Marginal analysis in practice: an alternative to needs assessment for contracting health care

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Prioritising health care services on the basis of total needs can lead to inefficient use of resources. A better option is to determine priorities by marginal analysis, which examines the effects of altering the existing balance of expenditure between health care programmes. Resources to support investment are released from disinvestments—that is, the strategy is resource neutral. Thus an increase in total health benefits is achieved independent of any gains that may result from increased spending on health. In 1989 the Welsh Health Planning Forum identified 10 health gain areas, outlining within each one where further investment was likely to produce health gains and where disinvestment might be considered. All Welsh districts then attempted, with varying degrees of success, to produce a resource neutral strategy. Mid Glamorgan further explored the possibility of using marginal analysis in producing its strategy and influencing its policy for contracting. Working groups for most health gain areas each proposed 10 programmes for investment and a further 10 for disinvestment, which were then evaluated by a core evaluation team. In the case of maternal and child health the team dropped 10 of the 20 proposals. The remainder were considered by the health authority, which dropped a further proposal. Nine of the original 20 proposals thus formally became policy for 1995.

As part of the process of creating the internal market in the NHS, health authorities and health boards were given responsibility for assessing the total needs of the populations they serve and advised to include these assessments as part of the process of setting priorities. Economists have long opposed prioritising on the basis of total needs for reasons given below, preferring an approach that focuses instead on the needs that are currently just failing to be met.[1,2]

This approach of analysing costs and benefits at the margin (marginal analysis) has been part of health economic thinking for many years, but its impact on decision making in the NHS has been minimal. This has been partly because of deficiencies in available data but more because the nature of decision making in the NHS was not conducive to the economic thinking on which marginal analysis is based. The changes introduced in the recent NHS reforms, particularly the new role of health authorities and health boards as purchasers, have led to renewed calls for use of marginal analysis in priority setting and purchasing.[3,4]

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Disadvantages of assessing total needs when setting priorities

The main problem in using information on total needs for setting priorities is the implication that priorities will be determined by the amount of need. The *Health of the Nation*, for example, advocates selecting key priority areas on the basis of the size of the health problem.[5]

Such an approach can be criticised (*a*) for tending to equate need with illness without taking account of the potential for patients to benefit from treatment or prevention and (*b*) for ignoring costs. For example, an illness with less total need (as determined above) may have an effective, low cost treatment while another with more total need may be less amenable to treatment and even then only at high cost. In this case a given amount of extra resources directed at the illness with less total need will produce more benefit than if it were directed at that with more total need. If maximising health benefit from available resources is a goal, then prioritising on the basis of total need clearly can lead to inefficient allocations of resources.

Principles of marginal analysis

Marginal analysis—economists' preferred alternative to total needs assessment—takes the existing pattern of expenditure of resources as the starting point and examines the effect of small changes to that pattern. It is based on five basic economic principles.

(1) Resources to improve health are scarce relative to need, which means that choices have to be made.

(2) Decisions on where to allocate resources (priorities) should be made on the basis of explicit criteria. One valid criterion is efficiency, which is about maximising the benefit from available resources.

(3) Allocating resources to one programme means sacrificing the benefit that the resources might have produced in another. In economics the cost of any programme is perceived in terms of benefit forgone (opportunity cost).

(4) The relation between benefits and costs depends on the amount of activity. Usually, the marginal (extra) cost of achieving an extra unit of benefit will rise as programmes expand and fall as programmes contract. For example, a small scale screening programme targeted at the highest risk groups may show a low cost per positive case detected. Continual expansion of the programme, however, will entail screening progressively lower risk groups or screening more frequently. The number of screens required to detect each additional positive case will rise, increasing the cost per case detected.

(5) Marginal analysis focuses solely on the extra costs and benefits of changes in expenditure of resources. It analyses the effects of shifting resources between programmes—that is, changing the balance of expenditure. Overall efficiency will increase when the marginal gain in benefit in the expanding programmes exceeds the marginal loss of benefit in the contracting programmes. As a result, marginal analysis identifies where additional resources should be targeted, where reductions should be made if expenditure must be cut, and how resources can be reallocated to achieve an

overall gain in benefit with no overall change in expenditure.

Marginal analysis in practice

In the *BMJ* in 1991 Donaldson and Mooney described a practical exercise that health authorities and health boards could use to put marginal analysis into practice.[6] This entails challenging the existing pattern of expenditure by grouping clinical activity into related areas and estimating the effects of increasing and reducing spending on various activities within each group by some specified amount.

Since then, several preliminary attempts at running this exercise have been reported (G H Mooney *et al* and N Craig *et al*, papers presented to Health Economists' Study Group, University of York, York, January 1993). Though a degree of success has been achieved, difficulties have been enountered

- In delineating clinical activity into relevant groupings
- In identifying current expenditure and estimating the marginal cost of expansions and contractions
- In selecting appropriately representative working groups to conduct the exercises
- In getting the groups to accept certain economic principles alien to their way of thinking, particularly, that small losses in benefit could be sacrificed in exchange for larger gains in benefit.

Wales as ideal setting for marginal analysis

Recent developments in health care planning in Wales suggested that Wales could be the ideal setting to put marginal analysis into practice. Before *The Health of the Nation* was published in England the Welsh Health Planning Forum had produced *Strategic Intent and Direction for the NHS in Wales*, which identified 10 "health gain areas" (clinical groupings).[7] This was followed by 10 accompanying protocols for investment, which outlined where further investment was most likely to achieve gains in health and where current practices were of questionable value and disinvestment might be considered.

As part of the process of implementing the Welsh forum's strategy, the Welsh Office instructed all Welsh districts to produce a local strategy for health gain. The document was to identify areas for investment and disinvestment on the principle that the strategy should be overall resource neutral—that is, resources to support investments were to be released from disinvestments.

The advantages of applying marginal analysis to the NHS in Wales are obvious. Firstly, areas of related clinical activity (health gain areas) had already been defined, although authorities could alter these if they wished.[7]

Secondly, although they were not specifically instructed to do so as part of the local strategies process, several districts had already produced programme budgets that divided total expenditure (district health authority plus family health services authority) into the health gain areas. The table shows such expenditure for Mid Glamorgan for 1993-4.[8]

Expenditure (£m) in Mid Glamorgan health district in 1993-4 in identified health gain areas[8]

Health gain area	District health authority	Family health services authority	Total
Cancers	16·7	1·9	18·6
Cardiovascular disease	30·4	15·7	46·0
Maternal and early child health	25·8	1·8	27·6
Physical and sensory disability	20·8	12·0	32·8
Pain, discomfort, and palliative care	25·2	21·3	46·5
Oral health	4·6	9·7	14·3
Respiratory diseases	14·5	14·8	29·3
Injuries	18·2	0·8	19·0
Learning difficulties and disabilities	13·8	0·1	13·9
Mental health	35·0	3·4	38·4
Healthy living	5·0	3·2	8·2
Healthy environments	7·9	5·6	13·5
Other*	24·0	4·8	28·8
Total	241·9	95·1	337·0

*Activities not allocated to any of the 12 identified health gain areas—for example, emergency surgery.

Thirdly, each health gain area already had a working group of about 20 people from a wide range of professional, managerial, and voluntary and other lay groups, including community health councils.

Finally, the districts were under instruction from the government to produce resource neutral strategies. This made it easier to accept the principle of examining the current balance of expenditure between activities —a concept alien to conventional thinking.

First stage in Mid Glamorgan: expert groups

A pilot exercise was conducted with the Maternal and Early Child Health Working Group to determine whether the procedure was worth repeating in other health gain areas and to determine the extent to which Mid Glamorgan Health Authority wished to commit itself to marginal analysis as a mechanism for setting priorities and for purchasing.

The working group comprised 18 people, including three consultants (in obstetrics, paediatrics, and public health medicine), a general practitioner, a senior nurse, a supervisor of midwives, a paediatric liaison officer, two health promotion officers, and representatives from the community health council and the National Childbirth Trust. Also participating were seven senior officers of the health authority, including the chief administrative medical officer, the director of business services, and the director of service development. A representative from the Welsh Office attended as an observer.

IDENTIFYING AREAS FOR INVESTMENT AND DISINVESTMENT

The aim of this first stage was to identify potential areas for investment and disinvestment. This was achieved in a one day seminar, whose first two hours were devoted to an explanation of the principles of health economics on which the exercise is based. This was later judged to have been an indispensable part of the process as it helped the group to accept the unfamiliar concepts; non-acceptance of these principles having bedevilled other attempts to apply marginal analysis (G H Mooney *et al* and N Craig *et al*, papers presented to Health Economists' Study Group, University of York York, January 1993).

Equipped with information on how expenditure on maternal and early child health was currently deployed, the group was asked to identify potential candidates for expansion if overall funding was increased and potential candidates for contraction if overall funding was reduced. They were also asked to take into account the recommendations in the relevant protocols for investment document from the Welsh Health Planning Forum.[7]

Although it had no difficulty in suggesting areas for investment, the group was understandably uncomfortable with suggesting areas for disinvestment. Group members were naturaly reluctant to consider disinvesting in beneficial activities, and only interventions suspected of doing virtually no good to anyone initially emerged as candidates for disinvestment. When the economic principles were reinforced, however, the group became increasingly aware that relatively small disinvestments in beneficial activities might mean only small marginal losses in benefit. For example, reducing the number of ultrasound scans to pregnant women at low risk of having a malformed fetus might free resources with little marginal loss of benefit.

It was further emphasised that identifying a candidate for disinvestment did not imply a belief that current provision was excessive. The group was not recommending reductions but simply identifying which activities might be considered if reductions were to be made.

A target of 10 candidates for expansion and 10 for contraction was sought. The group was free to apply whatever criteria it thought was appropriate, bearing in mind that political or other considerations might make some possible candidates unacceptable. When, as expected, the list for expansion grew beyond the target of 10, group members were asked to vote on which to drop.

A certain amount of coaxing was inevitably needed to get the list for contraction up to 10. The full list is shown in the box.

APPLYING ECONOMIC PRINCIPLES

The group was then asked to estimate the effect, in terms of both workload and health, of an expansion by £100 000 for interventions on the investment list and by a similar amount for interventions on the disinvestment list. The assistant director of finance gave estimates of what this meant in terms of numbers of staff, numbers of treatments, etc, on the basis of current costs. Clearly, an alternative would have been to postpone the next part of the exercise until a detailed costing of expansion and contraction plans could be made, but it was felt that reasonable estimates could be made on the spot and that the advantages of keeping the momentum going were more important than having the greater accuracy of detailed costings.

To ensure that the group felt comfortable that this economic exercise represented a net gain in benefit it was asked to imagine that a £100 000 reduction in each activity on the list for disinvestment had already occurred and what they would do if an additional £100 000 now became available. The choice was between restoring anything from the list for disinvestment to its former level or expanding anything on the investment list. This was repeated 10 times.

This was the end of the group's participation in the exercise, but it was kept regularly informed of subsequent progress and invited to comment on later stages of the exercise.

The group confirmed that if the proposed package of investments and disinvestments went ahead the result would be an increase in overall health gain with no increase in cost.

Second stage in Mid Glamorgan: core evaluation team

The second stage was to identify and weight criteria for benefit that could be applied to all interventions on both lists. Since the intention was to conduct this exercise with more than one working group, it was felt that a consistent set of criteria and weights should be applied in each exercise. A core evaluation team representing senior medical and nursing professionals, planners, general practitioners, and community health councils was set up for use in this and all subsequent exercises.

The criteria used in the evaluations were evidence of effectiveness, distance from national target, numbers of patients treated, whether the intervention was centred on people, the severity of the condition, and extent of jurisdiction of health authority. An attempt to attach weights to these criteria was abandoned when no semblance of a consensus emerged. The criteria were therefore not weighted, which of course implies equal weighting. This is arguably the element of the exercise most open to criticism and is currently being reviewed.

The core evaluation team scored the identified proposals against these criteria and, using additional information from research undertaken subsequent to the exercise, identified five clear winners and five clear losers (box). In order to be as non-controversial as possible recommended reallocations were restricted to these.

Proposals for investment and disinvestment in maternal and early child health

Investment proposals

- Health education for children*
- Fetal assessment unit*
- Support for emotional ill health during and after pregnancy*
- Promotion of breastfeeding*
- Child abuse intervention service*
- Targeted family planning
- Identify, target and support of women with high risk pregnancies
- Continuity of care
- Counselling (termination, stillbirth, genetic, etc)
- Community and primary care for children

Disinvestment proposals

- Clinics for childhood surveillance*
- Less duplication of family planning services by health authority and in general practice*
- Increase interval between cervical screens*
- Subfertility services*
- Parent craft classes, etc*
- Admissions to units other than district general hospitals for delivery*
- Antental care for women with low risk pregnancies
- Admission of children to hospital for reasons not based on clinical need
- Number of ear, nose, and throat operations of questionable benefit and length of stay
- Generic prescribing and development of joint formulary for both health authorities

*Subsequently dropped by core evaluation team and joint meeting of health authorities.

Although there were inevitably criticisms of certain aspects of the exercise, the overall view was that it had been successful. It was decided to repeat the process with three other working groups (cancers, respiratory diseases, and cardiovascular disease) before presenting results to the health authority. In addition, since a commitment to this approach to planning entails a change in the culture of the organisation, chief executives and authority members were to be invited to attend subsequent exercises as observers.

Becoming formal policy

In September 1993 a special joint meeting of the district health authority and family health services authority was held to discuss the marginal analysis exercises of the four working groups. As not all the people at the meeting had attended the exercises, the first part was devoted to an explanation of the principles of health economics.

Again there was a consensus—felt especially strongly by the non-professional members of the authority—that this was invaluable to understanding the process and interpreting the results.

Although unanimity of opinion was neither expected nor achieved, the overall view was that the exercises had been worth while. Marginal analysis, however, is based wholly on an attempt to improve efficiency and

efficiency is not the only criterion for prioritising: members had to take other factors into account. As a result one additional proposed disinvestment was dropped from the proposals for maternal and child health, but it was agreed that the remaining nine recommendations would be formally incorporated into the next strategy document and would apply to contracts from 1995 (box). This is probably the first time that applied marginal analysis has directly influenced strategic planning in the United Kingdom.

The exercise has since been repeated with four more working groups, but the most difficult part of the overall process remains to be attempted. Each of the eight completed exercises entailed changing the balance of resources between the programmes of a single health gain area. The final exercise, which will involve shifts between health gain areas, will be undertaken at an, as yet, unspecified date.

Recently, the results of two additional applications of marginal analysis have been reported—one on services for elderly people with dementia in Aberdeen[9] and the other on gynaecology services in Glasgow.[10] Greater Glasgow Health Board has now indicated that the results of the gynaecology exercise will become policy, and the exercise is being extended to urological, diabetic, and stroke services.

Conclusion

The experience of Mid Glamorgan District Health Authority shows that marginal analysis is not only attractive in theory but useful in practice. Two points are especially worth noting.

Firstly, because the process entails value judgments the composition of the groups needs to be considered carefully. The ideal group depends on the nature of the programme. For example, small intimate groups worked effectively for health gain areas such as oral health and pain, discomfort, and palliative care. For learning difficulties and disabilities, however, the greater number of agencies with vested interests meant that a larger group with broader representation was required. That group included 10 representatives from social services, two representatives from voluntary organisations, and three people who used the services, in addition to 20 others employed by the health authority.

Secondly, judgments of the values attached to marginal gains and losses depend on a knowledge of local circumstances. For example, the proposal to consider disinvestment in the admission of children to hospital for reasons not based on clinical need was made in the knowledge that in some areas of Mid Glamorgan more than the average number of children are admitted for social reasons. Disinvestment might therefore be achieved without affecting admissions based on clinical need. This recognises that the marginal loss of benefit from reduced admissions for social reasons and for clinical reasons can differ. Similarly, local knowledge is needed to predict public, professional, and other responses to the changes.

Marginal analysis is clearly not a panacea and does not solve the problems of measuring benefit or of having incomplete or inaccurate data. It does, however, at least ensure that decisions are made about the right things and within the correct framework. Because of its focus on benefits and costs on the margin, it is a superior aid to efficient service planning than is total needs assessment and can lead to greater efficiency in the contracting process.

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Commentary: Possible road to efficiency in the health service

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The NHS at last seems ready to use economics as a framework for setting priorities. Cohen points to two main reasons why this is the case. Firstly, the advent of the purchaser-provider split has, among other things, led to a clearer definition of roles; explicit priority setting is now less easily avoided by purchasers. Secondly, some sensible person in the Welsh Office has offered guidance on how to set priorities. This process requires the use of economics techniques. Will England and Scotland follow suit?

The data free environment of the NHS should not prevent the use of economics as a framework within which less tangible costs and benefits are included alongside those which are tangible. This allows explicit observation of the trade offs made as a result of decisions to expand or contract a service. Cohen's work is an important example of such use of the economic framework.

The economics approach is not, however, free of problems.

TIME

Marginal analysis takes time. A team approach is required, with a change in focus from firefighting to more considered analysis carried out in enough time to be relevant to setting contracts.

RESPONSIBILITY

Marginal analysis is multidisciplinary. This is a strength as all perspectives are considered. Responsibility for such exercises, however, must be allocated to one or two people. Otherwise, each discipline will revert to focusing on day to day tasks within its own function, and the exercise will flounder.

DISAGGREGATION OF DATA

Collection of information in the NHS is not geared up for marginal analysis. It is often difficult to disaggregate data. The fact that marginal analysis exposes this is useful, and, as Cohen has shown, good estimates can still be obtained without delay. It is also important

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