KF PROJECT PAPER

Number RC6 July 1980

Health Service Finance and Resource Management

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Alan Williams

Based on working papers of the Royal Commission on the NHS

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Published by the King's Fund Centre, 126 Albert Street, London NW1 7NF. Printed in England by Trident Services, London SE1.

HEALTH SERVICE FINANCE AND RESOURCE MANAGEMENT

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July 1980
Price: £1.00

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126 Albert Street
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EDITORS' INTRODUCTION

This is the sixth in a series of pamphlets based on the working papers of the Royal Commission on the National Health Service. The Royal Commission's discussion and recommendations on finance are to be found in Chapter 21 of their final report[1]. The papers reproduced here were written as background material for the Royal Commission by two economists: H S E Gravelle who was the economic adviser to the Royal Commission, and Professor Alan Williams who was a member of the Royal Commission until 1978.

The first paper included here discusses the alternative models of financing health services. The second describes one of those models as used in the NHS: health service charges. This paper has been updated since the publication of the Royal Commission's report. The third paper discusses efficient management of resources in the NHS, and the last two papers detail specific resource management issues; clinician budgeting and costs of training doctors and nurses. These papers complement a wide variety of material made available to the Commission on these topics through evidence submissions, commissioned research[2], discussion with health service workers and other papers prepared by the secretariat and members of the Commission. The views expressed do not necessarily reflect those of the King's Fund or the Royal Commission.

1 GREAT BRITAIN. PARLIAMENT. *Report of the Royal Commission on the NHS* (Chairman Sir Alec Merrison) London, HMSO 1979 *Cmnd 7615.*

2 See for example, PERRIN, J et al. *Management of Financial Resources in the National Health Service,* Royal Commission on the NHS, Research Paper Number 2, London, HMSO 1979.

We are grateful to King Edward's Hospital Fund for London for giving a grant to enable this material to be published, and to the Polytechnic of North London where this project has been based.

Christine Farrell
Rosemary Davies

FINANCING HEALTH SERVICES – ALTERNATIVE MODELS

H S E Gravelle

The alternative methods of finance which will be examined are:

(a) charges
    without insurance
    with insurance
(b) taxation (local and national)
    general tax revenue finance
    earmarked or hypothecated taxes
(c) lotteries
(d) voluntary contributions.

This paper examines the general issues raised by the finance of health care and provides a background for a more detailed examination of specific proposals for changes in the current methods of financing the National Health Service.

The first part of the paper discusses briefly whether health care has any characteristics which imply that it ought to be financed in one way, rather than in another. The second examines some criteria for evaluating the alternative methods of finance, some of the problems involved in applying these criteria, and describes the main features of the alternative methods of finance and their implications for the health service.

THE NATURE OF HEALTH CARE

In this section we consider the arguments which suggest that there are certain intrinsic features of health care which imply that it cannot be financed by charges.

Irrationality

One of the assumptions of the proponents of the market solution is that the demand for health care will be the informed choice of consumers acting in their own best interests, ie behaving rationally. There are some groups in the population for whom this assumption is clearly inappropriate, for example children, the mentally ill and the mentally handicapped. Their choices, in any institutional framework and method of financing, are unlikely always to be rational. This implies a need for intervention and guidance by parents or guardians, so that choices are made on behalf of these groups rather than by them. It does not imply that the parents or guardians should not pay for medical care consumed by those for whom they are responsible. Parents or guardians may neglect their trust and choose too little or the wrong type of health care for their charges. This underconsumption may be partially offset by zero prices for medical care, but a selective lowering of the relative prices of the types of care which are underconsumed, or supervision and regulation of actions of parents or guardians, may achieve the same effect. Whether the abolition of the price barrier to care will lead to greater use depends on the type of rationing which replaces it. A system in which parents or guardians have to spend time or effort to acquire care for their children or wards may also lead to underconsumption.

More generally it is sometimes suggested that when individuals pay for care they consume less care, especially less preventative care, than they 'ought', because of commercial pressures to purchase other consumer goods. The provision of free care may correct for this consumer myopia, but the arguments of the previous paragraph apply: it is again not clear that this is the only or the best policy to adopt.

Ignorance

Consumers are usually dependent on doctors or other health professionals for information about health care. As a result the demand

for care will be heavily influenced by the doctor and the patients will often be unable to judge the quality of advice or care provided. This implies a need for regulation of the doctor-patient relationship, for example by systems of ethics, peer review, audit, licensing or certification. It may have implications for the method of reimbursing the doctor but not for the method of financing the health care system. The latter will not affect the doctor's incentives either to act in the best interests of his patient or to exploit the patient's ignorance.

Patients can reduce their ignorance by the expenditure of time, effort and money. The extent to which they will become better informed depends on a comparison of the costs of acquiring information with the costs of ignorance. Some of the costs of ignorance (such as poorer care) are unaffected by the method of finance but some are altered. One such cost is the patient's monetary expenditure on care. Better informed consumers will be likely to spend less on care than wholly ignorant consumers. If patients have to pay directly for care then there is a greater incentive for them to be better informed. Hence if patients have any influence at all over their treatment they will tend to be less ignorant when the care is financed by the market than when there are no direct charges.

Uncertainty

There are two main types of uncertainty which, it has been suggested, may influence the choice of method of finance. The first and most obvious is the unpredictability, at the individual level, of the incidence of illness. Since some forms of illness require expensive treatment, this implies that individuals will wish to insure. It does not however tell us anything about which method of insurance (private, state or tax finance) is preferable.

The second type of uncertainty which is held to have implications for the method of finance is in the future development of medical technology. New and costly cures for conditions presently untreatable

may be discovered and hence, it is argued, no private insurer would be willing to provide cover for these conditions, because the commitments might prove extremely expensive. But

(a) some new discoveries reduce the costs of treatment
(b) it is always possible to insure for a fixed sum payable if the insured person develops a particular condition, rather than cover the uncertain cost of treatment
(c) expensive new treatments will be expensive under all methods of finance and may not be worthwhile compared to the benefits produced. It is therefore not necessarily a criticism of private insurance that very expensive treatment may not be insurable and therefore not provided. What is required is a detailed specification of how the method of finance affects the assessment of the worthwhileness of new methods of treatment.

External effects

Consumption of health care by an individual may confer benefits on other individuals in several ways. Some types of care consumed by an individual improve the health of other individuals eg vaccination against infectious diseases benefits everybody in the community. In such cases a market system in which individuals pay prices related to the costs of the care consumed will lead to too little consumption of some types of care, because the social benefits of additional consumption exceed the benefits to the individual consumer. Hence there is an argument for reducing the price of some types of care, possibly to zero, and financing such care by taxation.

A second type of external effect arises from the altruism of some individuals who derive satisfaction from the consumption of care by others. Such altruistic individuals may feel that some sections of the community for example, the poor, are consuming too little care and that they should be encouraged to consume more by lowering the price of care. One method of achieving this is by charitable contributions. It may be that individuals would be willing to give more if they knew that

everyone else was contributing. Hence tax finance could be justified as a means of coordinating the actions of potential donors and thus increasing the amount of money given, rather than being a system in which the altruistic have the opportunity to do good with other people's money.

Third, some individuals may be concerned about **inequalities** in the consumption of care. Since individual expenditure on care under market finance appears to be strongly dependent on income, one solution to inequality in expenditure on care would be to reduce disparities in income levels and hence also disparities in expenditure on other goods and services. However, such large scale redistribution is usually not advocated as a cure for inequalities in health care because, either it is thought to have deleterious effects on the functioning of the rest of the market economy; or it is felt not to be politically feasible; or the distribution of health care is regarded as being 'more important' in some sense than the distribution of other goods and services. Hence, it is suggested, health care must be allocated by a non-price rationing mechanism. Whether such mechanisms will actually reduce the inequalities in the consumption of care depends upon what specific rationing criteria are actually used.

A fourth type of external effect arises from concern felt by some individuals about the unequal distribution of the **need** for health care. Individuals with the same income but different needs or health states are not equally well off. This might not matter if income and health were inversely correlated, but they are, if anything positively related, since health tends to affect earning ability. One solution might be to redistribute income directly to the less healthy, so that they could then buy more care or other goods and services. Income transfers contingent on health states would tend to create opportunities for fraud however. Hence, it is argued, health care should be provided free to all who require it, since the health care received by one individual usually cannot be sold or transferred by that individual.

Public goods

Some goods which affect health, for example clean air and pure water, must either be supplied to all individuals if they are supplied at all or are very much less costly to supply to all rather than separately to individuals. Hence financing their production via the market will be difficult because individual consumers will realise that they cannot be prevented from consuming the good even if they do not pay for it. Compulsory tax finance of such goods may therefore be preferable to voluntary market finance. Tax finance would not necessarily lead to efficient supply of public goods since individuals would have little incentive to reveal correctly their valuation of such goods.

Conclusion

This short survey appears to indicate that, apart from some types of health care where there are external effects or public good aspects, the choice of method of finance cannot be settled by appeal to the intrinsic nature of health care. Most of the arguments sketched above rest on assumptions about individual motivation or competence which may not be accepted by everyone, or on implicit assumptions about the way alternative systems will actually work. What is required therefore is a closer examination of the effects of the alternative methods of finance on the health care system. The next section suggests four aspects of health care systems which may be affected by the method of finance and which can be used to evaluate the alternative methods.

COMPARISON OF ALTERNATIVE METHODS OF FINANCE

The methods of finance described below are **models**: all actual methods are considerably more complex than the descriptions indicate and most health care systems use more than one method. The aim is to focus on the question of who (patient, doctor, taxpayer, politician, bureaucrat or insurer) takes what decisions under what incentives, and on the consequent effects on the costs and type of health care service provided.

We will examine how the method of finance affects the incentives and constraints on the various decision makers, but it is necessary to remember that these will also be affected by two other important facets of health care systems:

(a) the ownership and control of health care facilities;
(b) the internal financial system: the way in which doctors, other health professionals and hospitals are reimbursed for costs incurred.

The method of finance (the external financial system or the way in which money gets into the health service) will affect the demand for health care; the ownership and control, and the internal financial system, will affect the supply of health care.

Differences in the method of finance are often associated with differences in both ownership and control and the internal financial system, but there is no necessity for a particular method of finance to be found with a particular internal financial system or pattern of ownership. Charges to patients are often linked with fee per item of service reimbursement of doctors but this need not be the case. Patients could pay charges when doctors receive salaries, or doctors receive fees per item of service under a system of tax finance. Similarly private insurance finance is often associated with private ownership of health facilities such as hospitals, but state owned hospitals could be financed by charges to patients (with or without private insurance) or by taxation.

A failure to make the distinction between the effects of the method of finance, the ownership of facilities and the method of reimbursement has led to confusion in some of the discussion about the merits of alternative methods of finance. For example, some of the arguments for and against charges have been concerned with fee per item of service payment to doctors. It has also been wrongly suggested that private insurance finance would necessarily end the effective monopoly buyer position of the state and cause a rise in the prices of goods, services and labour supplied to the health service.

To fix ideas in what follows, we will consider the implications of different methods of finance in a system in which the state owns most of the health care facilities and most doctors and other health professionals are not paid on a fee per item of service basis.

COST EFFECTIVENESS

It is presumably generally accepted that a health care system ought to deliver any particular pattern or amount of care at minimum cost. Cost minimisation requires that

(a) the procedures and treatments used are **effective**, that is they produce the largest possible amount of care (of given quality) from a given mix of resources (different types of labour, supplied, equipment and buildings); and

(b) where there are alternative effective procedures and treatments producing the same output of care of given quality the least costly alternative is chosen. Cost in this context will include all costs, not just those falling on the health service, but also, for example, those borne by the patients and their families and other individuals in the community.

The method of finance is unlikely to influence the effectiveness of the health service since, given the technical ignorance of the patients, doctors or other health professionals will be the key decision makers as regards the choice of treatment. These decision makers will not be led to choose more or less effective procedures by changes in the method of financing the health service because such changes do not affect the incentives and constraints confronting them. The method of finance is, however, likely to affect the cost of any given level of care because:

(a) collection and administration costs may differ;

(b) methods of finance may introduce changes in resource use in the rest of the economy;

(c) there may be some effect on the choice of alternative effective procedures and treatments.

Charges without insurance

The collection costs of charge finance are likely to be significant because of the heterogeneity of patients who will be receiving different amounts of different types of care. There will need to be a patient based costing system, capable of recording what each patient receives and costing the different types of care.

Charges with insurance

The introduction of insurance to cover patient charges is likely to raise the cost of providing any given amount of care because the administrative costs of the insurance system must also be covered. These costs may be a significant proportion of premium income, perhaps between a third and a half for individual subscribers and a tenth and a quarter for group insurance.

The impact of insurance on collection costs will depend on the structure of the insurance industry. Consumers are probably better able to evaluate insurance schemes than health care and this will increase competition amongst insurers, which in turn will provide an incentive for insurers to keep their own administrative costs down. Individually insurers will have little incentive to put pressure on health care suppliers to keep their costs down, unless they own health care facilities or insure a large proportion of the users of particular facilities, because the benefits from such pressure will be spread over all insurers. There is some evidence that there are economies of scale in health insurance. This will tend to reduce the number of insurers and hence reduce competitive pressures on costs. Since individual insurers will tend to be large and their customers to constitute a significant proportion of the users of individual health care facilities there will be offsetting effects on their incentive to monitor health care facility costs.

The costs of raising finance with insurance will also depend on the ownership and objectives of insurers. American evidence suggests that

non-profit orientated insurers are less efficient, ie have higher administrative costs, than commercial insurers.

General tax revenue finance

If health care is financed from the general pool of tax revenue raised by the government, the **additional** costs of collection caused by the need to finance health care will depend on how the additional revenue is raised. If the tax base is extended, so that more goods and services or individuals are taxed, there will be additional costs, in the form for example of more tax collectors and more time spent on paperwork by those paying taxes. Alternatively, if additional revenue is raised by increased tax rates, with a constant tax base, there will be no extra collection costs: the costs of collecting VAT, for example, do not depend on whether it is levied at five or ten per cent.

Most taxes cause the prices faced by consumers to differ from those faced by producers. This may lead to inefficiency since the value of additional output to consumers will differ from the cost of producing that additional output. Tax revenue finance for health care will increase such distortionary effects whether the additional finance is generated by higher tax rates or by an extension of the tax base.

There is little incentive for the individual taxpayer to try to ensure that health care is delivered in a cost effective manner and that collection and distortion costs are minimised. Any reduced costs will be shared with all other taxpayers in the form of lower rates or fewer taxes and the benefits to the individual of pressure on politicians or bureaucrats to reduce costs are therefore small compared with the input of time and energy required.

Earmarked taxes

Under earmarked or hypothecated tax finance all of the proceeds of particular taxes are used to finance health care. The collection costs again

depend on whether the tax base is extended or tax rates increased to raise the required revenue.

The distortionary costs are likely to be greater than with general tax finance, since the same amount of revenue is being generated from a smaller base and hence tax rates on the earmarked goods and services and the consequent divergence between marginal valuations and marginal costs, will be greater. It could be argued that earmarked taxes on alcohol and tobacco will be less distorting than general taxes because such goods would otherwise be sold at prices below their true marginal social cost, which should include their effects on the health of consumers. Increasing the prices of alcohol and tobacco by specific taxes may well increase the efficiency of resource allocation, but this effect is not conditional on the proceeds of such taxes being used to finance health care. Nor is it likely that the tax rates necessary to finance health care would raise prices just to the level at which they equal the marginal social cost of these goods.

As with general tax finance the number of individuals paying the earmarked taxes will give very little incentive for individual pressure to ensure a cost effective health care system and hence lower taxes.

Local tax finance

The health care provided in an area within a country could be financed by general or earmarked taxes raised in that area. The remarks made above in the context of national tax finance apply to local tax finance with two amendments:

(a) If there are any economies of scale in the collection of taxes, local tax finance will be administratively more expensive than national tax finance;

(b) the smaller number of local taxpayers may provide greater incentive for the formation of local pressure groups to keep tax rates down.

Lotteries

The profits of a state run lottery (revenue less prizes, administrative and selling costs) could be used to finance health care. Since a state lottery will replace other forms of gambling the total administrative and selling costs in the gambling industry will not be changed, provided the state lottery is run as efficiently as the other forms of gambling.

In these circumstances, the collection costs for this form of finance would be small. There will, however, be a few incentives to keep such costs to a minimum because the managers of the state lottery will have no monetary interest in the profits, there may be little competitive pressure on the lottery and there will be large numbers of customers each with a very attenuated interest in applying pressure to reduce collection costs.

Voluntary contributions

Administrative and advertising costs will be incurred in the finance of health care by charitable contributions. Individuals who run charities have no personal financial inventive to reduce such costs, but may be more than averagely altruistic and hence wish to reduce costs so as to maximise the amount of care provided. Altruism is not necessarily highly correlated with managerial ability. Whether there is any incentive for donors to monitor collection costs will depend on whether the donors derive satisfaction from the size of their donation or the amount of care it finances.

Conclusion

General tax finance at the national level appears to be the cheapest form of tax finance (after allowing for both collection and distortion costs) and to have the lowest collection costs of all the methods. Whether it is cheaper than the non-tax methods depends on the magnitude of the distortion costs it generates.

PATTERN OF CARE

The term 'health care' covers a multitude of goods and services which affect the health of individuals. A given total expenditure on care will be efficiently allocated amongst the different types of care when the value of the marginal benefits of an additional £1 spent on each type of care is the same for all types of care. This raises the question of how the marginal benefits of care are to be valued and by whom. The obvious answer would appear to be the patients receiving the different types of care. There are two problems:

(a) it may be difficult to measure patient valuations. There are obvious dangers in asking patients to value the different types of care. In any system in which there is non-price rationing, inferring valuations from patient choices may be time consuming, costly and unreliable;

(b) patient valuations of care will depend, inter-alia, on their incomes, and changes in income distribution will alter valuations. Hence, if the prevailing income distribution is thought to be unfair, one may be reluctant to accept valuations dependent upon it.

The alternative to patient valuation of care received is paternalism: the substitution of someone else's subjective judgments about the value of the benefits of different types of care. The difficulty here, of course, is that different people will make different valuations.

Charges without insurance

When consumers are charged for the different types of health care they receive the resulting pattern of care will be efficient (as defined in the previous paragraph) provided:

(a) prices are proportional to marginal costs;

(b) consumers' own marginal valuations of the different types of care are equal to the social marginal valuations;

(c) the income distribution is acceptable (since marginal valuations depend on the distribution of income).

Prices will be equal to the marginal costs of care if the health care market is competitive, or if government produced health care is priced at marginal cost. Consumer ignorance, professional practices such as strict controls of advertising, restrictive legislation and economies of scale in some health care facilities and products will tend to reduce, though not to eliminate, competition in health care markets. Prices will therefore tend to diverge from marginal costs if suppliers are privately owned and controlled.

If those responsible for setting prices for state produced health care decide not to respect the preferences of consumers as revealed by their market demands, prices need not equal marginal costs and there will be cross-subsidisation amongst the different forms of care.

The patters of care may be efficient under a system of charges without insurance, but the individual will bear the risks arising from the uncertain health expenditure. Most individuals are risk averse and hence charges without insurance are inefficient. Individual risks could be reduced by pooling them in some alternative method of finance which did not vary the individual's expenditure fully with the cost of care consumed. All the other methods of finance provide some degree of risk sharing but may not give an efficient pattern of consumption.

Charges with insurance

If consumers are fully reimbursed from an insurance scheme for charges paid, the effective price of care to them will be zero. The cost of additional units of health care consumed by an individual will be met by the insurance pool and will raise the premiums paid by **all** insured individuals. Hence the payment by the individual (in the form of a larger premium) for additional health care consumed will be a very small proportion of the actual additional expenditure generated. Health care insurance is not usually comprehensive so that the consumer pays the full price for some types of care, a proportion of the charge for others and a zero price for those types of care which are fully covered by insurance. Insurance alters the relative prices of different types of care. As a result, prices to the

consumer will not reflect the marginal costs of the different types of care. Insurance therefore seriously undermines some of the efficiency arguments in favour of market finance. It does not completely destroy them, however, since under insurance some, at least, of all types of care demanded by consumers is likely to be supplied, although not necessarily in an efficient amount. Under other methods of finance, consumers may not be able to exert sufficient pressure on suppliers to ensure that some types of care are supplied at all.

Tax finance

With tax finance of any kind the consumer faces zero prices for care, since the costs of additional care consumed by him are spread over all taxpayers. Consumers will therefore demand a pattern of care such that the marginal valuation of each kind of care to them is zero. The actual pattern of care consumed, however, will depend upon the rationing mechanism adopted by the providers of health care and on the political and other pressures exerted on suppliers by consumers at the different types of care.

Lotteries and voluntary contributions

Similar influences will determine the pattern of care under lottery and voluntary finance, except that some forms of care may be more easily financed because they can be more easily advertised in promotion of lotteries and charities, for example those types of care using advanced technology or provided for small children. This may lead to the neglect of less glamorous techniques or development of services for the elderly.

TOTAL EXPENDITURE ON CARE

Proponents of the alternative methods of finance seem to place great emphasis on the assertion that their particular scheme will increase expenditure on health care. Whether this is an argument for or against a scheme depends on what is thought to be the correct level of

expenditure. An efficient level of total expenditure on care would be that at which the benefits of an additional £1 of expenditure are worth £1. The difficulties of valuing the benefits of care mentioned above apply here. Hence, there is considerable scope for disagreement about what the level of the expenditure on care ought to be.

Charges without insurance

Total expenditure on health care with charge finance will be efficient only if health services are priced at marginal cost by suppliers and consumers' marginal valuations of those services are accepted.

Charges with insurance

Since insurance reduces some health care prices, total consumption of care will rise and expenditure will be greater than when consumers face the full price of health care.

Tax finance

Taxpayers will wish to restrict expenditure on health care but patients will press for greater expenditure so long as they perceive any benefit to themselves, no matter how small, from consumption of additional care. Patients will be supported in this by those who work in the industry, both out of concern for the patients and for selfish reasons. The smaller the tax base from which the tax revenue is raised, the greater will be the incentive for taxpayers to press for reduced expenditure. Earmarked taxes, whether special health taxes or taxes on particular goods and services, will also tend to increase taxpayer pressure by increasing the visibility of the tax and the use to which the proceeds are put.

Lotteries and voluntary contributions

Expenditure financed from these sources will be limited by the demand for gambling and the supply of charity respectively. It is doubtful if either

method would provide anything like the amount of finance generated by the other methods.

DISTRIBUTION

Methods of finance will affect the distribution of

(a) the consumption of health care and resulting health states:
(b) income and hence the consumption of all other goods and services.

Different people will clearly have different views on what constitutes an acceptable distribution but there are additional possible sources of disagreement:

(a) is the distribution of care or of health relevant? Expenditure on care for different individuals ought not to be considered in isolation from their needs, since some would be healthier than others in the absence of treatment. On the other hand, the need for care is partially determined by the individual's choices, for example, his smoking, drinking and driving habits. Focussing on the final health states achieved after the provision of care may therefore be unfair to those individuals who do not indulge in such health damaging activities;
(b) the context of the proposed methods of finance may not be made clear. For example, views on the acceptability of the distributional impact of charge finance may well depend on the degree of progression in the income tax system and resulting after-tax income distribution.

In charge finance systems, both with and without insurance, those with higher incomes tend to consume more care and to have better health than those with low incomes. When price rationing is removed under tax, lottery or voluntary contribution finance, the poor increase their consumption proportionately more than those with higher incomes. The abolition of price rationing will not usually result in equal consumption of care for those equally in need because other forms of rationing are

adopted. Most usual is queueing or rationing by waiting. This is held to be fairer than rationing by price in that time is more evenly distributed than income and those with lower incomes will have smaller opportunity costs in waiting. However, those with higher incomes often have more flexible hours of work and do not lose income while waiting, so that their costs may in fact be lower than those borne by individuals with lower incomes. Education and similarity of background to health care professionals also govern access to care and tend to be associated with higher incomes.

Charge finance means that the cost of care falls directly on those who consume care and each individual bears the cost of his own consumption. If there is insurance, costs are borne by all those insured, but the costs are pooled so that there is redistribution within the pool from the healthy to the sick. This redistribution is curtailed by the fact that it is profitable for insurers to identify different risk classes in the population and to charge them different premia related to the expected cost they will impose on the insurance pool. The less healthy therefore will pay higher premiums if the insurers can identify them. Some groups for example the elderly will face such high premia that they will not wish to insure and so will bear the costs themselves.

The unit administrative costs of providing group insurance, for example to all the employees of a particular firm or to all members of a union, will be very much smaller than of providing insurance to individuals. As a result, members of group insurance schemes will be better off than people who are individually insured since the latter will pay higher premia and may also have a less complete insurance coverage.

The income redistributive effect of tax finance depends on the tax used to finance health care. Lottery finance will tend to be regressive since gambling expenditure is inversely related to income.

CONCLUSION

Consideration of the alternative models of finance at the level of

abstraction considered here can at best provide some hints as to which method is best. All methods have been shown to be less than ideal in one respect or another and we must choose amongst imperfect methods. This requires a much fuller specification of the alternatives and the institutional framework in which they are to be introduced and some attempt to quantify the implications of the alternative methods. The next paper provides a more detailed examination of some proposed changes to the existing method of financing the NHS.

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CHARGES IN THE NHS

H S E Gravelle

The main types of charges in the NHS are:

(a) family practitioner services
  1 prescription charges
  2 dental charges
  3 ophthalmic charges

(b) hospital services
  1 outpatient charges
  2 amenity beds
  3 private beds
  4 Road Traffic Act charges
  5 implicit hotel charges (reduced social security benefits).

The first part of this paper gives details of these charges, including grounds for exemption and the amount of revenue raised. The second part considers various proposals for amending the system of charges:

(a) varying the existing charges

(b) introducing new charges
  1 GP consultation fees
  2 accident and emergency department fees
  3 hotel charges.

Appendices A, B and C give brief histories of prescription, dental, and ophthalmic charges.

PART 1 THE CURRENT SET OF CHARGES

Prescription Charges

History

Prescription charges were introduced in June 1952 at 5p per **form** for drugs and medicines prescribed by GPs. The charge was changed to 5p per **prescribed item** in 1956, raised to 10p in 1961, abolished in 1965, reintroduced at 12½p in 1968 and raised to 20p in April 1971. From July 1979 the charge was 45p and it was raised again in April 1980 to 70p.

TABLE 1 Changes in prescription charges

Date of change	1948	June 1952	December 1956	March 1961	February 1965	June 1968	April 1977	July 1979	April 1980
Charge (p)	0	5	5	10	0	12.5	20	45	70

Note: The charge imposed in 1952 related to the form on which items were prescribed. From 1956 the charge related to each item

Exemptions

Certain groups in the population do not pay the prescription charge:

(a) children under 16;

(b) men aged 65 or over; women aged 60 or over;

(c) expectant mothers and mothers with children under 1 year of age;

(d) people with certain conditions, which require regular prescriptions,

such as diabetes or epilepsy; people incapable of leaving their homes unaided;

(e) war or service pensioners for treatment of accepted war service disablements;

(f) recipients of Supplementary Benefit (SB), Family Income Supplements (FIS) and their dependents and other exempt, after a means test, on grounds of low income;

(g) holders of pre-payment certificates ('season tickets') with six or twelve month validity, available to all patients.

Table 2 gives details of the numbers in the various exempt categories in England over the period 1969 to 1977. About two-fifths of the population is exempt and in 1977 63 per cent of prescriptions in England were dispensed free.

TABLE 2 Exemptions (England) 1969–1977

	1969	1974	1975	1976	1977
Estimated exempt (June,m)					
Children[1] 15(16)	10.9	11.5	11.4	11.25	–
Elderly[1] 65(60)	5.9	7.8	7.97	8.02	–
Low income (SB, FIS)	1.1	1.2	1.3	1.4	1.5
Other low income	0.020	0.020	0.013	0.013	0.011
Service disabled[2] under 65	0.220	0.179	0.174	0.164	0.151
Exemption certificates[3] issued (m)					
Expectant mothers or with babies under 1 year old	0.395	0.476	0.460	0.439	0.437
Patients with specified conditions	0.044	0.045	0.039	0.039	0.040
Prepayment certificates issued (m)					
6 month cover	0.046	0.060	0.051	0.044	0.039
12 month cover	0.035	0.156	0.165	0.179	0.185
Prescriptions dispensed free to patients[4]					
Number (m)	127	174	165	183	186
% age of total	52	61	60	62	63

Source: DHSS Annual Reports

Notes:

1 On 8 April 1974 age exemptions were extended to children up to age 16 and women aged 60 and over. Men aged 65 and over are exempt.

2 People not exempt on age grounds entitled to exemption for treatment of war or service disablement.

3 These certificates have varying periods of validity, the rate of issue does not indicate the number in these categories at any one time.

4 Includes those dispensed for holders of prepayment certificates.

Revenue

The revenue from prescription charges in England from 1969 to 1977 is shown in Table 3. The proportion of the cost of the general pharmaceutical service in England recouped by charges declined from 10.8 percent in 1972 to 3.7 percent in 1978. This was because:

(a) the average cost of a prescription increased from 82p in 1972 to £2.14p in 1978.

(b) the prescription charge remained constant at 20p from 1971 to 1979.

(c) the proportion of exempt prescriptions increased.

Collection Costs

The revenue figures in Table 3 and in subsequent tables take no account of the costs of collecting the different charges and of exempting certain groups. These costs will fall on the NHS (and hence reduce the net revenue generated by the charges), practitioners in contract with family practitioner committees (FPCs), (mainly chemists in the case of prescription charges, though doctors dispense some 5 percent of prescriptions) and on the patients.

Prescription charges are retained by the dispensing chemist and are deducted from the remuneration he receives from the FPC. The additional expense imposed on the chemist by his collection of prescription charges is probably small since he is already in retail trade. Since the chemists' system of remuneration is designed to cover all expenses incurred in the NHS business, any collection costs are likely to be passed on to the NHS.

The Department of Health and Social Security (DHSS) has made various attempts since 1969 to calculate the cost to the NHS of administering prescription charges. Estimates given in reply to Parliamentary Questions between 1971 and 1976 range from £1 to £1½ m for Great Britain. As

TABLE 3 Revenue from prescription charges (England) 1969–1977 (Calender Years)

Revenue charges (£m)	1969	1970	1971	1972	1973	1974	1975	1976	1977
Chemists	14.8	14.4	19.2	21.5	22.1	22.0	21.5	21.9	21.7
Dispensing doct doctors	0.485	0.523	0.689	0.817	0.888	0.888	0.894	0.931	0.961
Prepayment certificates	*0.165*	*0.200*	*0.517*	*0.678*	*0.744*	*0.666*	*0.693*	*0.719*	0.75
Gross Revenue	15.450	15.123	20.406	22.995	23.732	23.544	23.087	23.550	23.411
Refunds	*0.270*	*0.170*	*0.258*	*0.262*	*0.197*	*0.149*	*0.114*	*0.113*	*0.106*
Net Revenue	15.18	14.953	20.148	22.733	23.535	23.405	22.973	23.437	23.305
Net Revenue as percentage of Cost	10.05	8.98	10.77	10.78	10.12	8.63	6.39	5.20	4.21
Average total cost per prescription (£)	0.62	0.67	0.76	0.82	0.88	0.99	1.28	1.54	1.87

Sources: Department of Health and Social Security Annual Reports

the work is carried out by staff employed in other duties it is thought to form a small part of overall administrative costs and is not readily separately identifiable. The estimates include allowances for separate hospital, FPC and DHSS local office administrative expenses and for the cost of mounting checks on the declarations of entitlement which patients claiming exemption complete on the reverse of the prescription form. The estimates do not take account of the possibly higher remuneration required to reimburse chemists for any collection costs they incur.

The costs falling on the patients, rather than the charge itself, arise from the system of exemptions and are likely to be small. Exemption for the elderly and for children can be claimed by signing a declaration on the back of the prescription form and all recipients of SB and FIS are automatically issued with exemption certificates with their order books.

General Dental Service Charges

History

There is no charge for examination, arrest of bleeding, denture repairs or necessary visits to a patient's home. Charges for dentures were introduced in 1951 and for treatment in 1952. Under the current system of charges, introduced in April 1980, the patient pays:

(a) the full cost of each item of treatment up to a maximum of £8 per item;

(b) up to £30 (synthetic resin) or £50 (metal or porcelain) for dentures and bridges;

(c) £18 per tooth restored with crowns, inlays, pin lays and gold fillings.

The maximum charge per course of treatment for any combination of the above treatment is £54.

Exemptions

Patients are exempt from charges if they are:

(a) under 21 (except for those aged 16 to 21, not at school, who must pay for dentures);

(b) expectant mothers and mothers with a child under 1 year;

(c) in a family receiving SB, FIS or free prescriptions, vitamins or milk on income grounds, or on a low income.

In 1977 48 percent of NHS treatments in England were free of charge and as Table 4 indicates, this proportion has remained constant over the last few years. The average amount paid by a non-exempt patient was £3.89 per treatment and the average cost (for all patients) was £8.50 in England in 1978.

Revenue

Table 4 shows the revenue from dental charges in England both absolutely and as a percentage of the cost of the GDS. The decline in the percentage of cost recovered between 1973 and 1975 was reversed by the increase in charges in 1976 and 1977.

TABLE 4 Dental charges: exemptions and revenue (England) 1969–1978

	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Exemptions										
number m	9.252	9.555	9.851	–	11.419	11.662	11.948	12.341	12.633	–
proportion of treatments %	47.55	47.91	46.72		48.14	47.32	46.12	46.97	48.00	
Patient contributions										
amount £m	14.6	15.8	20.528	24.689	28.700	30.519	30.764	38.212	47.852	54.8
proportion of cost %	19.62	18.24	20.89	23.85	25.02	21.72	16.85	18.43	21.86	23.67

Sources: DHSS Annual Reports; Health and Personal Social Services Statistics (HPSSS) London, HMSO; Annual Abstract of Statistics 1980.

Notes:

1 Both the number of exemptions and the total number of treatments refer to courses of treatment plus occasional (mainly emergency) treatments.

2 The figures for children and expectant and nursing mothers and for total treatments for 1969, 1970 and 1971 are based on a 12-month period from December to November. The low income exemptions for those years relate to the calendar years.

Collection Costs

Many of the remarks in the paragraphs discussing the collection costs of prescription charges apply to the collection costs of dental charges. The DHSS have not made any estimate of the collection costs falling on the NHS. The system of claiming automatic exemptions on low income grounds introduced in 1974 cut by two-thirds the number of such claims requiring assessment in Social Security Offices.

General Ophthalmic Service Charges

History

Eye tests are free to NHS patients but, since 1951, charges have been made for spectacles. Under the current set of charges if the patient chooses standard NHS lenses in NHS frames he pays

1 £1.84 to £9.75 for the frame depending on style;

2 £2.90 per single vision lens, £5.50 per fused glass bifocal lens, £6.15 for other types.

Charges are also made for 'hybrids': NHS lenses in non-NHS frames.

Exemptions and Revenue

Patients are exempt from ophthalmic charges if they are:

(a) children aged up to 16 or in full time school (but not in tertiary education) and if they choose NHS lenses in NHS frames. The full charge must be paid for hybrids;

(b) receiving means-tested benefits such as Family Income Supplement, or supplementary benefit, free pharmaceutical prescriptions or free vitamins. Patients get NHS lenses free and have the cost of the cheapest NHS frame deducted from the charge for the frame whether they have NHS lenses frames or a hybrid. No help is given if the patient has private lenses in private frames. Some relief from charges is also given for those on low incomes not getting other means tested benefits.

Table 5 gives the numbers of exemptions and charge revenue and amount of remissions and refunds of charges in England from 1974 to 1974. The proportion of the cost of the service recovered from patients fell from 50% in 1969 to 34% in 1978.

TABLE 5 Ophthalmic charges: exemptions and revenue (England) 1974–78

		1974	1975	1976	1977	1978
Exemptions[1]	000s	–	564	691	745	–
Charge Revenue	£m	15.9	16.1	20.7	23.0	24.7
Percentage of cost of service		47.6	27.8	34.2	33.5	33.9

Source: DHSS Annual Reports, Annual Abstracts of Statistics.

Note: 1 Excluding children who are automatically exempt.

Collection Costs

No estimate has been made of the cost to the NHS of administering the ophthalmic charges and exemption system. The additional burden on opticians is probably not great since they must maintain an accounting system for their private business.

Out-Patient Charges

Hospital out-patients pay the normal prescription charge for drugs dispensed from hospital out-patient departments and higher charges for certain appliances supplied, for example £17.00 for bespoke wigs, £6.00 for stock wigs, and £4.50 for fabric supports. The exemptions are the same as those for drugs prescribed by GPs (see above).

Revenue

Total revenue from out-patient charges in 1976/7 in England was £1.374m. Table 6 gives the figures for earlier years. There have been no attempts to estimate the collection costs associated with out-patient charges.

Amenity Beds

Hospital patients desiring accommodation in single rooms or small wards on non-medical grounds are charged £3 per day (single room) or £1.50 per day (small wards). There are no exemptions from such charges and no attempt has been made to estimate the collection costs.

TABLE 6 Hospital charges (England) 1973/4–1976/7 (£m)

	1973/4	1974/5	1975/6	1976/7
NHS patients:				
Outpatients	1.220	1.365	1.327	1.374
Amenity beds	0.269	0.308	0.291	0.308
Road Traffic Act	1.191	1.282	1.309	1.321
Total	2.680	2.955	2.927	3.003
Private patients:				
Inpatients	13.703	15.297	19.631	24.599
Outpatients	0.610	0.629	0.708	0.795
Total	14.313	15.926	20.339	25.394
Total hospital charges	16.993	18.881	23.266	28.397

Source: NHS Accounts

Revenue

The total revenue from amenity beds in England in 1966/7 was £0.308m. The revenue for earlier years is shown in Table 6.

Private In-Patient and Out-Patient Charges

Charges for private in-patients are designed to recover the full revenue cost plus some contribution to capital costs. Charges per day for a

private room for patients receiving private medical treatment in NHS hospitals range from £25.70p in psychiatric hospitals to £113 in London postgraduate teaching hospitals. If the private patient is not receiving private medical treatment the charges are about ten percent higher. Private out-patients pay £3.50p or £5.00 for a consultation, and £15.20p as a day patient in London teaching hospitals. Various other charges to private patients range from £3.70p for pathology services to £35.70p for operating theatre facilities in hospitals outside teaching districts. There are no arrangements for exemptions or refunds. The cost of collecting the charges has not been separately estimated but an element of administrative costs at district level included is in the calculation of the charges for private resident patients.

Revenue

It is estimated that the revenue from private in-patients and from private out-patients in England in 1979/80 will be about £31.0m. Table 6 gives revenue figures for earlier years. Charges are raised annually and are intended to cover both revenue and capital costs. The calculation of capital cost however appears to make no allowance for the implicit interest cost of NHS capital.

Road Traffic Act Charges

History

Since 1930 legislation has provided for the recovery through motor insurers, of a contribution towards the cost to the hospital service of treating road traffic casualties. The charges are of two kinds:

(a) an emergency treatment fee (£6.65 from 1 April 1980) payable irrespective of blame by the user of the vehicle where emergency treatment is required as a result of injury arising from the use of a motor vehicle. The fee is paid either to the GP or the hospital first giving treatment. There is no flat rate fee of this kind in Northern

Ireland.

(b) cost of in-patient (up to a maximum of £1,250 from 1 April 1980) or out-patient treatment (up to a maximum £120 from 1 April 1980) may be recovered by the hospital which provides the treatment from the insurance company with whom the driver of the vehicle involved is insured in cases where insurers make payments to third parties. The charges were unchanged from 1969 to April 1980 at £1.25 for emergency, £200 for in-patient and £20 for out-patient treatment.

Revenue

Income from Road Traffic Act charges in England in 1976/77 was £1.321 m. The DHSS believes that a significant proportion of this revenue is absorbed by administrative costs. Table 6 gives revenue for earlier years. The higher charges from April 1980 are expected to produce an additional £1.5m in 1980/81 and £3m per year thereafter.

Implicit Hotel Charges (Reduction of Social Security Benefits)

From the start of the National Insurance scheme in 1948 most in-patients receiving social security benefits have had their benefits reduced when they are in hospital. The rationale for the reduction is that social security benefits are meant to cover their maintenance which is provided free of direct charge while the beneficiary is in hospital. No reduction is made for the first eight weeks in hospital but thereafter the benefit is reduced by 40 per cent (20 per cent if the patient has a dependent). After 52 weeks the patient receives only 20 per cent of the benefit and 60 per cent is paid to the dependent if there is one, or is accrued for up to 52 weeks and paid to the patient on discharge from hospital (but not if the patient is discharged to local authority care). The benefit savings are not paid to the health service. The estimated reduction in benefits in 1976/7 in Great Britain was £60m, primarily from reductions in old age pension.

Conclusion

Table 7 shows the amount of finance raised from the main explicit charges for NHS treatment in Great Britain from 1969/70 to 1978/79. The decline in the proportion of finance arising from charges over this period has been due primarily to the failure of charges to keep pace with inflation and to the increased number of exemptions. The revenue from all charges has declined as a percentage of the total cost of the NHS from 3.5 to 2.0 over the same period. Charge revenue has never covered more than 5.6 per cent of the cost of the NHS.

No account has been taken of the collection costs of the charging and exemption system. Such costs are probably small in the Family Practitioner Services (FPC) because the system of remuneration of the practitioners in contract with FPCs means that much of the administrative work and record keeping necessary for charging would have to be carried out in any case. Collection costs may be relatively more important in the case of the hospital service charges because of the need to keep additional records in order to charge patients.

TABLE 7 Revenue from principal NHS charges (GB financial years ended 31 March)

Service	Charge revenue, £m						
	1972/3	1973/4	1974/5	1975/6	1976/7	1977/8	1978/9
General pharmaceutical	27	28	28	27	28	28	29
General dental	30	33	34	37	45	58	63
General ophthalmic	16	17	19	20	26	27	31
Service	**Revenue as % cost of service**						
	1972/3	1973/4	1974/5	1975/6	1976/7	1977/8	1978/9
General pharmaceutical	9.9	9.4	7.8	5.8	4.8	3.9	3.4
General dental	23.4	23.2	19.4	16.0	17.7	22.5	19.1
General ophthalmic	51.6	50.0	45.2	27.8	34.2	35.2	34.4

Source: compiled from health departments' statistics

PART 2 CHANGES IN NHS CHARGES

Introduction

Charges, Revenue and Demand Elasticity

Increases in the price of goods do not necessarily increase the total amount spent on them since the higher price will tend to reduce the amount bought. Each unit sold brings in more revenue but fewer units are sold. Whether the sum of these two effects is positive (revenue increases) or negative (revenue decreases) depends on how much the quantity sold declines as the price rises. The more responsive the quantity sold to the price charged, the less likely is revenue to increase as the price rises, since given price increases cause larger quantity reductions. A measure of the responsiveness of quantity to price is the **elasticity** of demand with respect to price. This is defined as the percentage change in quantity divided by the percentage change in price. There is a very simple relationship between elasticity and the effect of price rises on revenue:

Elasticity of demand	Change in revenue from price rise
$<$ 1 (inelastic demand)	+
= 1	0
$>$ 1 (elastic demand)	–

Most foreign studies and the few British studies of the demand for health care show an inelastic demand for most types of care, so that it is likely that increases in existing NHS charges will increase revenue.

Effect of Charges on Tax Finance

One of the difficulties in discussing the effect of changes in charges on the financing of the NHS is that it is not clear whether variations in the revenue from charges will lead to offsetting changes in the amount of

tax finance. Some of the differences between the advocates of high charges and those opposed to charges arise from different implicit assumptions about the political response to changes in the revenue from charges. Those supporting increased charges do so, on the grounds, *inter alia*, that expenditure on the NHS will be thereby increased and hence must be assuming that there will be no offsetting fall in finance from taxation. Opponents of charges who wish to abolish them, assume that total expenditure will not thereby be reduced, that is that tax finance will be increased to compensate for the lost charge revenue. Both sides agree that the total amount spent on the NHS ought not to be reduced and that the NHS is not overfunded. Neither side, however, suggest any criteria by which an optimal level of funding could be recognised.

The analysis below will concentrate on the effects of changes in charges on the revenue from charges and on the use of the NHS. The reader can supply his or her own estimates of any possible offsetting changes in tax revenue finance.

Public Expenditure and Charges

Increases in charges can lead to a reduction in the public expenditure which must be financed from taxation in two ways. First the extra charge revenue may be substituted for tax revenue finance directly. Second, increased charges may reduce use of the NHS and hence reduce costs. The sum of these two effects will be the potential reduction in public expenditure.

Distributional Effect of Charges

The distributional effect of changes in NHS charges are complicated by the fact that nearly all tax payers are patients and some, but not all, patients are tax payers. However, on the assumption that increased charge revenue and reduced costs are used to reduce taxes, the individual as a tax payer is made better off by increased charges. The individual as a patient however is made worse off in two ways if he is

not exempt from charges. First the charge causes him to reduce, and possibly to alter the pattern of, his consumption. So unless health care is entirely ineffective, this forgone consumption will worsen his health state. Second, he now pays a higher price for his reduced consumption.

Charges and Efficiency

Since most charges, even after the proposed increases, will be considerably below the extra cost imposed by providing an additional unit of the particular service being charged for, it could be argued that increased charges will increase the efficiency of resource allocation. The fact that non-exempt patients reduce their use of service when charges are increased implies that the units of service no longer consumed are not considered **by the patient** to be worth the charge paid. Since the charge is less than the marginal cost of this service, the conclusion is that the forgone units were not 'worth' the additional cost they imposed.

This argument is valid only to the extent that one accepts that only the valuation by the individual patient (or his medical advisers) of the care he consumes is to count in assessing the value of care. As was noted in the paper on alternative methods of finance there are several reasons why we may wish to overrule the patient's preferences and substitute our own valuation of the care forgone as a result of increased charges. If these latter valuations are greater than the patient's, the charges may reduce the efficiency of resource allocation in that the cost of the forgone care is less than the value of the benefits it generates.

Variations in Existing Charges

Prescription Charges

The effects of an increase in prescription charge depend on:

(a) exemptions; how many patients will actually be affected by the

increased charges. We will assume that the current exemption categories continue to apply and that any increased propensity to **claim** exemptions caused by higher charges will have a negligible effect on the total number of exemptions;

(b) demand elasticity. The study by Lavers (1977)[1] of the demand for prescriptions suggested an elasticity of 0.021 i e, an increase in price of 100 per cent would cause a reduction in the total number of prescriptions of 2.1 per cent. Estimates of elasticity are unreliable for large price changes, so we will also examine the implications of some other assumptions about the elasticity;

(c) amount prescribed per prescription. There have been some suggestions that GPs respond to higher prescription charges by increasing the amount prescribed per item in order to relieve some of the additional burden on the patient. Lavers found little evidence to support this suggestion and so we will assume that the amount prescribed per prescription (and hence the cost of the prescription) is unaffected by the prescription charge.

Different assumptions about exemptions and demand elasticity can have considerable impact on the estimates of the effects of a given charge. This is shown in Table 8 and also by the difference between the figures of £150m, given by John Banham in his evidence to the Royal Commission ('Realising the Promise of the NHS'), and of £45m, given in a written answer to a Parliamentary Question (31 January 1977) as the estimates of the increased revenue from a 50p prescription charge. The reason for the discrepancy is that Banham appears to assume that there would be no exemptions and that there would be a zero elasticity of demand, while the DHSS estimate is based on the existing set of exemptions and makes some allowance for a reduction in demand.

TABLE 8 Estimated effects of increased prescription charges (GB, 1976, £m)

Charge	50p			£1			£1.5		
Elasticity of non exempt demand	.01	.02	.1	.01	.46	.1	.01	.02	.1
Increase in revenue	38.81	38.42	35.29	103.50	102.46	94.09	168.19	166.50	152.90
Reduction in costs	3.05	6.10	30.50	8.13	16.26	81.30	13.22	26.44	132.20
Reduction in tax financed public expenditure	41.86	44.52	65.79	111.63	118.72	175.39	181.41	192.94	285.10

Sources: DHSS Annual Report, HPSSS 1977, Lavers (1977)

Notes:

1 The proportion of non-exempt prescriptions in GB is assumed to be the same as in England in 1976 (37.5%)

2 It is assumed that exempt and non-exempt patients have the same average cost per prescription

Table 8 sets out some estimates of what would have been the effects in 1976 of different levels of charges on different assumptions about demand elasticities. The effect of abolishing all exemptions can be estimated **very** crudely by multiplying all the figures shown by 2.5. Since the administrative costs of charging or exempting the patient are independent of the level of charges, there will be no change in the administrative costs provided that the number of patients claiming exemptions does not increase significantly.

Abolition of Charges

It was the policy of the Labour government 1974 to 1979 to make the NHS a fully free service 'as and when economic circumstances permit' (Parliamentary Questions, Written Answers, 22 March 1978). Table 9 gives an estimate of the increase in tax revenue which would have been required in 1975/76 to finance the additional public expenditure which would have been generated if there had been no charges in the

Family Practitioner Services in that financial year. The total increase in tax revenue required is equal to 2.8 per cent of the tax revenue required to finance the health service in 1975/76 and is equivalent to about a half per cent on the standard rate of income tax.

TABLE 9 Effect of abolition of all family practitioner service charges (£m, GB, 1975/6)

	Pharmaceutical[1]	Dental[2]	Ophthalmic[3]	All
Reduction in revenue	27.0	37.0	20.0	84.0
Increase in costs	9.8	23.1	28.8	61.7
Increase in public expenditure requiring tax finance	36.8	60.1	48.8	145.7

Sources: Health and Personal Social Service Statistics, 1977

Notes:

1 A constant elasticity of 0.021 is assumed and to avoid certain mathematical difficulties the increase in costs has been calculated on the assumption that the charge is made very small (0.1p) rather than being set at zero.

2 The elasticity has been taken as 0.1, this being toward the lower end of the range of US studies.

3 The elasticity is assumed to be 0.4, based on some crude manipulation of the data on lenses dispensed before and after the rise in charges in 1971. It should be treated with caution.

Road Accident Charges

The Labour government considered amending the Road Traffic Act in order to increase the amount recovered from motorists in respect of accident costs. Under the scheme the current Road Traffic Act charges would have been abolished and replaced with a flat rate charge per motor vehicle to be paid by the vehicle user at the same time as he took out or renewed his motor insurance. The charges would have been revised annually so as to recover the NHS costs of providing treatment

for road-accident victims in each financial year. The scheme would have raised some £40m at November 1975 prices. Since the charge would have been independent both of the amount of NHS services consumed and of the risk rating of the motorist there would have been no incentive to reduce the use of hospital services or to drive more carefully. Hence the NHS and other costs of road accidents would probably have been unaffected by the charges.

The government decided not to proceed with its proposals because it felt that there would be practical difficulties in collecting the charge through motor insurers and high administrative expenses. There was also considerable opposition from insurers and from motorists organisations.

New Charges

GP Consultation Fees

There are about 165m surgery consultations annually in Great Britain. The effects of charging for a visit to a GP depend on:

(a) exemptions. If the social value and equity implications of visits to GPs are thought to be similar to GP prescriptions the same exemption criteria might be used. If so, and if consultations and prescriptions are similarly distributed across the exempt and non-exempt categories, about 40 per cent of visits would be charged for. Special provision might have to be made for visits for sick notes. There was 8.945m new spells of certified incapacity for sickness and invalidity benefit in 1975 and certification visits might constitute an additional exemption category. The actual number of additional exemptions on this ground would, however, be less than 8.945m since some individuals requiring incapacity certificates would already be exempt.

(b) demand elasticity. There are no British studies of the effects of money prices on the demand for GP consultations. Foreign exper-

ience indicates that consultations are reduced by higher prices but suggests a considerable range of possible elasticities.

The effects of GP visit fees on costs depends on a variety of factors:

(a) there will be additional administrative costs arising from the collection of the fees, which will be imposed in the first instance on the GPs. Since GPs do not currently collect money from patients on any significant scale the new fee will increase their book-keeping costs. If the exemption grounds are the same as for prescriptions there will be only a small extra administrative cost for the exemption system. In the estimates in Table 10 no attempt has been made to allow for any additional collection costs.

(b) the use to which the time of GPs released by the reduction in the number of consultations is put must be specified. General medical service costs will be reduced by the reduced demand for consultations only if the average GP list size is increased and the capitation fee reduced. General medical service costs will otherwise be unchanged and GPs may respond by:

1 spending longer with those patients who do come, thus increasing the quality of care provided. This may well reduce the cost of pharmaceutical services since prescriptions are a substitute for GP time.

2 taking more leisure.

(c) GPs act as 'gatekeepers' to NHS services and fewer GP visits may mean fewer prescriptions, outpatient visits and inpatient days.

The estimated cost reduction in Table 10 is based on the very crude assumption that general medical service costs fall proportionately with GP consultations and that costs in the rest of the NHS are unaltered.

Table 10 gives some estimate of the effects of introducing GP visit fees

in 1976 conditions. If there were no exemptions and all patients had the same demand elasticities the effect of the new charge can be found by multiplying all figures in Table 10 by 2.5.

TABLE 10 GP consultation fees (1976, GB, £m)

Fee	£1			£2			£5		
% reduction in non exempt visits	5	10	30	5	10	30	5	10	30
Increase in revenue	62.70	59.40	46.20	125.40	118.80	92.40	313.50	297.00	231.00
Reduction in cost	6.66	13.32	39.96	6.66	13.32	39.96	6.66	13.32	39.96
Reduction in tax financed public expenditure	69.00	73.00	86.00	132.00	132.00	132.00	320.00	310.00	271.00

Sources: Health and Personal Social Services Statistics, 1977; DHSS estimates

Notes:

1 It is assumed that general medical service costs fall in proportion to the number of visits.

2 The reduction in tax financed public expenditure is independent of the reduction in the number of non-exempt visits where a fee of £2 is charged because the fee is almost equal to the average general medical service cost per visit. Hence reductions in cost offset reductions in revenue as the number of visits falls.

Accident and Emergency Department Charges

There were 15.054m attendances at hospital accident and emergency departments in Great Britain in 1976. Table 11 gives some estimates of the likely effects of various charges with different possible demand responses.

It has been assumed that the grounds for exemption from such charges would be the same as for prescription charges and, more dubiously, that the age and sex pattern of demand for visits to accident and emergency departments is similar to that of the demands for prescriptions. Hence it has been assumed that some 40 per cent of visits would bear a charge. If 20 per cent or 60 per cent of visits bear a charge the estimates in Table 11 should be halved or doubled respectively.

No account has been taken of the additional collection costs arising from the new charges.

TABLE 11 Accident and emergency department charges (1976, GB, £m)

Charge	£1			£2			£5		
% reduction in non exempt demand	5	10	30	5	10	30	5	10	30
Increase in revenue	5.7	5.4	4.2	11.4	10.8	8.4	28.6	27.1	21.1
Reduction in cost	2.9	5.7	17.2	2.9	5.7	17.2	2.9	5.7	17.2
Reduction in NHS tax financed expenditure	8.6	11.1	21.4	14.3	16.5	25.6	31.5	32.8	38.3

Source: Health and Personal Social Services Statistics, 1977

Notes:

1 It is assumed that 40% of the accident and emergency department visits in 1976 would be subject to a charge and the reduction in demand refers to the non-exempt visits only.

2 An accident and emergency department visit has been costed at £9.52 (1975/6) by the DHSS. It has been assumed that costs are similar in the rest of GB.

There is some UK evidence to show that GPs and accident and emergency departments are close substitutes, with relative use being dependent on the relative costs (time and inconvenience) of access. Hence if GP visits are free and accident and emergency visits are charged for there is likely to be a larger drop in accident and emergency visits and a larger increase in GP visits than if GP visits are also priced and vice versa.

Hotel Charges

The total days spent by in-patients in hospitals in Great Britain in 1976 was 138.7 million. Various assumptions can be made about exemptions and the number of in-patient days of the various categories of patients has been estimated for the DHSS for England. Grossing this up on the assumption that similar distributions of bed usage prevails in the rest of Great Britain the numbers of patient days in some possible exempt groups are:

Category	**Patient days(m)**
All patients in psychiatric hospitals	56.16
Children under 14	7.02
Pregnant and nursing mothers	5.85
Patients in hospital more than 1 year and less than 1 week	11.70
Patients in families in receipt of SB, FIS	1.17
Total exempt days	81.90

Hence with this set of exemptions there would be some 56.8 non-exempt patient days.

Some in-patients already pay an implicit charge in that their social security benefits are reduced after their eighth week in hospital. These implicit charges do not increase NHS revenue but they do reduce public

expenditure, since social security expenditure is reduced. If explicit hotel charges are payable by those currently paying implicit charges, NHS revenue will be increased by the gross amount of the hotel charge. The amount of public expenditure (including both NHS and social security expenditure) which must be met from taxation is however reduced only if the explicit charge paid by the patient is not offset by reduction in the implicit charge ie by an increase in the patient's social security benefits. If the implicit charge is scrapped (social security benefits are not reduced) then the reductions currently made in the social security benefits paid to those in-patients who would not be in one of the exempt categories must be subtracted from the yield of the hotel charge. Grossing up DHSS estimates for England to get a Great Britain estimate gives the figure of £16.38m in social security benefits currently recovered from patients who would not be exempt from the hotel charge. This must be subtracted from the increased NHS revenue to give the net increase in public sector revenue.

The effect of hotel charges, given the above assumption about exemptions, depend on:

(a) the elasticity of demand for in-patient days. Once again evidence from the United States suggests a wide range of possible elasticities and Table 12 indicates the effect of various possible assumptions about the change in demand generated by the various charges;

(b) the extent to which patients take out insurance against hotel charges. Such insurance would reduce the response of in-patient days to the hotel charge since, depending on the particular form of insurance, the insured patient bears no additional cost from a longer stay or pays only a fraction of the hotel charge. The greater the number of people who take out insurance and the greater proportion of the charge borne by the insurer, the less will be the effect of the charge on demand.

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TABLE 12 Effects of hotel charges (£m, 1976 data)

Weekly charge	£10			£20			£50		
% reduction in non-exempt patient days	5	10	30	5	10	30	5	10	30
Increase in revenue	77.1	73.0	56.8	144.2	146.0	113.6	385.0	365.0	284.0
Reduction in cost[1]	42.6	85.2	255.6	42.6	85.2	255.6	42.6	85.2	255.6
Reduction in NHS expenditure financed by taxation	119.7	158.2	312.4	186.8	231.2	369.2	427.6	450.2	539.6
Reduction in public expenditure financed by taxation[2]	103.0	142.0	296.0	170.0	215.0	353.0	411.0	436.0	523.0

Source: HPSSS 1977; HURST, J. ***Saving hospital expenditure by reducing in patient stay*** Government Economic Service Occasional Paper No. 14, 1977.

Notes:

1 The cost per in-patient day in acute non-teaching hospitals in 1975/6 was £30. This will exceed the cost of an extra day at the end of a patient's stay in hospital since the daily cost declines with length of stay. Hurst (1977) estimated the cost of a marginal in-patient day to be half the average cost. Hence a figure £15 per in-patient day has been used to estimate cost savings.

2 Reduction in NHS tax financed expenditure less the current social security benefit savings for non-exempt patients of £16.38.

No attempt has been made in Table 12 to estimate the effects of the introduction of hotel charges on administrative costs in hospitals. This is likely to be significant since hospitals do not currently charge most patients for their services. The suggested hotel charge is however considerably simpler than the fee per item of service system used in many American hospitals. Less sophisticated accounting and administrative techniques will therefore be required and the proportion of health expenditure devoted to administration and clerical work in the United States cannot be taken as a guide to the likely administrative costs of

hotel charges.

Conclusion

Table 13 summarises the possible effects of charges of 50p for a prescription, £2 for a GP consultation, £5 for a visit to accident and emergency department and £20 for an in-patient week. The total additional revenue so raised (£336m) is about three times as large as NHS charge revenue in 1975/76. The reduction in public expenditure required to be financed by tax (£375m) is 7.1 per cent of tax-borne health expenditure in 1975/76.

TABLE 13 Effect of hypothetical increased and new charges (1975/6 GB)

	Prescription[4] charge 50p	GP visit £2	A and E Dept. £5	Hotel Charge £20 p.w.	Total
Increase in revenue	39.00	125.40	27.95	144.2	336
Reduction in cost	5.25	6.66		42.6	55
Reduction in NHS expenditure[2]	44.25	132.1	27.95	186.8	391

Source: Health and Personal Social Services Statistics, London, HMSO, 1977

Notes:

1 The prescription charge elasticity has been assumed to be 0.02 and the reductions in the other services to be 5%.

2 The reduction in tax financed public expenditure is £391m less the £16.4m increase in social security benefits.

3 The figures have been adjusted where possible to a 1975/6 financial year basis. Previous tables are on a calendar year basis.

4 The prescription charge revenue includes an estimated £1.8m additional revenue from charges paid to hospital out-patient departments. This is **not** included in Table 8. It has been assumed that out-patient dispensing is unaffected by the increased charge.

No account has been taken in Table 13 of the extra administrative costs involved in charging.

Table 14 shows the proportion of the costs of each service which would have been recovered in charges in Great Britain in 1975/76 if the charges in the set of charges listed in Table 13 had been in force in that financial year. The new and increased charges cause the proportion of health expenditure financed by charges to rise to 8.2 per cent from the actual figure of 2 per cent in 1975/76.

TABLE 14 Effect of hypothetical changes in charges on finance of NHS (1975/6, GB)

	Revenue	
	£m	% of cost of service
Hospital	199	4.8
Pharmaceutical	64	13.9
Dental	37	16.0
Ophthalmic	20	27.8
General medical	125	38.4
Total	445	8.2

Sources: Table 13, HPSSS 1977

Note: The increase in outpatient prescription charge revenue has been included in hospital revenue, along with the items in Table 6, accident and emergency department fees and hotel charges.

Note: Decimal coinage was introduced in 1971 when one shilling 1/0d (twelve old pence) became five new pence (5p).

Reference

1 LAVERS R J *A Demand Model for Prescriptions,* Institute for Social and Economic Research, University of York, 1977.

History

1 1 June 1952–

Prescription charges were introduced at 1s/–d per form, except elastic hosiery: elastic anklet, kneecap, legging, thigh piece – 5s/–d each. Elastic knee legging, stocking, thigh kneecap, knee stockings, thick leggings, thick stockings – 10s/–d each. No exemptions – refunds made to low-income claimants.

2 1 December 1956 –

Prescription charge changed to 1s/–d per item

3 1 March 1961–

Prescription charges changed to 2s/–d per item

4 1 February 1965–

Prescription charges were abolished

5 10 June 1968–

Prescription charges reintroduced at 2s/6d for each drug or appliance supplied. Exemption categories:

1 Children under 15 – claim by signing declaration on reverse of form.

2 People aged 65 and over – claim by signing declaration on reverse of form.

3 Expectant mothers and mothers with a child under 1 year of age – exemption certificate issued by Executive Council.

4 People suffering from certain specified conditions.

5 War/Service pensioners for treatment of accepted war/service disablements – exemption certificate issued by

Ministry of Social Security (MOSS)

6 People (and their dependents) receiving Supplementary Benefit — exemption certificate issued by MOSS.

7 People (and their dependents) who cannot afford to pay the charge — exemption certificate issued or refund given by MOSS following a means test.

6 1 November 1968--

Prepayment Certificates introduced — the prescription charge 'Season Ticket' cost £1/10s/0d for 6 months or £2/15s/0d for 12 months.

7 1 April 1971--

1 Prescription charges increased to 20p per item.

2 Charges for elastic hosiery increased:
Elastic anklet, legging, kneecap, thigh pieces — 25p.
Elastic stocking (thigh, above-knee or below knee) — 50p.

3 Prepayment certificate price increased —
£2 for six months, £3.50 for 12 months.

4 Charges introduced for the following items supplied by hospitals:

Bespoke wig	£7.50
Stock wig	£2.50
Fabric support	£2.00

8 3 August 1971 --

Family Income Supplement introduced.
All recipients and their dependents automatically exempt.

9 8 April 1974 —

Exemption on age grounds extended to women aged 60 and over and children under 16.

10 1 July 1975 –

Contraceptive drugs and appliances made available free to women under the General Medical and Pharmaceutical Services.

11 July 1979 –

Prescription charge raised to 45p.

12 April 1980 –

Present charges introduced.

Historical Background

Charges

Charges have been introduced or varied as follows:

Acts

1 1951 Act — charges for dentures introduced — ranging from £2 for a 1, 2 or 3 tooth denture to £4/5s/0d for full dentures.

2 1952 Act — charges for treatment introduced — cost of the treatment or £1 which ever was the less (cost defined as the current authorised fee for the service provided) — maximum for dentures and treatment — £4/5s/0d.

3 1961 Act — gave power to vary charges by regulation and increased denture charges to maximum £5.

Regulations

4 May 1968 — charge for treatment increased to maximum of £1/10s/0d.

5 Aug 1969 — increased charges for dentures to maximum of £6/5s/0d and overall maximum to £6/5s/0d.

6 April 1971 — changed system of charging — charges for treatment half the cost up to a maximum of £10 for a course of treatment, whether or not including dentures.

	Oct. 1974 to Jan. 1976	— charges frozen despite increase in costs (Govt. decision not requiring regulations as status quo was preserved).
7	Jan. 1976	— pre 1971 system reintroduced — charges for dentures up to maximum of £12 and cost of each item of treatment up to maximum of £3.50. Overall maximum of £12 for course of treatment.
8	April 1977	— charges to cover full cost of each item of treatment up to a maximum of £5 per item. £10 per tooth restored with crowns, inlays, pinlays and gold fillings — maximum charge per course of treatment £30.
9	July 1979	— full cost of each item up to a maximum of £7 per item. £12 per tooth restored with crowns, inlays, pinlays and gold fillings. — maximum charge per course of treatment £36.
10	April 1980	— present charges introduced.

NHS GENERAL OPHTHALMIC SERVICES PATIENT'S CHARGES

APPENDIX C

1 From 1948 to 1951 the NHS provided glasses free of charges except for appliances of a 'more expensive type' than the standard range and supplied at the request of the patient. Charges were also made for the repair or replacement of any appliance if it was determined (by the Ophthalmic Services Committee of the Executive Council) that the repair or replacement was necessitated by lack of care on the part of the patient. Section 44 of the NHS Act 1946 gave power to make provision for these two types of charges in regulations.

2 In the 1951 NHS Act the Government introduced a Statutory Charge of 10s/0d each for lenses and made provision for the patient to pay the current specified cost of the frames as shown in the Statement of Fees and Charges. The 'current specified cost' was, roughly speaking, equivalent to the cost of the frames to the optician. Children's glasses (ie appliances from the NHS children's standard range) were exempted from these charges.

Type of lens	Per lens		
	£	s	d
Single Vision		12	6
Multifocal or bifocal	1	0	0

Ministers were given the power to vary the statutory charges (or the appliances to which these applied) by making regulations.

4 From 1965–1968 charges for frames were 'frozen' so that they did not reflect the cost of supply to opticians, but in 1969 the charges were increased. Regulations were also made to increase lens charges, as follows:

Type of lens	Per lens		
	£	s	d
Single vision		16	0
Multifocal and bifocal	1	5	0

5 In 1971 the Conservative government announced that 'charges for spectacles will be increased so as broadly to include the cost of dispensing'. This policy was implemented by the NHS (Charges) Regulations 1971, which increased the charges for standard lenses to between £1.20 and £3.20 for a single-vision lens and between £2.45 and £3.50 for a bifocal or multifocal lens depending upon its power and other chracteristics. The underlying principle was that, subject to a maximum charge of £3.50 per lens for the most expensive lenses, the patient should pay for his lenses broadly their price as supplied to the optician plus the optician's dispensing fee. In fact, however, lens charges were not further increased until 1st January 1976.

6 In 1975 flat-rate charges were reinstated by the Labour government as follows:

	Type of lens	Per lens	
		£	p
1	Single vision	2	25
2	Fused glass bifocal	4	25
3	Lens of any other description	5	00

7 In December 1978 charges increased to:

	Type of lens	Per lens	
		£	p
1	Single vision	2	90
2	Fused glass bifocal	5	50
3	Lens of any other description	6	15

8 Charges for adult frames increased in February 1980.

EFFICIENT MANAGEMENT OF RESOURCES IN THE NATIONAL HEALTH SERVICE

Alan Williams

BASIC PRINCIPLES

Efficient management of resources in the NHS requires two related conditions to be fulfilled:

(a) No activity should be undertaken, the total costs of which outweigh its total benefits;

(b) Those activities which satisfy (a), should be pursued up to the point where **additional** costs generate **additional** benefits of equivalent value. (The corollary of this is that if **additional** benefits outweigh **additional** costs, the activity should be expanded, and if **additional** costs outweigh **additional** benefits it should be contracted).

Condition (a) is the 'total' principle, and condition (b) the 'marginal' principle.

If we are to judge whether the decision making structure of the NHS is conducive to efficient management of resources, we must ask whether it does, or is likely to, lead to the fulfilment of above conditions.

Before embarking upon that task, two caveats are in order. Firstly, life is fraught with uncertainty, and no system can be expected to work infallibly. Hence, it is unreasonable to expect the above conditions to be continually satisfied, or even to be widely satisfied at any particular point in time. A more reasonable frame of reference within which to apply these principles is that of adaptive behaviour in the face of continuous (and often imperfectly foreseen) change. We then test the system's properties by asking 'does it have an inbuilt tendency to move speedily and effectively towards the fulfilment of the two efficiency conditions?'.

The second caveat concerns the complexity of the NHS, which obviously rules out any possibility of tight and detailed control of all resource

allocations by a single central agency. This implies that it is necessary to see the NHS as a decentralised and complex network of partly autonomous sub-systems, to each of which the efficiency test must be applied.

Thus the essence of the problem of efficient management of resources in the NHS is the fundamental problem of all complex human organisations, namely, how to devise a decentralised structure of decision making which has inbuilt tendency to move speedily and effectively towards the fulfilment of the efficiency conditions, in the face of continuous and imperfectly foreseen change.

A STRATEGIC APPRECIATION

In an ideally operating decentralised system of resource allocation, all relevant costs and benefits are taken properly into account by each decision maker. This means that any change in costs or benefits, now or in the future, consequent upon the decisions should be identified and valued in accordance with the objectives of the organisation (which may need to be made much more explicit for this purpose). There are plenty of reasons why this careful balancing of costs and benefits may not happen.

Three key ones are that decision makers

(a) may not be appropriately motivated personally;
(b) may face very migh costs in obtaining and processing information on costs and benefits;
(c) may work within a job specification which generates systematic bias in the weighing of costs and benefits.

Each of these will now be considered briefly with special reference to the NHS.

Inappropriate motivation at a personal level is essentially a matter of individuals using the system to pursue objectives which are not

sanctioned by the system itself. Crude examples are the pursuit of self-aggrandisement, or the desire for a quiet life, or the use of one's position as a source of patronage or special treatment for favoured individuals or groups. I doubt whether the NHS is any more vulnerable to this weakness than is any other organisation. But it does face a more subtle and much more important problem of this general ilk, namely that many key decision makers do not accept that it is proper for them to think in the kind of cost-benefit terms which the system requires on efficiency grounds. I refer, of course to clinicians and other professional and quasi-professional staff whose training has imbued them with such a strong ethic of service (at any cost) to the patient, that they feel it morally wrong and psychologically intolerable to be asked (and expected) to count costs and work within cost constraints. I believe this to be a mistaken ideology [1], stemming from inappropriate training, but until it is overcome it will continue to constitute a major obstacle to efficient resource allocations.

But even the growing numbers of professional staff who recognise the need, and are willing to accept the responsibility, for the kind of efficiency calculus I am referring to, soon encounter the second group of problems listed above. Information on behefits is typically confined to measures of 'throughput' (eg number of cases, consultations, treatments, etc) whereas we ideally need measures of improved health (additional years of life expectation, reduced physical disability, improved social functioning, less anxiety or pain, etc). It is possibly more a research task than a routine managerial monitoring task, though a surprisingly large amount of useful information could be assembled routinely at quite low costs, if the system demanded it and were seen to be using it sensibly. On the cost side the problems are different but again the information that is collected and processed routinely is not usually suitable as it stands for the efficiency calculus which is our central interest [2]. It concentrates almost exclusively on those financial costs borne on service budgets (ignoring, for instance, costs falling on patients or other agencies), while the conventions for allocating joint costs (because chosen so as to be the best approximation for general

application across the board) tend not to be directly focussed on the specific circumstances of any particular decision maker. There is a sharp dichotomy between capital costs and current costs, with very little routine information on the former. Moreover, since the room for manoeuvre in resource deployment differs from one decision maker to another, each requires a different 'package' of cost data, distinguishing items totally under his control (and presumably on his budget), items only partially under his control yet borne on his budget, and items partially under his control but on someone else's budget. Items not at all under his control (ie not influenced in any way by his actions), should not be on his budget, though they sometimes are so 'allocated' because of a strong central urge to allocate all costs to someone or other. A key difficulty here is that it is important to recognise explicitly the time horizon over which the decision maker is working, because costs which are 'fixed' in the short run become 'variable' in the longer run, and it is important to ensure that the long run cost implications are borne in mind from the outset. This is a strong argument for sharply differentiating information systems for day-to-day management and information systems for medium and long term planning, despite the obvious dangers of this separation. More specifically it sounds a note of caution about taking data collected for one purpose and using them uncritically for a different purpose.

My third category of 'common problems with decentralisation' is concerned with job specification, interpreted in a broad sense to include all of the decision makers' ostensible 'terms of reference', but concentrating in this context on those which bear most directly on resource allocation problems. One can distinguish two extreme types of decentralisation, each of which gives its own characteristic bias to the resource-allocation process. Under the first of these, the decision maker is given a 'production-target' and left with discretion as to how to meet this at least cost. Under the second, he is given a fixed allocation of resources, and left with discretion as to how to use them so as best to achieve the organisation's output objectives (or such part of them as are that decision maker's responsibility). A third, intermediate, model of

decentralisation simply gives decision makers a set of valuations to place upon 'output', a set of prices to be paid for inputs, and he is then free to vary both so as to maximise the excess of benefits over costs (this is the simulated market model). Each of these is worth examining in turn in rather more detail.

The **'production-target'** model is seen most clearly in the NHS in the classic approach to the specification of a bill of requirements for a new building or piece of equipment, where a prior decision is made as to the required performance level or capacity of the project, and the designers are then left to find the most economical way of meeting it. The weakness of this kind of decentralisation is, obviously, that when deciding on the specification (eg fire regulations) the specifiers have no idea what the costs will be, and because of the all-or-nothing nature of the 'package' they typically have no idea how variation of the specification at the margin would affect costs, so that neither the 'total' nor the 'marginal' principles are enshrined in the process. Its strength, however, is that if the task is necessary precisely as defined and if the effects on both benefits and costs of variations in the target level of performance are being carefully monitored elsewhere and if all the relevant costs are being taken into account, it gives the decentralised cost minimiser very clear terms of reference, generates a very simple test of his managerial skills, and will undoubtedly contribute positively to the objectives of the organisation. The three ifs are, however, crucial.

The **'prior allocation of resources'** model is seen most clearly in the NHS at present in the thinking underlying RAWP, SHARE etc. It implies that greater efficiency shows up in better performance rather than lower costs. It has the same weaknesses as the previous model, (though they show up in a different way) in that benefits are not known when the resources are allocated, and in the (typical) absence of systematic variation at the margin, the relationship between additional costs and additional benefits will not be known. Its strength, however, is that if resources are strictly and undeniably limited to the precise amounts specified, and the effects on both benefits and costs of variations in resource levels are being

carefully monitored elsewhere and if all the relevant benefits are being taken into account, it gives the decentralised benefit-maximiser very clear terms of reference, and generates a simple test of his managerial skills. Again, the crucial nature of the ifs should be noted. But it also presupposes that benefits can be clearly defined, identified and valued according to the system's objectives. Without these features, it implies political rather than merely managerial decentralisation, ie the decentralised resource allocators are left free to use the fixed allocation for whatever their objectives happen to be (or, less liberally, for whatever their interpretation of the system's objectives happen to be). This implicit political discretion seems to me to be the essence of the actual current pattern of decentralisation in the NHS, both between the 'high-level' (DHSS/RHA/AHA) sub-systems and between the 'low-level' (DMT/SECTOR/Clinicians) sub-systems. In other words, clinicians are as much 'policy makers' as the Minister is, though at a different level and with different scope. Each is tightly circumscribed by resource constraints which they see as being imposed (rather arbitrarily) by others.

The **'simulated market'** system of decentralisation attempts to deal with the complementary asymmetries and resulting inefficiencies of the two preceding systems by attempting to put each resource-allocator in a position where he has to 'internalise' all aspects of the efficiency conditions in order to perform properly. Whereas the cost-minimising targeteer could ignore benefit valuation, and the benefit maximising user of a fixed package of resources could ignore input valuation, the decision maker in the simulated market adjusts both output and inputs as conditions change. I believe that the likelihood that the NHS will successfully meet the challenge set out above as how to devise a decentralised structure of decision making which has inbuilt tendency to move speedily and effectively towards the fulfilment of efficiency conditions, in the face of continuous and imperfectly foreseen change is greater under this symmetrical system of decentralisation than under either of the asymmetric systems outlined above *, and it is therefore towards this system that we should be working.

* See Page 77

A TACTICAL APPRECIATION

In the short and medium term, we must recognise the dominant position of the 'prior allocation of resources' model of decentralisation, and of the managerial and political discretion over benefits that goes with it. At present the main constraint upon this local discretion at a high level** is the promulgation of national policy via 'priorities' documents of one kind or another. Regional Plans are then tested to see how far they are consistent with this national strategy. This 'testing' is partly technical and administrative (ie concerned essentially with the competence of local planners) and partly political (ie concerned essentially with their objectives). At a much lower level in the system one sees similar phenomena, with DMTs trying to persuade clinicians for example to reduce length of stay and increase throughput, or to cut down on the more expensive drugs, ie to change their policies, with the clinicians resenting what they suspect to be a challenge to their competence or their clinical objectives (or possibly both). If this is acknowledged to be the starting point for any evolutionary programme of reform, with the symmetric market-simulation model of decentralised decision making as the desired end point, then the various specific proposals which have been put before the Commission could be analysed according to which of the weaknesses of the current situation (compared with the desired situation) they are supposed to make good.

The Programme Budget at DHSS level works with 'client groups' as the key concept, at least in principle. (In practice there are severe weaknesses in the implementation of this idea, with a rather mixed classification currently in use, due mainly to initial data difficulties on which further effort needs to be expended in order to strengthen the capability of the system). Since priorities are fundamentally between people, and only instrumentally between, say, institutional versus domiciliary support, or one medical specialty versus another, this seems the correct strategy. But there is also a strong notion of geographical equity embedded in the objectives of the NHS, and with the use of RAWP/SHARE mechanisms to give powerful tangible effect to this, it becomes

** See page 77

essential to link these two mechanisms more closely together. As a first step the terms and coefficients in the RAWP formula could be brought closer to the concepts underlying the Programme Budget. As a second step each Region could be required to set up a programme budget of its own, consistent with, but not the same as, that of the DHSS, just as Regions are having to grapple with sub-regional RAWP. This would force and enable Regions and, eventually, Areas and Districts too, to think more explicitly about priorities in terms of **client groups** rather than in instrumental terms. The third step in this process would be to introduce a new kind of budget holder into the system, viz the holder of the budget for, for example, the elderly, who would 'buy in' services from geriatrics, orthopaedics, general surgery and medicine, GPs etc, to the extent that they provide for his client group. A shift of priorities then shows up as a shift of resources into his budget at the expense, say, of the holder of the budget for children. The holder of the budget for the 'Programme' for the elderly would not actually run any services, but would have the task of continuously evaluating the relative cost effectiveness at the margin of the various contributory 'services' in his area, and varying the pattern of provision accordingly. The development of health care planning teams is an attempt to shift thinking in this direction, but to make it bite it probably needs to be carried over more formally into the budgetary allocation system too. I believe this 'client group approach' to be the most promising way forward in ensuring that resources are deployed more effectively towards the high level objectives of the systems, and the Programme Budget is its natural manifestation.

Service providers, as **budget holders** generate problems for the client group approach because at lower levels in the system the requirement for clarity and simplicity in the organisation of particular services for example a general practice, an orthopaedic department, an ambulance service, dictates an arm's length relationship with client group agencies. One has to ensure that those 'selling' services to the client group 'agency' have the capacity and incentive to review the efficiency of their own sub-system, and to do something about it. Ideally, such a service provider should also be considering whether it would be more 'profitable'

to expand services for the elderly (since that client group has plenty of money to spare) at the expense of (say) services for children: more hip replacements and less tonsillectomies. Here there are a succession of steps that could be taken to improve on the present situation. The most important single step would be to devote a great deal more effort to devising measures of performance which relate sensibly to the systems objectives and the relative priorities attaching thereto. For instance, one readily measureable phenomenon at present is average length of stay, and there is pressure to reduce it, but reducing length of stay may or may not be sensible, depending on

(a) the consequences: medical, social, financial, for the patient concerned,
(b) the costs falling on other agencies, for example local authorities, and
(c) the use made of the spare capacity so created in the hospital itself.

We need to find some measure of overall health benefit from increasing throughput by reducing length of stay, and seeking an optimum balance between them.

There is another common division within budgets which segregates certain inputs, for example nurses, buildings, drugs, and gives them separate budgets held by separate budget holders. Viewed from the general standpoint expounded earlier, this is bound to be deleterious to efficiency, because it deprives the decision maker closest to the patient of the opportunity to appraise and control the relative contributions of the various resources needed at the point of service. If for reasons not immediately connected with the efficient delivery of care to a particular group of patients it is necessary to have separate control over nursing establishments, (perhaps for career or training purposes); or over building adaptation or renewal or expansion, (perhaps because of complex scheduling or commissioning problems); or over drugs, (perhaps because of the desire to take advantage of centralised procurement policies); then it is important to allow the maximum degree of discretion to the 'unit' budget holder that is consistent with the objectives of the 'functional' budget holder. Usually this means having the 'unit' budget face increasing marginal costs as it moves further away from the 'standard'

allocations, so as to reflect the increasing costs imposed on the system at large by accommodating local variations. (It may of course turn out that in some cases these 'extra ' costs do not exist, and that the 'standard allocation' is purely the product of unthinking application of hallowed but untested conventions). Thus I recommend a strong bias against making those controlling particular inputs budget holders, unless they can be put in the position of 'selling' these inputs to more broadly based budget holders, with the latter given ample virement (or, more generally, scope for redeployment on inputs) ***

At this stage we must return to the problems of motivation, incentives and skills, for it is one thing to say what the system should be in principle, and another to ensure that it will work out in practice in the manner in which its designers hoped. The whole thrust of the preceding argument has been to broaden responsibility at all levels, by asking input managers to think more about output and its value, and output generators to think more about inputs and their costs and to try to fuse managerial and political responsibilities so that budget-holders at all levels have as much control as possible over **both** simultaneously. The immediate response may well have to be decision making by groups, with the inevitable costs of discussion, consultation and risks of lack of coordination that that implies. At the level of clinical team, for instance, it may at a minimum call for the assignment to the service of the team an administrator cum cost accountant cum statistician to ensure that they are aware of the logistic implications of their actions. In many cases this may be sufficient, but it will eventually raise two other issues:

(a) how is responsibility for their performance to be monitored and to whom are they accountable for it? and
(b) what rewards or penalties are likely to be needed if the system is to be self-sustaining?

At present the managerial responsibility of clinical teams is in principle to the DMT. However, clinicians seem to be more concerned in practice with their responsibilities to (and sense of solidarity with) their professional colleagues, and would doubtless claim that their main

*** See page 77

responsibility is to their patients. If my strategic plan for client group budget holders became effective, this would doubtless confuse the lines of responsibility still further. The way forward through this jungle would seem to be to have a more detailed discussion of performance with clinical teams, along the lines envisaged by Iden Wickings' 'PACTS' (Planning Agreements with Clinical Teams) which are virtually negotiated performance targets allied with resource deployment plans. This is essentially a political bargain, but as information on the relative cost effectiveness of different ways of delivering care accumulated, it would presumably enable harder and harder bargains to be struck, and the system slowly to become more efficient. It would also eventually bring out into the open any implicit differences in output valuation between the various parties for example, between those who want to increase quantity at the expense of quality, or vice versa, or those who attach greater weight to one client group/condition than others do.

A critical element in all such arrangements is what is the reward for success and the penalty for failure. At an immediately practical level this may translate into "if I fail to meet the agreed 'production target' with the assigned resources, will I get more resources or will 'production' suffer?" If more resources are thrown in, the citizen as taxpayer suffers. If 'production' suffers, the citizen as patient suffers. Either way what happens to the unsuccessful 'manager'? In the opposite case, where things go better than planned, the options are either to hang on to the resources and improve performance, or to maintain performance and hand back unused resources. Two general observations are pertinent: firstly to the extent that 'success' or 'failure' is due to factors beyond the control of the 'manager' he ought not to be rewarded or penalised, and secondly if he has a strongly developed sense of professional pride, or if highly regarded promotion prospects are at stake no further reward or penalty may be needed. But even in these circumstances a shrewd manager will be anxious to have 'PACTs' which are as easy to fulfil as possible, and unless some central comparative ex post review of such arrangements is undertaken to determine their relative stringency, and to keep them broadly in line with each other, there is likely to develop a sense of unfairness about them if X is believed to be 'getting away with murder'. It is more than likely that professional pride and promotion

prospects will not be enough, however, and so we must return to the rewards/penalties issue more directly. In the relatively simple case in which things go better than envisaged originally, it seems important that those responsible be allowed to keep some fraction of the value of the 'saved' resources, for redeployment at their discretion, ie according to their own objectives within carefully predetermined bounds. What this fraction and predetermined bounds should be, in order to get the greatest improvements in efficiency for least cost is a suitable topic for systematic experiment and evaluation, for example as between personal productivity bonuses and discretionary spending funds. The opposite case, where things go badly, is prima facie, much more difficult because one has to decide how far the patients and how far the taxpayers are going to bear the costs of inefficiency. At present, the patients bear them all, so if we shift **any** of the costs on to providers it will be an improvement! At present they are totally protected from such direct penalties, however, and I suspect that, tactically, it may be impossible to elecit cooperation in accepting new responsibilties if the penalties for failure look too stark. Perhaps the best way would be

(a) to impose time-and-trouble costs of more stringent review in such cases,

(b) to carry forward all or part of such 'deficits', and

(c) to require subsequent 'surpluses' to be applied, in whole or part, to the elimination of accumulated deficits before permitting them to be used for 'discretionary' purposes.

There would still remain the problem of inequity if it were thought that some clinical teams were being set easier targets than others, or where the 'improvements' rewarded for some still left them less efficient than others who achieved their present state of high efficiency prior to the introduction of the incentive structure. One could simply answer this with the observation that everyone gains to some extent from greater efficiency if some of the savings go into the common pool. If this is not felt to be sufficiently reassuring, however, the only alternative would seem to be to go in for 'interfirm comparisons' on a large scale, and to offer rewards (annual or quinquennial prizes?) for those clinical teams which show a consistently good absolute record of managerial

efficiency, (as opposed to technical virtuosity, which may be far from cost-effective!).

Even if we managed to get the 'system' right we still have the problem of inculcating the requisite skills. There is clearly a dire need for better directed information gathering and processing, with a greater stress on **evaluation** rather than mere 'programming'. Too little effort is still devoted to health services evaluation as opposed to clinical and other technical studies lacking a proper cost-effectiveness thrust. A basic appreciation of economic modes of thinking about efficiency needs to be part of the training of all potential decision makers, since it is not feasible to have an economist close to every decision. For those likely to become budget holders some brief initiation into the theory and practice of budgeting and financial control seems equally essential, though in my view this should follow a basic appreciation of economics, and neither precede it nor become a substitute for it.

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* It might be argued that the asymmetric systems will get there in the end by a process of successive approximately provided some powerful central processing of information and continuous adjustment of tasks is undertaken. It is this very proviso which leads me to prefer the symmetrical system.

** Apart from the occasional breaches in the model via 'earmarked' allocations (eg for kidney machines) or 'indicated' allocations (eg to reduce waiting lists).

*** All this 'buying' and 'selling' of services requires a sensible and sensitive structure of "transfer prices" to be calculated, and this is another key area in which research and experimentation will be required.

References

1 For the fuller exposition of this view see : WILLIAMS A The Costs and Benefits of Survery *Surgical Review I* edited by J S P Lumley and J L Craven, Pitmans, London.

2. WILLIAMS, A The Budget as a (Mis)Information System in Culyer A J and Wright K G (editors) *Economic Aspects of Health Services* Martin Robertson, London 1978.

CLINICIAN BUDGETING

H S E Gravelle

This paper discusses clinician budgeting as one means of improving the efficiency of the health service. The paper by Professor Williams gave a more general guide to the question of the efficiency of resource use. The report by Professor Perrin and his team prepared for the Commission on financial management in the NHS is also relevant.[4]

CLINICIANS AND RESOURCE ALLOCATION

Financial Irresponsibility

Doctors have perhaps the major influence over the services provided by the NHS and their costs. GPs decide what drugs or appliances should be given to patients and whether or not to refer patients to hospital. Consultants have the power to admit patients or treat them as out-patients, to order diagnostic tests, to prescribe surgical, pharmaceutical and nursing treatment and to discharge the patient. Doctors have **clinical** responsibility for the effects of their decisions on the health of the patient but do not have **financial** responsibility for the implications of their actions on the allocation of resources in the health service.

Lack of Incentives

Clinicians have little incentive to act efficiently, namely to weigh the marginal benefits of the care they provide against its marginal costs. A reduction in the cost of providing a given level of care as a result of a doctor's actions will have a negligible impact on the doctor's tax bill since the reduction in costs and hence taxes is spread over all taxpayers. Nor will an increase in the amount of care provided for a given total of expenditure necessarily accrue to 'his' patients. An altruistic concern for the generality of taxpayers and patients is an insubstantial basis for efficient resource allocation. It is too easily turned to apathy and cynicism by seeing others acting wastefully and, at least in popular

mythology, there is no shortage of such spectacles.

Poor Information

Even if clinicians wish to act efficiently they may be prevented from doing so by poor information. For example cost data may not be related to decisions taken or available only with a considerable lag or be inaccurate. There is some evidence that providing very simple information, for example on the costs of laboratory tests, can have a significant effect on resource use, though such effects are neither inevitable nor necessarily permanent.

Inadequate Training

Medical education concentrates on the clinical aspects of the doctor's work to the almost complete neglect of the economic implications of medical decisions. The focus is on the individual patient and the need to do 'everything possible' for him, to provide all treatment which has some chance of providing some benefit, irrespective of cost.

CLINICIAN BUDGETING

Clinician budgeting is an attempt to improve the efficiency of clinical decisions by tackling the first of the sources of inefficiency considered above. By making doctors budget-holders, accountable for the expenditure generated by their decisions, it is hoped to provide more cost effective care. GPs could be asked to keep their prescribing within certain cost limits and to account for any over-spending. Consultants could be given budgets based on an agreed cost per case (so that the budgets increased with additional cases treated) and allowed to control their pattern of expenditure within the budget.

Some Problems in Clinician Budgeting

Clinician budgeting need not, by itself, imply greater cost-effectiveness.

There are a number of problems:

(a) Incentives. The mere setting of a budget and exhortations to keep within it do not imply that clinical decision-makers will either act more efficiently or even attempt to keep within the budget. Enthusiasm and altruism are laudable but cannot be relied on to permanently motivate decision-makers to behave efficiently. There is a need to provide stronger incentives to clinicians. The budget-holder's salary could be made dependant on his budget performance, being increased or reduced by some fraction of the budget saving or over-spending. Such an incentive might perhaps put an undue strain on the clinician's role as the patients agent. It might be better to reinforce the budget-holder's professional ethic by permitting him to keep all, or a fraction, of any budget savings to be spent on new equipment, extra staff or on any other form of care. There may be smaller efficiency gains with this form of incentive but a larger part of any cost saving will be devoted to patient welfare.

(b) Content.
(1) the clinician ought to be made responsible only for those items which are controllable by him. GPs can be held responsible for the volume of prescribing, but not for the prices of drugs or the chemist's on-costs. Consultants who order pathology tests or X-rays can be made to account for the numbers of such investigations but not their unit costs. These are controllable by the clinicians in charge of the pathology and radiology departments who, in turn, should not be expected to account for the use of their services. The inclusion of uncontrollable items in clinicians' budgets will reduce the incentive to act efficiently since their efforts may be swamped by factors over which they have no influence.
(2) Not all responsibilities can be linked to budgets and be made subject to incentives. For example the hospital pharmactist's duties will include stock control and the provision of pharmacol-

ogical advice to prescribers. Incentives to control the stock of drugs can be built into a budget, but it will be difficult to devise an effective incentive scheme which rewards the pharmacist for his advisory activities.

(c) Locus of Responsibility. The budget holder may be a single individual or a group of doctors. A general practice drug budget might be held by the individual GP, the members of a group practice or all GPs on the FPC list. In the hospital sector budgets might be held at the level of the individual consultants, the Cogwheel division, the medical executive committee, the ward etc. The smaller the number of individuals responsible for a budget the greater the incentives since the effect of individual actions will be spread over a smaller number of people. On the other hand, since budget-holders ought only to be responsible for the things they can control and many uses of resources are the results of the actions of more than one individual, larger groups of budget-holders will enable more items to be placed within budget.

(d) Budget setting must involve the budget-holder. He is likely to have greater knowledge about his area of work and a budget imposed without consultation or agreement is likely to be both poorly framed and felt to be unfair.

(e) Budget Dynamics. When budgets are first introduced they are usually based on previous performance. As a result those budget-holders who were previously acting with greater efficiency will be penalised relative to those who are operating with a good deal of slack. Budgets are also usually re-set at the end of each accounting period in the light of actual performance in that period. This may reduce the incentives to good decision-making since better performance in one period results in a tighter budget in the next.

(f) Information. Clinician budgeting requires cost, volume and quality information which is accurate, so that actions may be evaluated correctly and promptly, so that behaviour can be altered within the

budget period. Clinicians may also need information and assistance to evaluate their existing procedures and to consider alternatives. Such information requirements will imply additional equipment and staff costs which have to be set against any benefits stemming from clinician budgeting.

(g) Output and Quality Control. Budgets must be related to agreed standards of performance ie the amount and quality of care or service provided. This may be relatively easy in some areas perhaps in, for example, pathology departments, but difficult in others, perhaps, for example, in psychiatric wards.

(h) Clinician Objections. Nothing in the doctor's training or professional life inclines him to consider the economic implication of his decisions and clinicians are notoriously jealous of their clinical freedom. Attempts to encourage clinicians to take an active, explicit and responsible part in the management of NHS resources, rather than an implicit and irresponsible one, need to be very carefully packaged. They must be persuaded rather than pressed into becoming resource managers. Perhaps this can be done by pointing out to them the economic implications of their actions, drawing their attention to the fact that they already apply economic criteria to the management of one very important resource, ie their time and by suggesting that by becoming managers they will gain a measure of control over their affairs and hence that clinical budgeting increases clinical freedom.

Experience with Clinician Managers

The Westminster Study[1] appears to indicate that impressive improvements in the efficiency of resources allocation are possible. Involvement of clinicians in management has also apparently been successful in the programme investigation unit in a Manchester hospital and the North Teesside DGH[3]. A common factor in those units which are making more efficient use of resources is the presence of an 'administrator', who is

often a ward sister. The small number of experiments involving clinicians in management is probably due to the rapid growth in resources in the health service until recently, which has disguised to the clinicians and others the fundamental economic problem of the health service (finite resources and apparently limitless 'needs').

The DHSS and Clinician Management

The DHSS funds a variety of management courses for clinicians. These range from bread and butter courses for senior registrars or young consultants to highly specialised courses for newly appointed clinician members of district management teams. In addition, short term appointments of NHS administrators to academic or research posts are being financed.

ISSUES

Clinician budgeting and management raises a number of issues:

(a) What is the best method of encouraging clinicians to take a greater interest in management?
What kind of incentives should be used?

(b) What types of expenditure can clinicians be properly expected to manage?

(c) Should clinicians be formally responsible as budget-holders for expenditure?
If so, what types of expenditure?
At what level should the responsibility be placed (individual consultants, Cogwheel divisions, medical executive committees)?

(d) What kind of information and logistic support is required?

(e) What ought the role of the health departments and the NHS authorities to be?

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COSTS OF TRAINING AND NURSE-DOCTOR SUBSTITUTION

H S E Gravelle

A necessary condition for efficiency in the health service is that whatever the amount, quality and mix of care it is produced at minimum cost. Minimum cost production of health care requires knowledge of:

(a) technology, ie the relationship between the various combinations of inputs (different types of labour, equipment and capital) and the output of care, since this will determine whether it is **possible** to substitute one type of input for another in the production of health care;

(b) the **relative** costs of the different types of inputs, which will determine the extent and ways in which it is **desirable** to substitute one input for another.

With this information decisions can be made concerning both the efficient **current** use of the existing stocks of input and the **planned future requirements** for those stocks. Hence **manpower planning** for doctors and nurses must be based on, amongst other things, an investigation of the nurse-doctor substitution possibilities and the relative costs of doctors and nurses. This paper gives some estimates of the costs of training doctors and nurses (an important but neglected part of the costs of these resources) and uses these in an attempt to calculate the order of magnitude of the relative costs of doctors and nurses.

1 COSTS OF TRAINING DOCTORS

This section attempts to estimate the resource costs and the public sector costs of training an additional doctor; examines some of the problems involved, and considers the derivation of the DHSS estimate of £40 000 and explains why it is not an estimate of either the resource costs or the public sector costs of training an additional doctor. Finally there is a discussion of the usefulness of these estimates. The Appendix contains some calculations of training costs based on alternative assumptions.

Resource Costs of Training

Resource Costs

Resource costs are incurred when productive resources are diverted from alternative uses where they would have produced valuable output. The resource cost of such resources is the value of the foregone output they would have produced. It is usually (and heroically) assumed that resource costs are measured by the market prices of the diverted resources. Resource costs (sometimes also known as social costs) are the relevant concept of cost when we wish to assess the effect of a decision on the economy as a whole and are not concerned with questions of distribution, ie which particular individuals bear the costs of the decision.

Undergraduate Years

Resource costs arise in training an extra doctor in three main ways during the five years up to the pre-registration year:

(a) University costs will increase. The extent of the increase will depend on what happens to the total number of university students. The marginal medical student is almost certain to have gone to university in any case if he had not been admitted to medical school. If the non-medical department to which the additional medical student would have gone does not recruit an additional student to

replace him there will be a cost saving in that department to set against the additional medical school cost. Alternatively, the non-medical department may recruit an additional student from otherwise unsuccessful applicants and thus the total number of students increases by one. In this case there is no offsetting cost reduction. We will assume that the total number of students does increase when an additional medical student is trained. The Appendix examines the effect of the alternative assumption that the total number of students is fixed, so that the increase in medical school numbers is at the expense of other, non-medical, university departments;

(b) Teaching hospital costs will rise;

(c) There will be a loss of output in the rest of the economy. Students, whether in non-medical departments or in medical schools or teaching hospitals, could have been producing goods and services. Hence there is an opportunity cost (the output foregone) associated with any increase in the student population:

1 it is assumed that the relevant alternative foregone by the additional medical student is three years' study as a non-medical student, and that a medical student after five years' training could produce the same output as a non-medical student after three years' university education. Thus two years' output is foregone when an additional medical student switches from a non-medical department to a medical school;

2 We have also assumed (see (a) above) that an additional non-medical student is admitted to university when an additional medical student enters medical school. This results in a loss of three years' output from the additional non-medical student.

Hence, in total, five years' production is lost while the additional medical student is in medical school.

Pre-Registration Year

During the sixth, pre-registration, year of training the trainee doctor is employed as a houseman in the hospital service. There will be some increase in cost in the hospital service since housemen will still require supervision, guidance and assessment. In addition there will be an opportunity cost arising from the output foregone by employing the houseman in the hospital service, rather than elsewhere in the economy. Housemen, however, also produce medical services in their pre-registration year, so that the net resource cost is the sum of the additional hospital costs and foregone output costs less the value of the medical output produced during the pre-registration year.

It will be assumed that the value of the medical output produced by the pre-registration year trainee is equal to the additional costs he imposes on the hospital service. Hence, the resource cost of the pre-registration year is assumed to be the value of output foregone in alternative employment. The Appendix examines the implications of varying this assumption.

Training Resource Cost Stream

Table 1 gives some estimate of the magnitude of the resource costs incurred in each of the six years of training under the three headings (University, NHS and lost output costs) discussed above.

The following points and caveats should be noted in connection with the estimates:

(a) the figures relate to **current** costs and make no allowance for capital costs incurred in medical schools and teaching hospitals. Hence, the total costs of training are underestimated, unless it is assumed that there is spare capacity in medical schools and teaching hospitals, and that this spare capacity has no valuable alternative use. The plausibility of this assumption depends on how large a variation in the number of doctors in training we are considering;

TABLE 1 Training cost stream : resource costs (£s, 1975/76 prices)

	YEAR					
	1	2	3	4	5	6
University cost	1,035	1,035	2,409	2,409	2,409	
NHS cost			9,893	9,893	9,893	
Output foregone	2,111	2,111	2,111	2,392	2,392	2,392
Total resource cost per student	3,146	3,146	14,413	14,694	14,694	2,392
Total resource cost per doctor	3,418	3,362	15,149	15,191	14,941	2,392

Sources:

A J Culyer and others, Joint costs and budgeting for English teaching hospitals, University of York, Institute for Social and Economic Research, 1976, unpublished.

P J Hodgman, 'Analysis of the vacancy lists of the Central Services Unit for University and Polytechnic Careers and Appointments Services, 1977', April 1977, Department of Education and Science.

DHSS Medical Manpower — the next twenty years, HM Stationery Office 1978.

New Earnings Survey, Department of Employment.

Notes:

1 **University cost** is the marginal cost of an additional medical student. It derived by applying the Brown index of university costs to the results of a UGC regression analysis based on 1970/1 cost data. The reader is warned that:
(a) no allowance has been made for the research activity of universities;
(b) the analysis related medical student numbers to medical department costs. This may lead to inaccuracy because:
(1) some of the costs imposed by medical students arise in non-medical departments and some medical department costs are incurred in teaching non-medical students;
(2) no attempt has been made to relate non-departmental expenditure (administration, libraries etc) to student numbers. The average non-departmental cost per student in 1975/76 was £962.

2 **NHS costs** of training are the revenue (current) costs and are derived from a study by Culyer ***et al*** of the costs of English teaching hospitals in 1969/70. The estimates have been updated by applying an index of hospital and community health service costs provided by the DHSS. Actual costs may have been affected by the 1974 reorganisation and by RAWP. No attempt has been made to incorporate the possible effects of SIFT funding on actual teaching hospital costs. No allowance has been made for the training of people other than doctors in the teaching hospitals.

3 **Output foregone** in years one, two and three is estimated by 52 times the mean of the average gross weekly earnings of male employees aged 18–20 in April 1975 and 1976, shown in the NES. Output foregone in years four, five and six is the sum of three quarters of the 1975 and a quarter of the 1976 mean starting salaries for all vacancies on the files of the CSU.

4 **Cost per doctor** is derived from the figure for the cost per student by making allowance for the wastage during the medical school years. Assuming for simplicity that there is a constant annual wastage rate (w) in the first five years and no wastage in the pre-registration year the cost per doctor trained in year t of training is:

$$\text{cost per student in year } t \times (1-w)^{t-6}$$

The annual wastage rate has been calculated on the assumption that the wastage rate over the first five years is eight per cent, ie eight per cent of new medical students do not enter the pre-registration year.

5 The cost estimates relate as far as possible to the financial year April–March but the university costs are for the university financial year August–July.

(b) there are large variations in the cost of medical schools and teaching hospitals, so that the actual costs of training would depend crucially on where the additional doctor was trained. The figures in Table 1 ignore geographical variations and are derived by pooling the data on the costs of different medical schools and teaching hospitals;

(c) more than one type of activity is carried on in both medical schools (teaching and research) and teaching hospitals (teaching, research and care of patients). This creates problems in assigning costs to the different activities, since there are obvious difficulties in attempting to measure the amount of care provided and research done in hospitals and universities.

Present Value of Training Resource Costs (Total Resource Cost)

The decision made now to train an additional doctor will result in additional resource costs being incurred in each of the next six years. It will not usually be appropriate however, to merely sum these resource costs (the bottom line in Table 1) to get a figure for the total resource costs of the decision. Such a procedure implies that we believe that £1 spent now is equivalent to £1 spent in six years' time. Since £1 not spent now could be invested for six years, a commitment to spend £1 in six years' time represents a smaller cost than spending £1 now and foregoing the investment opportunity. Hence, future costs must be discounted to make them comparable with costs incurred now. Failing to discount future costs is equivalent to assuming that there are no productive investment opportunities with a positive rate of return.

Table 2 gives the present value of the resource cost stream in Table 1 at various discount rates.

TABLE 2 Present value of the resource costs of training an additional doctor (£s)

	Discount rate (%)		
	0	5	10
At prices ruling in:			
1975/76	54,453	45,380	38,271
1976/77	61,286	51,068	43,061
1977/78	70,363	58,632	49,439

Notes:

1 The figures are the present value of the resource costs of producing an additional trained doctor, ie the present value of the bottom line of Table 1.

2 The 1976/77 estimates are derived from the 1975/76 estimates by applying the Brown index and the hospital and community health service cost index to the university and NHS cost estimates. The output foregone in years one, two and three is calculated as for Table 1 but using the April 1976 and 1977 figures. The output foregone in years four, five and six is calculated by applying the percentage increase in male weekly earnings (18–20 year olds) to the 1975/76 estimate.

3 The 1977/78 estimates are derived from the 1976/77 figures by applying the mean percentage charge in the Retail Price Index between March 1977/February 1978 and March 1976/February 1977.

Public Sector Costs of Training

Public Sector Costs

Public sector costs arise whenever a decision causes a change in the difference between government expenditure and government revenue. Government expenditure is the sum of government purchases of goods and services and **transfer payments** (for example: social security benefits, old age pensions, student grants). Government revenue is the sum of revenue from charges for goods and services produced by the government and taxes. Any increase in the difference between government expenditure and revenue must be met ultimately by rises in charges or in taxes. In the context of this paper we may assume that government charge revenue is fixed. Hence, any increase in the difference between expenditure and revenue must be met from higher tax revenue. The public sector costs of training an additional doctor can therefore be thought of as those costs which fall on the taxpayers.

The additional burden placed on taxpayers by training an additional

doctor consists of:

(a) increased expenditure on goods and services by the government in:

1 universities;

2 the NHS in the teaching hospitals in the clinical years of training. It is assumed that the additional NHS cost in the pre-registration year is just offset by the value of the trainee doctor's services in that year;

(b) transfer payments;

1 the grants paid to the additional medical student during his two final clinical years, plus the grants paid to the additional non-medical student during his three years at university, making five years of grants in all;

2 the salary (net of tax) paid to the additional trainee doctor as a houseman during his pre-registration year;

(c) loss of income tax revenue. We have assumed that the additional medical student would have gone to university for three years, even if not admitted to medical school, and that his vacated place in a non-medical department is filled by an additional student who would otherwise not have gone to university. Hence, there is a loss of income tax revenue on the additional non-medical student's salary during his three years at university and on the salary which the trainee doctor could have earned during his fourth, fifth and sixth years of training.

Training Cost Stream: Public Sector Costs

Table 3 gives some rough estimates of the costs falling on the taxpayer in each of the six years taken to train an additional doctor. Many of the

caveats raised in the discussion of the resource costs obtaining and the notes to Table 1 will apply to Table 3.

TABLE 3 Training cost stream: public sector costs (£s, 1975/76 prices)

Year	1	2	3	4	5	6
Government expenditure on goods and services:						
University	1,035	1,035	2,409	2,409	2,409	
NHS			9,893	9,893	9,893	
Total	1,035	1,035	12,302	12,302	12,302	
Transfers						
Student grants	*740*	740	1,048	1,048	1,048	
Net salary						2,818
Tax foregone	503	503	503	601	601	601
Total public sector cost per student	2,278	2,278	13,853	13,951	13,951	3,419
Total public sector cost per doctor	2,475	2,434	14,560	14,423	14,185	3,419

Sources: See Table 1 (page 91), and Doctors and Dentists Review Body, Seventh Report 1977. Cmnd 6800.

Notes:

1 Many of the notes to Table 1 apply.

2 **Student grants** are based on the assumption that the additional medical student attends a medical school outside London, does not live at home and receives the full grant.

3 **Net salary** in year six is the average of the minimum on the house officer scale in April 1975 and 1976, less the tax payable by a single individual claiming only the personal allowance.

4 **Tax foregone** is the tax payable on the salaries in the line 'output foregone' in Table 1, by a single individual claiming only the personal allowance.

Present Value of Public Sector Training Costs

Table 4 shows the total or present value of the public sector costs at various rates of interest. Taxpayers will not be indifferent between paying an extra £1 in tax now and paying an extra £1 in tax in say six years' time, since there are various investment opportunities foregone by them in paying now rather than in six years' time. Hence, the increases in the tax bill in the six years of training must be made compar-

able by discounting before they can be summed to give the total cost to the taxpayer.

TABLE 4 Present value of the public sector costs of training an additional doctor (£s)

Discount rate %	0	5	10
At prices ruling in:			
1975/76	51,496	42,674	35,790
1976/77	58,489	48,450	40,620
1977/78	67,152	55,626	46,636

Notes:

1 The 1976/77 estimates are based on actual tax rates and grants payable. The house officer salary is the April 1976 minimum plus 14%.

2 The 1977/78 estimates have been derived as in Table 2.

DHSS Estimate of Training Costs

The DHSS has estimated that the costs of training a doctor are £40,000 (Hansard, 27 July 1976, Written Answers, Column 217) and since this estimate has been accepted in many discussions of medical manpower questions it is worthwhile examining it in more detail.

TABLE 5 Training costs: DHSS estimate (£s, 1975/76)

Year	1	2	3	4	5	Total (undiscounted)
University	2,900	2,900	3,700	3,700	3,700	16,900
NHS			7,125	7,125	7,125	21,375
Total	2,900	2,900	10,825	10,825	10,825	38,275

Notes:

1 The university costs are the sum of average departmental costs per student plus the average non-departmental cost per student.

2 The NHS cost is the cost per student per year to be protected within allocation by SIFT (Report of the Resance Allocation Working Party, London, HMSO, 1976 para 4.15).

The DHSS estimate set out in Table 5 differs from the estimated resource costs in Tables 1 and 2 because:

(a) teaching hospital costs per student in the DHSS estimate are set at the level (£7,125) which the Resource Allocation Working Party recommended as a suitable basis for funding teaching hospital costs, rather than being based on actual pre-RAWP teaching costs. Which procedure is better depends on whether RAWP leads to a change in behaviour and hence actual teaching costs in the teaching hospitals;

(b) no allowance has been made for the opportunity costs arising from the output foregone when an additional doctor is trained;

(c) costs incurred in different years have not been discounted to a common base to make them co-measurable. Hence, there is an implicit assumption that the relevant rate of interest is zero;

(d) no allowance has been made for wastage rates. The DHSS figures therefore refer to costs per medical student rather than costs per new doctor trained;

(e) DHSS estimates of the additional university costs imposed by an extra student are based on the assumption that cost per student does not vary with the number of students. This assumption appears to be inaccurate and the additional costs associated with an extra student are significantly less than the average costs of a student.

The DHSS estimates also differ from the estimates of the public sector (taxpayer) costs given in Tables 3 and 4:

(a) no allowance has been made for transfer payments;

(b) no estimate of the loss in tax revenue has been made;

(c) there is no discounting of future costs;

(d) no allowance has been made for wastage rates;

(e) average rather than marginal university costs have been used.

The Significance of Training Costs

It should be clear from the previous parts of this paper that 'the cost of training an additional doctor' is not a simple concept. In any discussion we must be careful to specify:

(a) what decision is being considered. The cost of producing an additional doctor will depend on:

1 where the doctor is trained;

2 the number of doctors whom it has already been decided to train;

3 when the additional doctor is to be trained;

4 when the decision to train the additional doctor is made. The longer the time between a decision being taken and the doctor starting training the lower the costs are likely to be, since the capacity of the system can be varied.

(b) whether we are concerned with the resources costs to society as a whole, irrespective of where they fall, or with the public sector costs borne by taxpayers, or with the private costs falling on the student and his family.

The estimates given in the previous parts of this paper are the current or revenue costs which would be incurred if a decision was made now to admit sufficient extra medical students to produce an additional trained

doctor in six years' time. The estimates are based on the assumption that the medical school and teaching hospital in question have spare physical capacity with no valuable alternative use and have typical cost structures (ie their marginal costs are the means of the marginal costs of all medical schools and teaching hospitals).

The relevant cost concept if we are primarily interested in the efficient use of resources is the resource cost of training an additional doctor. This cost must be estimated if sensible decisions are to be taken about various aspects of medical manpower policy, including for example:

(a) the mix of foreign and UK trained doctors;

(b) the emigration of UK trained doctors (the medical brain drain);

(c) the cost minimising combination of doctors with other health service inputs such as nurses;

(d) the total number of doctors to be trained in the UK.

In conclusion, the many caveats which attach to the estimates in this paper and the fact that much of the original data is about ten years old indicate that there is an urgent need for further research in this area.

2 COST OF TRAINING NURSES

Resource Costs of Training

The resource cost of any decision is the value of the productive resources which are used up as a result of that decision. Resource costs are incurred in training an additional nurse in three main ways:

(a) direct tuition costs in schools of nursing will increase;

(b) NHS costs will rise because of the training provided on the ward;

(c) output will be foregone. Student or pupil nurses could have been employed elsewhere in the economy if they were not being trained as nurses and hence there is a loss of output. Against this loss of non-NHS output must be set the value of the services produced by nurses during training.

Table 6 sets out some estimates of the magnitudes of the various costs incurred in each year of a nurse's training. The estimates are very rough:

(a) teaching cost consists mainly of the total Regional Nurse Training Committee (RNTC) budget divided by the total number of learners. It is therefore the **average** teaching cost attributable to all learners, not the **marginal** cost of an additional learner. Experience in other educational establishments suggests that marginal costs are rather less than average costs;

(b) NHS costs are the in-service training costs and reflect the DHSS judgement that such costs per learner are a 'notional' 50% of the average RNTC cost per learner;

(c) there is apparently no allowance for any capital cost in the DHSS estimate of RNTC costs. Hence training costs will be under-estimated unless it can be assumed that there is spare capacity, with

no valuable alternative use, in nurse training schools.

TABLE 6 Annual resource cost of a nurse learner (£s, 1976/7 prices)

Direct teaching cost	415
In-service training cost	138
Output foregone	2,345
	2,898
Less: value of learner's services	1,071
Net annual resource cost	1,827

Notes:

1 Direct teaching cost is the RNTC budget divided by the number of learners (90,815), plus initial expense allowance (£15, examination fee (£18), laundry etc (£80) plus a notional administration cost.

2 In-service training cost is a 'notional' fifty per cent of the RNTC budget per learner.

3 Output foregone is based on the average weekly earnings (times 52) of 18–20 year olds shown in the New Earnings Survey. The figure is the mean of the weighted average earnings of male and female employees in April 1976 and 1977. The weights are the proportions of full-time male (0.12) and female learners (0.88) in 1975. Eighteen per cent has been added to the earnings figure to allow for national insurance and superannuation payments by employers.

4 The value of the learner's services is derived from the DHSS estimate that two additional learners can be substituted for one nursing auxiliary. It has been assumed that the NHS cost of employing an auxiliary measures the value of the auxiliary's output outside the NHS.

Present Value of Resource Costs

As the paper on the costs of training doctors explained, the total cost of training is **not** the simple sum of training costs in each year of training. Costs incurred in different years are not commensurable and must be discounted to a common date to allow for the foregoing of valuable alternative investment opportunities in different years. Table 7 gives the total or present value of the costs of training both state enrolled nurses and state registered nurses.

TABLE 7 Present value of resource costs of training a nurse (£s, 1976/77 prices)

Discount rate (%)	0	5	10
SEN	4,678	4,356	4,075
SRN	6,792	6,103	5,529

Notes:

The annual figures in Table 1 relate to the costs of learners **not** to the costs of providing trained nurses. Given the wasge rate the cost of producing trained nurses will exceed the cost of training all learners, including those who do not become nureses. The annual figures in Table 1 have therefore been grossed up by $(1-W)^{t+1-N}$ in year t of training, where W is the annual percentage rate and N the length of the training course in years. W has been assumed to be ten percent for SRN learners (student nurses) and fifteen percent for SEN nurses (pupil nurses).

Public Sector Costs of Training

Public sector costs are those costs falling on the taxpayer. They will consist of:

(a) increased government expenditure on goods and services, ie the direct teaching and NHS in-service costs less the cost saving (auxiliaries' wages) arising from the use of learners in the hospital service;

(b) transfer payments to learners, ie the net of tax training allowances paid to the learners;

(c) changes in tax revenue. A learner would otherwise have been employed outside the NHS and paying income tax. Hence government tax revenue is reduced during the years of training.

Table 8 gives an estimate of the annual cost falling on the taxpayer of an additional learner.

TABLE 8 Annual public sector cost of a nurse learner (£s, 1976/77 prices)

Government expenditure on goods and services:		
Direct teaching cost	415	
In-service training cost	138	
	553	
Less: saving on auxiliaries	1,071	
Net government expenditure on goods and services:		– 518
Transfer payment		1,615
Tax revenue reduction		438
Total annual public sector cost		1,525

Notes

It has been assumed that learner nurses pay tax at the standard rate and claim only the single person's personal allowance. Transfer payment is the average training allowance paid to nurses, less tax. Tax revenue reduction is the tax payable on the average earnings of 18–20 year olds as adjusted for Table 1 (see note 3).

Table 9 contains an estimate of the total or present value of the public sector costs of training SENs and SRNs at various rates of discount.

TABLE 9 Present value of public sector costs of training a nurse (£s, 1976/77 prices)

Discount rate (%)	0	5	10
SEN	3,905	3,637	3,400
SRN	5,669	5,093	4,615

Note

The annual public sector cost per learner in Table 8 has been grossed up to allow for the wastage of learners during training.

Conclusion

As the paper on the costs of training doctors noted, if we are interested in the efficient use of resources in the economy as a whole and we are not concerned with the question of who bears those costs, the relevant concept of cost is the marginal resource cost of training, rather than the marginal public sector cost falling on the taxpayer.

Given the importance of nursing resources in the NHS (over thirty per cent of hospital and community service current expenditure is on nursing and midwifery staff), it is vital that nurses are used efficiently. This cannot be done without information on the costs of training and employing nurses. The estimates in this paper of training costs, though indicative, are much too crude to be of relevance for policy and further work is urgently required.

3 NURSE–DOCTOR SUBSTITUTION

This section provides some very rough 'back of a bus ticket' calculations of the relative costs of nurses and doctors and discusses their implications. It draws on previous sections on the costs of training doctors and nurses.

Which Concept of Cost?

The relevant concept of costs for any decisions concerning the use of doctors and nurses in the health service will differ according to:

(a) whether we are examining the effect on the NHS, the public sector (ie the taxpayer) or the economy as a whole. These concepts are **not** equivalent. Some public sector costs (eg medical school costs) are not borne by the NHS and some are transfer payments and do not correspond to any change in resource use. If we are interested in the efficient use of resources in the economy as a whole and are not concerned with who bears the costs, the relevant cost concept is the resource cost, ie the value of the output foregone as a result of the decision to use resources in one way rather than in another.

(b) whether there is spare capacity, ie whether the existing stock of inputs is being fully utilised. If the stock of inputs in question is being fully utilised then the resource costs of using them for particular tasks will include capital costs. In the case of health service workers the capital costs will be their training costs.

The Relative Costs: Analysis

It might appear obvious that doctors are more costly than nurses, since they cost more to train and to employ in the NHS than nurses. However, account must be taken of the fact that doctors tend to be more likely to be supplying labour at any given age and to work longer hours when they are active in the labour force. There is also the possibility that

doctors are more productive or skilful than nurses, ie can perform the same services or tasks in a shorter time. This section therefore sets out a simple analytical framework within which these points can be considered. Readers without a taste for manipulation of symbols may prefer to move straight to the last paragraph of the sub-section.

Assuming that the stock of doctors is currently being fully utilised, the resource cost of using a doctor to perform a particular task is the sum of the training or capital costs and the employment or current costs.

(a) Every year a proportion d of the stock of doctors dies, emigrates or retires. Hence in order to maintain the active stock of doctors at a given level this proportion must be made good by the addition of new doctors to the stock;

(b) these additional doctors will either have been trained in the UK, at a resource cost c to the UK economy, or abroad, in which case their training has imposed no cost on the UK. If we let h denote the proportion of additional doctors produced by UK medical schools, the expected or average training cost to the UK of an additional doctor is:

$$hc$$

(c) hence a decision to increase the stock of doctors by one imposes an additional annual UK training cost of:

$$dhc$$

(d) let a be the fixed number of hours worked by an average doctor in a year. Hence the stock of doctors must be increased by 1/a to increase by one the number of hours worked by doctors in a year;

(e) it follows from (c) and (d) that the additional training or capital cost of an additional hour of work by a doctor is:

$$\frac{dhc}{a}$$

(f) the employment or current resource cost of an hour of work supplied to the NHS by a doctor can be denoted by w. This is the value of the output that a doctor could produce if not employed in the NHS. (We will below make the heroic assumption that it is measured by the hourly wage paid by the NHS to the doctor.)

(g) adding the training cost (from (e)) and the employment cost (from (f)), we see that the resource cost of an hour of labour supplied by a doctor is:

$$\frac{dhc}{a} + w$$

(h) since we are concerned with the relative costs incurred by having certain tasks performed by doctors or by nurses we must express these costs in terms of the resource cost per task performed. Suppose that a doctor requires q hours to perform a particular task (or set of tasks). The cost per unit of output (ie per task or set of tasks performed) is therefore given by:

$$q\left[\frac{dhc}{a} + w\right]$$

We can argue similarly to derive an equivalent expression for the cost per task completed by a nurse. Now let the subscript n and m denote nurses and doctors respectively, so that, for example, c_n is the cost of training a nurse and a_m the number of hours worked per year by a doctor. Resource costs will be reduced by the substitution of nurses for doctors in the performance of a particular task or set of tasks if and only if:

$$q_n\left[\frac{d_n h_n c_n}{a_n} + w_n\right] < q_m\left[\frac{d_m h_m c_m}{a_m} + w_m\right]$$

(A very similar expression results if we allow for the possibility that doctors may be required to spend some time supervising nurses in the performance of the tasks.)

It is not possible to say, without replacing the symbols in previous paragraphs with actual numbers, whether it is more economical to have certain tasks performed by nurses rather than doctors. We would expect that the hourly employment costs (w) are smaller for nurses than for doctors. The costs of training (c) an additional nurse are also smaller than for an additional doctor, but doctors have a lower replacement or depreciation rate (d), a smaller proportion of them are trained in the UK (h) and they work more hours per year (a). The productivity (q) comparison may go either way, perhaps depending on the proportion of their time which nurses and doctors would devote to the particular tasks and hence become more skilled with practice.

Relative Costs: Guesstimates

Table 10 presents a 'best guess' estimate of the magnitudes of the variables discussed above and indicates that the hourly cost of nurses is £2.35 and of doctors is £3.25. The training or capital costs of nurses and doctors are relatively much less significant than the hourly employment costs in determining the total hourly costs of doctors and nurses. A comparison of the total hourly costs indicates that for it **not** to be cheaper to use nurses rather than doctors for certain tasks, doctors must be 1.38 times as productive as nurses in those tasks.

The figures in Table 10 are very crude, so Table 11 gives the results of some sensitivity analysis. The table shows the effects on the relative hourly costs of doctors and nurses of some changes in the estimates and assumptions made in Table 10. Doctors will only be less expensive than nurses in performing particular tasks if the ratio of the productivity of doctors to that of nurses exceeds the ratio of the hourly cost of doctors to that of nurses shown in Table 11.

TABLE 10 Costs of nurses and doctors ('best guess' estimates, 1976/77 data)

Variable Definition	Symbol	Nurse	Doctors
Training cost per addition to stock	c	6,100	51,000
Replacement rate per year	d	12%	6%
Proportion trained in UK	h	1	0.8
Hours worked per year per worker	a	1,800	3,240
Training cost per hour	cdh/a	£0.41	£0.76
Employment cost per hour	w	£1.94	£2.49
Total cost per hour	$\frac{cdh}{a} + w$	£2.35	£3.25

Sources: DHSS Medical manpower: the next twenty years, HM Stationery Office 1978.
DHSS Reports of the doctors and dentists review body.

TABLE 11 Relative costs of nurses and doctors: sensitivity analysis

Assumptions	Ratio of doctor's hourly cost to nurse's hourly cost
1 'Best guess' estimate	1.38
2 Doctor training cost (c): half 'best guess' level	1.22
3 Nurse replacement rate (d): double 'best guess' level	1.18
4 All doctors trained in UK	1.46
5 Nurse hours worked (a): 2000	1.54
6 Doctor hours worked (a): 75% of 'best guess' level	1.84

Conclusions

The results in Tables 10 and 11 indicate that even after allowing for the lower replacement rate and greater number of hours worked per year by doctors, nurses are relatively cheaper than doctors. The difference in relative costs is, however, not as large as one might have expected. The

results in the tables must of course be treated with extreme caution: the analytical framework adopted was very simple and the estimates very crude. Nevertheless they indicate that:

(a) there appears to be a *prima facie* case, on grounds of relative costs, for substitution of nurses for doctors in some tasks. This tentative conclusion is supported by American experience with 'physician extenders';

(b) there is a need for research on:

1 the technical possibilities for substitution, to investigate whether these are confined to tasks which take up a small amount of doctors' time or whether they are significant;

2 the relative costs of doctors and nurses, in particular their hourly employment costs;

(c) if there are significant substitution possibilities the basis of estimates of the 'need' for medical and nurse manpower will need to be revised in manpower planning exercises.

APPENDIX

Resource Costs of Training an Additional Doctor: Implications of Alternative Assumptions

This Appendix examines the implications of some alternative assumptions for the resource cost estimates of Tables 1 and 2:

(a) no change in the total number of students;

(b) pre-registration year trainees produced medical services with a value equal to:

1 the additional NHS costs of supervision and training plus the value of output foregone in alternative non-medical employment;

2 the additional NHS costs of training and supervision plus the salary paid to house officers.

No Change in Total Student Numbers

If the total number of students is unchanged and the additional medical student transfers from a non-medical department, resource costs will be lower than estimated in Tables 1 and 2 because:

(a) there will be a cost saving in the non-medical university departments;

(b) no additional output will be lost in years one, two and three of training as no additional student is admitted to university.

Table A1 shows the effects of the assumption on the training resource cost stream at 1975/76 prices. The present value of the cost of training an additional doctor, again at 1975/76 prices, is:

£40 037 (0% discount rate)
£32 656 (5% discount rate)
£26 920 (10% discount rate)

The effect of assuming that there is no change in total student numbers is therefore to lower the estimated resource costs of training an additional doctor quite significantly. At 1975/76 prices and a five per cent discount rate the present value of training costs falls by nearly forty per cent of the figure shown in Table 2.

Value of Pre-Registration Year Medical Output

Assuming that the value of the pre-registration year house officer's medical output is greater than the additional costs he imposes on the NHS lowers the resource costs of training an additional doctor. If the value of medical output in the pre-registration year is assumed to be equal to the additional supervision and foregone output costs no net resource cost is incurred in year six of the doctor's training. The effect is to reduce the present value of the resource costs of training, at 1975/76 prices, to:

£52 061 (0% discount rate)
£43 595 (5% discount rate)
£36 920 (10% discount rate)

Alternatively, if the value of medical output in the pre-registration year is assumed to be equal to the sum of the additional supervision costs plus the salary paid to the house officer, the net resource costs in year six is negative since the minimum average salary paid to house officers in 1975/76 was £3 972, which exceeds the assumed value £2,392) of the foregone output in year six. Under this assumption the present value (1975/76 prices) of the resource cost of training an additional doctor is reduced to:

£50 480 (0% discount rate)
£42 416 (5% discount rate)
£36 028 (10% discount rate)

The effect of alternative assumptions about the value of pre-registration year medical output on the present value of the resource costs is much less than the effect of varying the assumption about student numbers. This is because the absolute effect is smaller in any given year of training and also the effect occurs later in the course of training and is therefore discounted more heavily.

TABLE A1 Resource cost of training with constant student numbers (£s, 1975/76)

Year	1	2	3	4	5	6
University	−195	−195	1,179	1,171	1,171	
NHS			9,893	9,893	9,893	
Output foregone				1,823	1,823	2,392
Total resource cost per student	−195	−195	11,072	12,887	12,887	2,392
Total resource cost per additional doctor	−212	−208	11,637	13,323	13,105	2,392

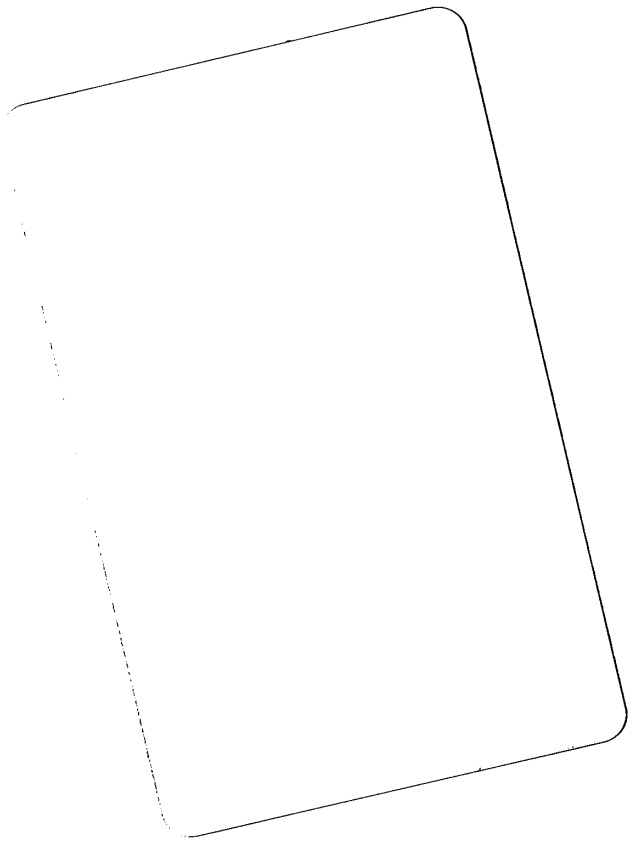
Sources:

As Table 1 (page 91)

Layard, PRG and Verry, DW *Cost functions for university teaching, Economic Journal,* March 1975.

Note:

It has been assumed that the additional medical student transferred from a physical science department (where undergraduate marginal cost is £1,230 p.a.) and had a 23.8 per cent chance of going on to do two years of post-graduate work.



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