THE COST-BENEFIT APPROACH

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There are not, and probably never will be, enough resources to satisfy the community’s desires for things that improve the quality of life. This poses the necessity for choice, and hence the consideration of priorities. In the medical field two distinct kinds of choice arise: one at the clinical level and the other in the planning process. At the point of contact with a particular patient, a doctor’s duty is to do the best he can for that patient within the confines of existing knowledge and facilities. In the planning process, on the other hand, the concern is with large groups of potential patients at some future date, and with decisions that will to some extent determine what the confines of existing knowledge and facilities will be at that date. The planning process is my concern here and, in particular, one important, and increasingly wide-spread, approach to the problems that arise within it, namely, cost-benefit analysis.

1. What is the Essence of the Cost-Benefit Approach?

Cost-benefit analysis rests on the proposition that we should provide services only if their benefits outweigh their costs. In subscribing to that view, however, we (perhaps unwittingly) commit ourselves to the following set of propositions: (i) it is possible to separate one service from another service in a sensible way; (ii) there is the possibility of choice between them; (iii) it is possible to estimate the outcomes associated with each alternative service; (iv) it is possible to value these outcomes; (v) it is possible to estimate the cost of providing each service; (vi) these costs and benefits can be weighed against each other; and (vii) we should cease providing those services the costs of which outweigh the benefits.

The technical problems of cost-benefit analysis lie in establishing propositions (i) to (vi). If these are resolved satisfactorily, item (vii) is merely a test of society’s belief in the basic principle. In this section I shall consider items (i) to (vi) in turn.

i. The separation of one service from another is the essence of analysis, and there can be no single correct way of doing it. Differing systems of separation will give different insights, and in the present context they are to be judged by their usefulness for health services policy. Thus, whether it is more useful to separate patients by disease, specialty, location, age, sex, weight, and so on, depends on the problem in hand. Often it will not be possible to know in advance which classification scheme is going to be the most fruitful, and abortive analyses may add to our knowledge just as much as successful ones. Also involved is the general problem of “project definition”, i.e., establishing the boundaries of the analysis.

ii. People frequently adduce the alleged impossibility of choice as a reason for not conducting analysis. However, what they are usually saying is that if certain assumptions are accepted there is only one logical outcome, hence no possibility of choice. In my experience it has yet to be the case that the logic is so restrictive that it tells you precisely, for example, how much of a particular service should be given. Usually, there is room for manoeuvre over “how much?”, or “how soon?”, hence the necessity for choice through the setting of priorities. But the analyst usually needs to go beyond this kind of exploration and challenge all or some of the assumptions themselves; one of his objectives should be the creative one of broadening people’s horizons as to what is possible and prima facie worth considering.

iii. The cost-benefit analyst (usually an economist) has to rely on the expertise of other groups. In the medical field, he needs to know what will be the likely consequences of one intervention rather than another (where the latter can mean doing nothing). Here cost-benefit analysis can encompass what is known to medical science, but it cannot be expected to make good what is not known. It may be possible to deal with ignorance here by making alternative assumptions about efficacy in order to see whether intervention is justified. It can also play a useful role, by indicating more clearly what needs to be known, and in what form, if particular policy issues are to be better illuminated. It may even be possible to establish some rough order of relative social values for some kinds of new knowledge compared with others. But cost-benefit analysis cannot supply answers to technical medical questions, since that is the role of medical science. What it can, and does, stress is that, in matters of health services policy, medical knowledge alone is not enough (see section 2).

iv. Whether a cost-benefit approach is adopted or not, valuation is inescapable. Much of the valuation of benefits is implicit, concealed in some broad judgement about priorities, or deeply embedded in some index or scaling mechanism designed to act as a measure of the seriousness of a condition. Since cost-benefit analysis is concerned with medical or humanitarian benefits (in terms of improved social function, absence of pain and distress, and a sense of being cared for) as well as with the more material benefits (the productive capacity of working individuals, new patients), we also need to find some way of bringing the two together.

v. Here cost-benefit analysts have a highly distinctive stance, derived from one of the fundamental principles of economics, namely that cost means “foregone benefit”; in common-sense terms, the cost of any service is what you sacrifice in order to obtain it. Hence in economics it is known as “the doctrine of opportunity cost”. Thus the cost of any kind of medical intervention is represented by the value (in the best alternative use) of all the resources so employed. This may or may not be accurately measured by what (if anything) is actually paid for them, so it must not be assumed that “opportunity cost” and “cash expenditure” are interchangeable. Herein lies a great deal of the distinctive contribution of cost-benefit studies to public policy, resting on some very complex technical analysis to which I cannot do justice here (see Dasgupta & Pearce, 1972; Layard, 1972), but some glimpses of which will be provided later in this paper.

vi. The final hurdle is the proposition that if costs and benefits are to be weighed one against the other, they must be
made commensurable. This implies that, if costs are to be measured in money terms, then benefits must be measured in money terms too. This prospect stirs deep emotions in many people, who seem to prefer matters of relative valuation to be left obscure (Williams, 1973). But decisions that are never systematically analysed, never confronted and compared with evidence from other related fields, are likely to become haphazard, and hence the strong drive in cost-benefit studies to find suitable bases for comparison across different fields of public policy (e.g. between improved health and road safety or the reduction of occupational hazards) as well as between apparently similar decisions within any one field.

Another aspect of the cost-benefit comparison that needs stressing is that cost-benefit studies stress the simple truth that the decision whether or not to pursue a particular course of action depends on both costs and benefits. Yet we see far too many recommendations based on assertions that \( x \) is cheaper than \( y \) (without adequate consideration of relative benefits) or that \( x \) is more effective than \( y \) (without adequate consideration of relative costs). Accountants are prone to perpetrate the former fallacy, and medical men the latter, and if the cost-benefit approach did no more than keep these errors in check it would have made a valuable contribution to clearer thinking!

2. Is Cost-Benefit Analysis Applicable to Health Services Policy?

In principle, cost-benefit studies are appropriate wherever resource-allocation decisions have to be made; and this leaves most of the field of human choice susceptible to cost-benefit analysis. In practical terms (since such studies are costly) the potential benefits of analysis are not likely, in many cases, to outweigh the costs; hence, cost-benefit studies should be concentrated where the reward is likely to be greatest. Among the ingredients by which I would seek to identify such areas of choice would be that (i) sizeable amounts of scarce resources are at stake; (ii) responsibility is fragmented; (iii) the objectives of the respective parties are at variance or unclear; (iv) there exist acceptable alternatives of a radically different kind; (v) the technology underlying each alternative is well understood; and (vi) the results of the analysis are not wanted in an impossibly short time. Items (i), (ii), (iii) and (iv) on this list specify situations in which the potential benefits from a cost-benefit study would be great. Items (iv), (v) and (vi) ensure that the analyst would have something worth while to consider.

In reality one never expects to see all these desiderata fulfilled simultaneously, so one has to decide whether the scope for analysis and the available material are promising enough to justify the time and effort involved—compared, of course, with the alternative uses of scarce analytical talents. Some problems will be worth only a short and simple exercise, others will warrant million-pound exercises of the most elaborate and sophisticated kind, and both may legitimately be termed “cost-benefit studies” if they conform to the general rubric set out at the beginning of section 1. But it will be important here not to place greater weight on the results of any particular study than it can legitimately sustain. As with every systematic investigation, interpretation and generalization remain a skilled and dangerous business, which the analyst, writing up his results, cannot fully anticipate. Hence everyone needs to develop a basic critical faculty with respect to such studies.

There are plenty of problems arising in the health services which are prima facie susceptible to cost-benefit analysis, even within my more restrictive version of the terms of reference. Leaving aside the many choices that have to be made which are not peculiar to health services as such (e.g. in the general fields of catering, domestic services, engineering and building), there are important decisions concerning different types, places and times of treatment for a particular condition, and priorities for treatment within a particular condition and between conditions (or patients). Each of these generates needs for similar types of data, and, even conceptually, they are not so dissimilar as they appear at first sight. They give rise to the need for more fundamental studies, concerned to elucidate certain common problems, such as the notion of cost that is appropriate for a particular context of choice, and how the effectiveness of health care systems can be measured. (See section 3.) Initially, a few examples will be given of actual studies that have been published.

The choice between different types of treatment is, I suppose, one of the classic problems of medicine. It has been studied recently, for instance, in a cost-benefit framework, with respect to such problems as those posed by varicose veins and chronic renal failure. In the case of varicose veins, the medical benefits for the population selected were found to be much the same from two kinds of treatment—surgery and sclerotherapy and surgery—hence the choice turned on their respective costs (Piachaud & Weddell, 1972). It was assumed that all the costs of injection-compression sclerotherapy were avoidable (and hence relevant) and were accurately measured by their money costs to the health services. Since the alternative, surgery, involved the use of a fair proportion of common facilities, cost allocation was based on average (non-medical) costs for each day in hospital plus a specific assignment of medical, surgical and nursing costs, again based on what the health services pay for these resources. No estimate was made of the cost to patients, but it was argued that since this would be higher for surgery than for injection-compression sclerotherapy, and, since the latter was in any case the cheaper form of treatment, this omission reinforces the conclusion that it would be to everyone’s benefit if the majority of patients were treated in out-patient clinics by injection-compression therapy. The standard analytical device of holding benefits constant, thus converting a cost-benefit study into a cost-effectiveness study, is acceptable provided that (i) the alternatives really do generate the same benefits and (ii) one is not interested in finding out whether anything at all should be done, since it is quite possible that, even for the least costly alternative examined, the costs exceed the benefits.

A study on chronic renal failure (Klarman, Francis & Rosenthal, 1968) in the USA goes one step further in terms of benefit evaluation, by taking years of life expectation as the relevant unit and measuring the effects of various treatments (kidney transplants vs. renal dialysis) upon it, recommending that treatment which provides a year of additional life expectation at the least cost. Benefit (in extra years of life) was roughly adjusted for “quality”, transplantation yielding a higher quality of life than dialysis, so the latter was regarded as worth 0.75 of the former. As regards costs, we still have preponderant attention given to actual expenditures on medical services, and relatively little to other costs (such as loss of output caused by patients’ being unable to work, additional

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1 See section 1c, p. 245, of the paper by Adler, Dunnell & Weddell in this Bulletin.—Ed.
family expenditures, and loss of leisure time). The study also worked with average data for a hypothetical cohort of 1000 people with chronic renal failure, whereas it is likely that the medical effectiveness of the respective treatments would be worse than average at the margin (if the patients with the best prognosis are taken first) and the costs of providing more or less treatment would differ from the average for the group as a whole (depending on whether there are economies of scale). The conclusion was that "... transplantation is economically the most effective way to increase the life expectancy of persons with chronic kidney disease." The method adopted does not, however, enable us to tell whether any transplantation at all is justified, compared with other possible uses of these resources.

Both these examples involved differences in the place of treatment as well as in its type. Indeed, there is some discussion in the study by Klarman et al. (1968) of the relative merits of hospital dialysis vs. home dialysis, with the latter showing up much better on grounds of cost. That this was so was probably partly owing to the non-inclusion of some relevant costs, as is hinted at in the conclusion:

... that one limitation on the performance of dialysis at home is the condition of housing. Accordingly, it may be desirable to consider alternative ways to improve the housing of patients with chronic renal disease and their families.

A study which tackles institutional care vs. domiciliary care more directly is that on the care of the elderly, commissioned by Essex County Council (Wager, 1972). Here a key concept was an "index of incapacity" based on 14 different components which cluster into five groups relating to sensory perception, intellectual processes, personal care, physical mobility and domestic duties. By scoring points for these components, "clients" are classified according to five grades of incapacity (none, slight, moderate, substantial and severe); the study shows that those with moderate incapacity, or less, account for about half of all applicants for places in the local authority's welfare homes, and for them domiciliary support is, in principle, a viable alternative. The study makes the important observation that the accommodation occupied when domiciliary care is being offered is usually not without cost to the community (quite apart from the costs—material and psychological—falling on the family itself). Estimates of the cost of such accommodation showed that it was likely to be higher for old people living alone in ordinary houses than for an old person living with others, since only the marginal (additional) resources used directly by that person would be released for other purposes. The study suggests that there are significant potential economic savings to the community through making small purpose-built dwellings available to elderly people at present living in larger dwellings which have become too big for their needs.

The benefit to the community's housing problem arises irrespective of whether the accommodation released is local authority or privately owned; this suggests that the optimum use of the community's housing resources is not served by the practice... whereby some local authorities do not consider applications for accommodation from owner-occupiers (Wager, 1972, p. 59).

Turning next to alternative times of treatment brings us into the field of preventive medicine. Following a general survey of the field (Pole, 1968), a particular example pursued in greater depth was mass radiography (Pole, 1971, 1972). As regards the benefits of early detection, it is observed that:

... the whole relationship between the existence of a primary active case and the existence of a secondary case requiring treatment, though complex, can be described by a series of interrelated but unknown probability distributions (Pole, 1971).

In the absence of a better understanding of the underlying epidemiology, a range of assumptions is made. The costs of a case are then estimated and the saving of such costs is taken to be the benefit derived from preventing the occurrence of that case. It is found that, even on the most favourable set of assumptions, the costs of mass miniature radiography are twice the amount of the expenditure needed for treatment of the patients. From this it is guardedly concluded "... that this analysis does not tend to show that the decision to abandon mass screening for pulmonary tuberculosis was mistaken" (Pole, 1971). Prevention is not always better than cure!

I have cited two final groups of alternatives—between different subjects for treatment, either within or between conditions—because I have come across few cost-benefit studies in the health field which tackle them directly. As regards road safety, there have been attempts to rank widely different measures in the order in which they would contribute to casualty reduction, but I believe that nothing comparable has been done for the closely allied field of preventive medicine, or for general medicine. Yet it seems to me to be one of the central problems for the setting of priorities in medical care, and frequently has economic undertones. The death or incapacity of a young productive individual costs the community more than that of an inactive person with short life expectancy, and one of the excruciating, but inescapable, issues of health services policy concerns the relative values to be attached to the "humanitarian" and the "material" benefits and costs involved in medical care; and on the resolution of that issue will depend the operational priorities of the system.

3. How are Benefits and Costs to be Measured?

A variety of benefit measures have been used in the studies cited. In debates on health services policy, indicators such as doctors/1000 population, beds/1000 population, costs/day in hospital, costs/patient, perinatal mortality, and life expectation at birth are all used as criteria of success (or failure). If it is accepted that the objective of health services is to improve health, then only the last pair of indicators is really a measure of the output (i.e., effect on health) of the system, the first pair relating to inputs (resources used), and the middle pair to throughput (amount of work done). Unless one can be convinced that more input of doctors and/or hospital beds automatically generates more good health, or more patients, then one had better stick firmly to indicators that relate directly to health conditions of people.

Morbidity statistics are of some help here, but only indirectly, since it is well known that the degree to which people suffer from any condition varies widely. It seems therefore advisable to concentrate on indicators of social functioning as the key to benefit measurement. This means going further down the road pursued tentatively in the Essex study cited in section 2, and building up some generally acceptable set of criteria, perhaps incorporated in an index of health, which becomes the touchstone for comparative evaluative studies in the health field.

Even then it will still be necessary to confront the issues of relative valuation of outcomes. At present these tend to be
resolved by experts exercising their judgement, and it is likely that this will continue to be the prop on which we lean for a good while yet. But ultimately these relative valuations, be they weights in an index, scores in an assessment schedule, or operational decisions that $x$ shall and $y$ shall not qualify for a particular "treatment", must be recognized as statements about health services policy and be accepted according to criteria that society has approved. They must first be systematized and made explicit.

Already, routine ways of measuring the extent of functional disability and adverse psychological effects of various conditions, and the changes that occur with and without treatment, are being devised by people in the field responding to the need to overcome particular clinical problems concerning assignment of treatment. An assessment schedule, designed to be administered once only at some stage of a diagnostic process, could be adapted for routine monitoring or follow-up, and be transmuted into a measure of effectiveness. It is but a short (though difficult) step further to get the various health conditions of people ranked in order of goodness to badness. At that stage we have the problem of benefit measurement essentially solved (see Culyer, Lavers & Williams, 1971). The remaining problem will be that of finding enough common elements in the scales used in different places and for different conditions to enable one to synthesize a more general health index.

All this is necessary and valuable whether or not we go to the final step of attaching explicit monetary values to health states. The acceptance of the fact that an additional year of healthy life is intrinsically worth, say, £1000, no matter to whom it accrues, would probably lead to a much finer, humanitarian, and egalitarian health service than we have at present, and does not imply that the pursuit of profit rules all, since my supposed figure of £1000 is merely a precise expression of what society should be prepared to devote to the cause of increasing expectation of healthy life, irrespective of these financial considerations! I fear that the reluctance of well-meaning people to accept this part of the logic of cost-benefit analysis makes them more likely to defer costs rather than to incur them early on. To take account of this we usually apply a discount rate (say 10% per annum) to the respective streams, which has the effect of reducing the value of more distant costs and benefits relative to those nearer to the present time. There is much dispute as to what should be the proper basis for calculating such a rate and as to the appropriate rate itself—though for most decisions on public expenditure this discussion is effectively short-circuited by a Treasury ruling saying what rate shall be used. However, since the balance between benefits and costs can be very sensitive to the discount rate used, this deserves more consideration than it frequently gets in cost-benefit studies.

### 4. Is it All Too Difficult?

Enough has been said to indicate that there is more to cost-benefit analysis than generalized discussion of advantages and disadvantages. It represents the outcome of much hard thinking about what is involved when we seek a systematic answer to the question: Do the benefits of a certain action outweigh the costs? It proves to be a very difficult problem even to formulate the question satisfactorily, and attempting to answer it frequently impresses one with the vast area of

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ignorance that pervades even quite commonplace activities. At this stage, therefore, the weak-spirited usually abandon the cost-benefit approach as too demanding, and return with relief to more comfortable ways.

The trouble with the more comfortable ways is that they foster the illusion that, if cost-benefit analysis is not done, the issues which it poses can be avoided, whereas the reality is that these issues are all still present, and they all still have to be resolved. If health services planning is not to be based on the principle that unwitting decisions are likely to be better than witting decisions, then the cost-benefit approach must become a part of every decision maker's intellectual equipment. As a homely contribution to the furtherance of that worthy cause, I offer the following "check-list" of basic questions that should be asked every time anyone makes a studied recommendation about use of resources. If it is impossible even to discern any material relevant to the questions, be especially on your guard, since the questions will have been answered by making assumptions which may be unrealistic, and/or unsupported, and/or unacceptable.

A basic check-list of questions runs as follows:

1. What precisely is the question which the study was trying to answer?
2. What is the question that it has actually answered?
3. What are the assumed objectives of the activity studied?
4. By what measures are these represented?
5. How are they weighted?
6. Do they enable us to tell whether the objectives are being attained?
7. What range of options was considered?
8. What other options might there have been?
9. Were they rejected, or not considered, for good reasons?
10. Would their inclusion have been likely to change the results?
11. Is anyone likely to be affected who has not been considered in the analysis?
12. If so, why are they excluded?
13. Does the notion of cost go wider or deeper than the expenditure of the agency concerned?
14. If not, is it clear that these expenditures cover all the resources used and accurately represent their value if released for other uses?
15. If so, is the line drawn so as to include all potential beneficiaries and losers, and are resources costed at their value in their best alternative use?
16. Is the differential timing of the items in the streams of benefits and costs suitably taken care of (e.g. by discounting, and, if so, at what rate)?
17. Where there is uncertainty, or there are known margins of error, is it made clear how sensitive the outcome is to these elements?
18. Are the results, on balance, good enough for the job in hand?
19. Has anyone else done better?

The last two have been added because I do not want to be accused of advocating a counsel of perfection. Decisions do have to be made, and will continue to be made, on the basis of imperfect knowledge. But I am anxious to ensure that we know how little we know when we do what we have to do. Let me quote again here my favourite story about Maurice Chevalier, which I regard as very apt to the cost-benefit approach to life generally. When asked by someone how he viewed the prospect of old age, he is alleged to have replied: "Well, there is quite a lot wrong with it, but it's not so bad when you consider the alternative."

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