION-BASED
SELECTIVE REVIEW

3.1 Introduction

In this section we briefly discuss modelling approaches that have been used to address issues, particularly those with a geographical focus, the main interests of medical geography.