Economic Evaluation:
Theory, Methods & Application

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1. Introduction

Resources are scarce, and consequently it is necessary to have an economic evaluation of various health care interventions. To allocate resources in an efficient way, prioritisation is needed. In this context different methods have been developed for economic evaluation purposes to help guide decisions and affect policymaking.

In the provision of health care, prices usually do not appear and this raises the need for other ways of measuring the value of this service. To measure the benefits of a programme or policy is not easy, the reason being that the players in the health care market, i.e., the demanders and suppliers, do not have the possibility to act as if they were in an ordinary market situation. Aspects of equity and access to treatment also have to be considered.

What characterises health care as a commodity is that the individual, i.e., the patient, who demands health care does not know most of the time what to ask for. The relationship between the physician and the patient, can be described by the principal-agent model (29), where the physician acts as an agent for the single individual (the patient becomes a principal) since information is asymmetric. Other market imperfections such as externalities, monopolies and also uncertainty about future health make the determination of a price/value for this type of services difficult and make the evaluation of health care interventions troublesome.

In this paper the framework of modern economic theory is considered. First the background in economic theory and methods for the measurement of value and the determination of a price for a good is illustrated. The optimal allocation and distribution of resources have been analysed within the welfare economic framework, in particular, Pareto-based approaches. These are explained and related to economic evaluation.

Different types of analysis and their use as decision tools are discussed. Finally, the reasons why the use of economic evaluation for the purpose of decision making and priority setting could be more widely used at present than it is, when influencing decisions concerning resource allocation to health care programmes, are examined.

2. Value

Adam Smith, in his book *The Wealth of Nations*, laid out the argument that the principal human motive is self-interest, that the invisible hand of competition automatically transforms the self-interest of many into the common good, and as a consequence, the best government policy for the growth of a nation's wealth is that policy which governs least (81). This insight, amongst others, has lead many writers to regard Adam Smith as the founder of 'political economy' as an intellectual pursuit. He was clearly concerned with the determination of 'value' from an economic viewpoint. Adam Smith struggled with the 'paradox of value in use and value in exchange', since he did not have the tools to distinguish between total and marginal utility. These tools were to arrive with the 'marginalist revolution' starting in the 1870s (79).

As explained by Rhoads (70), when looking at water and diamonds, water is of high value in use, without water we could not exist. Diamonds, on the other hand, are of no importance for our existence, but have nevertheless a higher value than water in exchange. The total utility of water exceeds that of diamonds. The question is not whether water or diamonds give more utility in total but whether more of one gives a higher additional utility than more of the other. Marginal utility will depend on how much of each good or service we already have. The price of diamonds is higher than

the price of water since people value diamonds highly at the margin and there is a low supply of diamonds, because of scarcity. Choices, thus, not only reflect core values or preferences, but also relative scarcity, that is, a weighing of marginal utility and marginal cost of the alternative opportunities before use.

With this revolution we entered the period now called 'neoclassical economics' which has been able to confirm, in a formal sense, Adam Smith's insights concerning the working of markets. Like much of modern economic theory, Smith's ideas can be set in the context of a Walrasian general equilibrium model, although, of course, this model was first developed many years after Smith published his book. Walras, a key figure in the marginalist revolution, established the notion of what is now called 'general equilibrium' (8;45). Economists such as Lerner (48), Lange (47) and Arrow (4) followed up this work; and it was the Arrow-Debreu conditions (5) describing the general equilibrium model of an economy with the first satisfactory existence theorem, concerning the existence of a competitive economic equilibrium, that supported Smith's argument.

In the theory behind the general equilibrium model it is assumed that all individuals in the economy are price-takers, no one is significant enough to influence price individually. Each individual chooses a consumption bundle, under the restriction of his budget constraint, that maximizes his utility. Each firm chooses its input-output vector to maximize profits under the restriction of its production constraint. The individual only cares about his own utility and the firm only about its own profit. The prices in the market contain information about desire, i.e., demand, and scarcity, i.e., supply. In the model, prices adjust until equilibrium is reached, that is until supply equals demand, and the price thereby reflects the market's valuation of the good.

Assume we have two individuals A and B and two goods 1 and 2 involved in the

market. x^1_A describes individual A's consumption of good 1 and x^2_A individual A's consumption of good 2, that is x^1_A and x^2_A are individual A's demand functions for good 1 and 2, respectively. Similarly, we have for individual B the notations x^1_B and x^2_B. w^1 represents the endowment of good 1 and w^2 the endowment of good 2. The equilibrium model can then be described in a more formalised way with help from the following equations (83)

$$x^1_A(p^*_1,p^*_2) + x^1_B(p^*_1,p^*_2) = w^1_A + w^1_B$$

$$x^2_A(p^*_1,p^*_2) + x^2_B(p^*_1,p^*_2) = w^2_A + w^2_B$$

Equilibrium is then represented by the set of prices p^*_1 and p^*_2 such that total demand equals total supply for each good respectively.

Neoclassical economists felt that they had 'solved' the problem of value: in a free competitive market without imperfections such as externalities, asymmetric information or monopolies, the value of a good or service is assumed to be reflected by the market price of that good or service. We need to explore further the implications of this approach.

3. Price

In the market with free competition the price of a good will reflect the equilibrium situation where demand equals supply. Hence, the price reflects the marginal utility that people experience from receiving the good. It is assumed that individuals value an additional unit less than the earlier units (i.e., marginal utility is diminishing), in other words the individual would pay more for the first unit of a good than for the

subsequent units. A demand curve therefore indicates how much individuals are willing to pay for various quantities of a good. As a consequence the area under the demand curve describes society's willingness-to-pay for a given good, and the net benefit from consuming the good, also called *consumer surplus*, is given by the area under the demand curve but above the price line (83)[1].

The supply-side equivalent to consumer surplus is called *producer surplus*. The firms that supply goods in the market are assumed to produce more goods to supply in the market as prices rise. Therefore, a supply curve indicates how much output a firm is willing to sell at a given price. The area under the supply curve indicates the opportunity costs incurred in producing a given amount of a good, that is, the minimum revenue the firm should receive to be willing to produce a given amount of output. The difference between the minimum revenue required and the actual price received is producer surplus.

In summary, demand reflects the value people place on consuming a good or a service. If individuals did not experience any value from having a good they would not demand it. Supply, on the other hand, represents the highest value it would have been possible to receive if the resources had been used for other purposes. Demand and supply are mediated by markets. Economists have always been concerned with how markets work. Adam Smith argued that competition would tend to establish the values/prices of the commodities produced and until the 1930's when economists became aware of issues such as imperfect competition (69), it was believed that because of perfect competition the problem of determining market values/prices would be solved. Perfect equilibrium, where demand equals supply, would result in a price that would reflect the value individuals experienced from receiving a given good. This analysis is very 'formal' and so long as the relevant conditions are met, the equations of the general equilibrium model can be 'solved' and equilibrium ensured.

[1]The concept was first introduced into the neoclassical framework by Marshall (51)

Nothing can be said *a priori* about the social welfare implications of such an equilibrium. For this we need to turn to the tenets of welfare economics.

4. Welfare Economics

Welfare economics is concerned with social welfare. Decisions made about various policies or programmes have consequences for society as a whole. Hence, the application of welfare economic theory implies that the well-being of the individuals in the society as a group is considered. Welfare economics is concerned with the extent to which the objectives of society as a whole are fulfilled (90). When people, as individuals, are better-off can it then be stated that they are also better off as a group? The aims of society cannot be easily distinguished from the wishes of the individuals who comprise it. However, because the public interest and the private interest might conflict, an economic study based on individual behaviour might not take into account important problems that would require action concerning the appropriate policy for society. Since the price mechanism does not work as an allocation instrument, other instruments must be used. The use of individual preferences may, because of asymmetric information, cause some difficulties. For example, a situation may exist where an individual has an interest in receiving a specific treatment. However, let us assume that this individual's treatment is considered by society to be too expensive. Not enough resources would be available to treat people with other diagnoses if the former treatment alternative was to be introduced. Despite the individual's interest in receiving the treatment it may thus not be offered as a possibility. Welfare economic approaches have been developed to deal analytically with issues such as this one.

An early concern in the development of welfare economics was whether the perfect competition model discussed in detail above was optimal from a social welfare point of view. The social welfare implications of this approach have been studied form the start of the twentieth century. In this context economists made particular use of the ideas of Pareto. The main features of this approach are: (i) that individuals are the best judges of their own welfare, (ii) that individuals are rational, which means that given an unrestricted choice set, individuals will make choices, and these choices are characterised by being transitive, (iii) the Pareto value judgement, which is to say that if an intervention can make somebody better off without making someone else worse off, this intervention should be undertaken, (iv) no externalities exist, i.e., in particular, individual utility functions do not overlap.

Using this framework we are in a position to judge whether markets are 'optimal' or 'Pareto efficient'. A Pareto optimal position is one for which it is not possible to reallocate resources to improve one individual's welfare without impairing at least one other individual's welfare. In relation to the perfect competition model it has been shown that this model is a sufficient but not necessary condition for Pareto optimality.[2]

Theoretical welfare economics includes three fundamental theorems (81). The first two theorems are of most interest considering the issues raised in this paper. They suggest that competitive equilibrium and Pareto optimality are firmly bound, whereas the third theorem is a statement of the distributional questions raised in theorems one and two. The first theorem of welfare economics establishes that a competitive equilibrium is for the common good. Which in a modern interpretation is to say that assuming that all individuals and firms are selfish price takers, then a competitive equilibrium is Pareto

[2] For example, with a decentralised socialist pricing policy it is also possible to deliver Pareto optimality, as shown by Lerner (48) and Lange (47).

optimal. Thus, the modern interpretation of 'common good' involves Pareto optimality, rather than a maximization of 'the national dividend' described by Pigou (65). In the second theorem of welfare economics, it is again assumed that all individuals and producers are selfish price takers. Then almost any Pareto optimal equilibrium can be achieved via the competitive mechanism, provided appropriate lump-sum taxes and transfers are imposed on individuals and firms. Finally, the third theorem of welfare economics states that there is no Arrow social welfare function that satisfies the conditions of universality, Pareto consistency, independence, non-dictatorship (these issues are also known as Arrow's Impossibility Theorem). Arrow was concerned with the logic of how individual preferences are transformed into social preferences. Thus, Sen (73) called a transformation of individual preference relations into a complete and transitive social preference relation an 'Arrow social welfare function'.

Following Pareto (80), most of the conventional theory of welfare economics rests on the assumed value judgement that, as a result of a policy, if one member of a community is better off and none made worse off, welfare is increased, i.e. the change has established a Pareto improvement, implying that welfare is an increasing function of individuals' utilities. The way Sugden & Williams (80) explain this is that if it, in principle, is possible to secure an actual Pareto improvement by linking a given project with an appropriate set of transfers of money between gainers and losers, even if in fact these transfers will not take place, a potential Pareto improvement is provided. This means that if the project is carried through and a positive net sum of money would exist after the gainers have compensated the losers, a potential Pareto improvement is provided. The rule that projects should only be carried through if they produce a potential Pareto improvement is called the potential Pareto improvement criterion.

Essentially the Pareto framework is that everyone gains from a proposed policy. Many policies evidently involve both gainers and losers. This situation was addressed by

Kaldor and Hicks, who represent two possible variants of the potential Pareto criterion: (i) the Kaldor compensation criterion, where a state A is regarded as better than a state B, if the gainers of a movement from B to A can compensate the losers and still be better off, and (ii) the Hicks compensation criterion, where a state A is regarded as better than a state B, if the losers in a movement from B to A are able to bribe the gainers and still be better off. Using the Kaldor version might seem most intuitively appealing since this would be similar to the market situation, where individuals have property rights and are compensated for giving something up (36). This is the basis for the potential Pareto efficiency rule that an intervention should only be adopted if net benefits are positive (explained in more detail below).

The health care market

Present-day economic evaluation has mainly been justified on welfare grounds by recourse to the Kaldor-Hicks criteria. Basically, the criterion requires that the amount people would be willing to pay (accept) for the benefits (loss) of a project should be used as a welfare measure. These benefits and costs are aggregated into 'social benefits' and 'social costs', hence a project is undertaken if the net social benefits (defined as social benefits minus social costs) are positive. The following equation established by Evans (29) can be used to describe this idea

$$\sum_{i,k,t}\left[\frac{P_{ikt}B_{ikt}}{(1+R)^t}\right]-\sum_{j,k,t}\left[\frac{V_{jkt}C_{jkt}}{(1+R)^t}\right]\gtreqless 0 \qquad (1)$$

where B and C refer to benefits and costs, with different categories of benefit and cost indicated by the i and j subscripts, respectively. The k subscript refers to the recipient of the benefit (individual or group), or the person or agency incurring the cost. The t

subscript caters for the time dimension, usually measured in years. The expression B_{ikt} thus represents B units of benefit type i received in time period t by person or agency k, and P_{ikt} is the corresponding weight or valuation. R is the social discount rate which caters for adjustments in the time value of costs and benefits.

Equation (1) can be interpreted in different ways, depending on who determines the weights P and V, and depending on the objectives of individuals and society: First, individuals could be asked to give their opinion. If individuals are asked, the weights are found through surveys such as willingness to pay (WTP) studies. Thus, the weights are based on Kaldor-Hicks criteria, i.e., the potential Pareto criterion. Secondly, a decision-maker could determine the weights. He could act in the interest of the public in an objective manner, or he could let his own value judgements and his own self-interest influence the final weights. These two points are further discussed below.

Aspects such as equity considerations could also influence the weights. For example in the distribution of health care, where individuals might like to ensure a distribution of health care that is regarded as 'fair'. The evaluation of health care becomes a difficult task in the context of equation (1). Health care is in many ways different from other goods. The differences lies in the fact that consumer rationality might not fully exist, since individuals may not always be the best judges of their own welfare and further that the assumption that choices reveal preferences may conflict with a situation where individuals are not able to reveal their preferences. Also uncertainty concerning future health and finally asymmetric information and external relationships (for example, caring externalities (29) are factors that distinguish health care from other goods. As an implication the outcome of health care interventions might not be straight forward to evaluate and raise some conceptual difficulties for an optimal allocation (15).

In the provision of health care, prices usually do not appear and this raises the need for other ways of measuring the value of this service. In particular, it may not be straight forward to measure the benefit part of equation (1). Due to market imperfections, the price of health care would not necessarily reflect consumer and producer surplus, that is it would not reflect the value of the good. Further, equity considerations might influence the P and V weights since, for example, it might be in the public interest to make everybody as well-off as possible.

As mentioned above, the weights in equation (1) could be determined by different individuals in different ways depending on the objectives of individuals and society. This issue has established two different *schools* of thought.

Different schools of thought

As mentioned earlier, welfare economics is concerned with the extent to which the objectives of society as a whole are fulfilled. The objective of society might be that potential Pareto improvements are secured, ensuring allocative efficiency. However, other interpretations of such an objective are possible. Two major schools of thought can be distinguished, i.e., the decision-making approach and the Paretian approach. With regard to the decision-making approach, the social objective pointed to by this school is an objective raised by a decision-maker who makes decisions in the public interest. The objective is social, since the decisions have an influence on society as a whole. This would imply, with regard to equation (1), that the weights P and V would be determined by the decision maker. The analysis becomes more of an interchange between the analyst and the social decision-maker, and a forum for making the decision-maker's values explicit (24). This is in contrast to the Paretian approach (38;55) which is a welfarist approach, where the consideration is that individual values should be aggregated, that is these individuals would determine the weights P and V.

As a consequence, the analyst works independently of the political decision-making process. The Paretian approach is used as the theoretical background when measuring WTP (or WTA), since here individuals are making judgements about the value of a good by indicating how much they would be WTP(WTA) for receiving (giving up) the specific good.

In addition to the Paretian approach and the decision-maker's approach, another distinction should be pointed out. Previously, the assumption that welfare is an increasing function of individuals' utilities was mentioned. One approach in welfare economics is 'welfarism', (i.e., Kaldor-Hicks and Pareto) (74), which assumes that social welfare is a function of individual utility and nothing else, that is non-utility aspects of a given social state are therefore not included. Further, individual utility is a function only of goods and services consumed (16). Another approach which is called 'extra-welfarism' includes other aspects of a social state as well, i.e. non-utility information such as, for example, happiness or basic capabilities in general are also considered (75;76). Non-utility information about individuals may, as stated by Culyer (16)

> *...relate back to the consumption of either commodities or the characteristics of commodities.... or to inherent characteristics of people, (or further), to the character of relationships between people*. (16).

The idea is to distinguish between categories describing *goods/commodities* and their characteristics on the one hand, and *people* and their characteristics on the other. Often these commodity characteristics are used to describe the quality of a commodity. The characteristics of the commodity might influence the characteristic of the individuals consuming the commodity, and these characteristics might then result in a state of pleasure which economists measure in terms of utility. The point made by Culyer is that

utility might be difficult or even impossible to measure, whereas it is possible to measure the characteristics of people. In the case of health care, it might, for example, be difficult to determine the utility from a given treatment, since the utility of the individual being treated is influenced by aspects other than simply the utility from improved physical health, such as mental well-being. As an alternative the characteristics of the individual, in this case health status, could be measured instead, using for example QALYs as the unit of measurement.

Lancaster (46) suggested that rational utility maximisers derive utility from the characteristics of goods. In traditional welfare economics there is no influence from intervening approaches such as characteristics of people, there is a direct connection from commodities to utility. A non-utility view of the quality of life described with these characteristics is the content of these intervening categories. Utilitarianism, the welfare economics approach where total utility if possible is maximized, rejects non-utility information about people as being irrelevant when judging about justice and efficiency (16). Looking at the characteristics of people is not equivalent to focussing on the characteristics of commodities or utilities. But paying more attention to characteristics than to utilities has some advantages, since the two basic assumption behind utility theory, that individuals have the best knowledge about their own welfare, and that individual preferences should be weighted according to wealth and their position in the income distribution might not always hold. Further, utilitarianism would not take into account that the characteristics of people may influence the amount of pleasure individuals are experiencing from a given amount of income, and considers non-utility information to have no influence in judgements about efficiency and justice.

In this context, the decision-making approach is an explicit departure from welfarism advocated by Williams (88), since it allows that decision-makers, e.g., the government, might have objectives other than those which require Pareto improvements. This may

involve not only decision-makers imposing their own values on, for example, the consumption of individuals, but also taking into account some extra-welfarist elements of choices, such as concerns about equity (85), which are excluded by pure welfarism. The extra-welfarism approach acknowledges that *goods/commodities* such as, for example, health care or education, have characteristics which influence the characteristics of individuals receiving the good. These individuals may, as an example, after receiving health care be able to earn their own living, or having education being able to get a better-paid job. Both these derived effects are characteristics of individuals which further influence their experienced pleasure and their utility. In the case of health care, extra-welfarism thus defines the social welfare function as a function of health status, and not the individuals' experienced utility levels, optimized with respect to different constraints.

The limitations of welfarism were also considered by Philipson (64). In his paper he obtained conditions on individual preferences under which measures of segregation were consistent with standard economic criteria of social welfare such as Pareto optimality. As pointed out by Philipson, welfarism has some limitations by being unable to incorporate aspects of segregation. It was stated that an absence of heterogeneity in preferences within social classes was required for such an interpretation to be feasible.

Overall, it is interesting to note that the issues of extra-welfarism are raised by health economists, which might indicate that health care is a quite special type of commodity, that is the consumption of health care as well as the characteristics related to health care, such as the knowledge that it is possible to be treated for a given condition if needed, might influence the utility of individuals. Since in some ways health care is different from other goods, the outcome of health care interventions might not be straight forward to evaluate. In practice different methods have been developed for this

purpose and used as tools for decision-making. The next section describes this in detail.

5. Methods for Economic Evaluation

In general, it is possible to treat more diseases than scarce economic resources allow. To allocate restricted resources in an efficient way it is therefore necessary to prioritise.

Efficiency is in this respect a key word. Allocation of resources can be accomplished in various ways, but to ensure that this allocation is performed in a way in which the amount of outcome is maximized for a given amount of costs, or cost are minimized for a given outcome can be difficult. Efficiency measures whether health care resources are being used to get the best value for money and is, therefore, concerned with the relation between resource inputs and intermediate output or final health outcomes. Health care can be seen as an immediate product, in the sense of being a means to the end of improved health.

Different types of efficiency exist. When looking at the physical relationship between resources and health outcome *technical efficiency* is considered. A technically efficient position is achieved if the use of a set of resource inputs results in the maximum possible improvement in outcome. However, it is not possible to use technical efficiency to compare alternative interventions, where one intervention produces the same (or better) health outcome with less (or more) of one resource and more (less) of another. In this case *productive efficiency* is used since it refers to the maximization of health outcome for a given cost, or the minimization of cost for a given outcome. A final efficiency term is *allocative efficiency* which takes account not only of the productive efficiency with which healthcare resources are used to produce health

outcomes but also the way with which these outcomes are allocated among individuals in the society.

Thus, technical efficiency addresses the issue of using given resources to maximum advantage; productive efficiency the issue of choosing different combinations of resources to achieve the maximum health benefit for a given cost; and allocative efficiency the issue of achieving the right mixture of healthcare programmes to maximise the health and welfare of society.

To prioritise and allocate scarce resources in an efficient way an analytical tool is required that is able to put into perspective the costs and benefits of implementing one project instead of another, thereby creating a basis for decision-making. Economic evaluation is such an analytical tool for decision-making, since it involves both a cost side and a benefit side which are being evaluated against each other. The cost side is composed of costs that are involved in the establishment and implementation of the project in question. The opportunity cost is considered. Additionally, in principle the marginal cost and not the average cost is determined, since it is the cost that arises because of the production of one extra unit, i.e., the cost at the margin, that is of interest. Regarding the benefit side, this is composed of the utility the implementation of a new project will generate. By utility is meant the value of the health outcome which can be received for the single patient as well as, for example, the patient's relatives. The determination of costs and outcomes in an economic evaluation is described in more detail in the following section.

Measurement of Cost

In economics, the cost of an event is the highest valued opportunity necessarily forsaken. The usefulness of the concept of cost is a logical implication of choice among

available options. Only if there were no scarcity of resources or no alternatives to choose between, would 'costs' and 'choice' be irrelevant. Costs reflect values. A uniform reduction in value of all options reflects the lower level of utility now available. This effect may be called decrease in cost since the best valued options are now lower valued. Costs are lower because values are lower. Hence, the cost of the use of any resource is never less than the highest valued opportunity for its use. Cost in an exchange economy is based on market-revealed values; it is always equal to the amount bid by the highest bidder in the market for that resource. As a result, the value of an amount of available resources in a particular class of use is described by demand, in contrast to supply, which represents the value of the resources if they would have been used for other purposes.

There are different concepts of cost, for example, *total cost, marginal cost, average cost* and *incremental cost.* Total cost is the total amount of cost that arises as a consequence of the intervention being carried through. Marginal cost is defined as the change in costs for a given change in output (technically, the derivative of total cost evaluated at output level q* is the marginal cost at output level q*). Further, average cost is the cost per unit of output (assuming that only one type of output is produced, i.e., no joint production). Finally, incremental cost is determined as the change in total cost associated with some change in output quantity.

Direct costs are characterised as costs which can be directly connected to the use of one or more resources needed to be able to carry out an intervention. The term *indirect cost* is used in health economics to refer to productivity losses related to illness or death (33), or, as defined in accounting, overheads or fixed costs of production (explained further below).

Sunk costs or 'historical' costs are costs that are inescapable. Once the historical cost

is incurred it should play no role in any subsequent decision, since regardless of what happens it has been incurred. For any ensuing decision only the escapable costs are relevant. *Fixed costs* are costs that occur when a restricted set of output programmes can be chosen between which cost is common to each option in the subset. Regardless of which option in the subset is chosen it is not possible to escape these fixed costs. However, these fixed costs are not sunk costs, since it is possible to escape the costs by choosing an option outside the subset. *Variable costs* are those cost elements that might change because of an intervention.

The purpose of the *short-* and *long-run cost* distinction is to note the differences in cost between different output programs, those achieved in the more immediate future in contrast with those undertaken later, when one can get the advantage of less expensive, less hasty adjustments. In the short run some factors of production are fixed; in the long run, however, all factors can vary.

The ideal economic evaluation starts by identifying all the implications of applying one intervention and at least one other intervention. The resource changes are measured and then valued. Cost categories included in the analysis are costs associated with the change in use of health care resources, the change in use of non-health care resources, the change in use of informal caregiver time and the change in use of patient time (50). The norm is to include all resources consumed that are large enough to have an impact on a decision (26).

Measurement of Outcome

The effect of the intervention being carried through can be measured in various ways depending on the characteristics of the effects. If it is possible to measure effect in natural units such as saved lives this one-dimensional effect measure would be

sufficient. The effectiveness measure could be a final health output or an intermediate output. If the latter is chosen it is necessary to have a link between this measure and a final health output or otherwise illustrate that the intermediate output measure also has some value. In general, however, it is suggested that an effectiveness measure that is related to a final output is chosen (26).

In other situations it is not possible to describe the effect by only one measure. The solution is then either to use various effect measures or use a scale instrument, the latter combining the different part-effect measures to one single measure (2). Special multi-dimensional effect measures has been developed for economic evaluation purposes, to be able to unify a set of effects in one utility- or benefit measure. Examples of such utility measures are Quality of Adjusted Life-Years (QALY's) or Healthy Years Equivalents (HYE's) where a common unit is determined by using a multi-dimensional measure of health status that is weighted according to individuals' preferences. The weighting is performed in different ways depending on which utility measure is being obtained.

A benefit measure is a monetary measure of utility. A number of indirect measurement methods have been developed in recent years. These methods determine individuals' preferences by asking hypothetical questions about how much individuals would be willing to pay (WTP) to receive, for example, a specific improvement in their health status. Methods to measure WTP are discussed further below.

Different methods of evaluation

When economic evaluation is applied in the health care field, four different methods of evaluation can be used (26;54). These methods are called cost-minimization analysis (CMA), cost-effectiveness analysis (CEA), cost-utility-analysis (CUA) and cost-benefit

analysis (CBA) and are discussed briefly below.

CMA is used when two interventions that are being compared have the same outcome. In this situation it is only necessary to determine the costs of each of the two interventions, and compare them. The intervention which incurs the lowest cost is then the one which would be most rational to implement if the goal is to minimize cost. The cost categories determined depend on the chosen perspective.

CEA is used when the analyst tries to answer the question concerning how to reach a specific goal with a minimum of resource use or how to achieve as much as possible for a given budget. However, it is not determined if it is worth the cost trying to reach this goal. A CEA measures the effect of an intervention in natural units and tries to find the alternative that has the lowest cost per unit measured. It is distinguished from a CMA, by not only including the cost side, but also by considering the amount of output produced. Hence, a CEA is concerned with productive efficiency. Costs are determined as in cost-minimization analysis. The gain is given by the effect that the programme achieves.

The way of framing the problem in a CEA could also be applied in a CUA instead. CUA can be used when the goal has more than one dimension, for example, both quality and life years are included in a single index (e.g., quality adjusted life years, QALYs). Costs are determined in the same way as in CEA. The gain is the number of QALYs[3] obtained in undertaking the intervention. This means that the treatment that in a rational context would be chosen is the one which has the lowest costs per QALY.

[3] To ensure that QALY's are consistent with expected utility theory, assumptions about the utility function are necessary. These assumptions are: (i) the existence of mutually utility independence between the remaining life-years and health related quality of life; (ii) constant proportional trade-off between the number of remaining life-years and health related quality of life and (iii) constant proportional risk attitude with respect to remaining life-years, including the assumption of risk neutral individuals with respect to remaining life-years (10;66).

In a CUA preferences for health status are used in the calculation when determining if a project should be implemented or not. It is not a full utility measure we are determining. Thus, critics have expressed their doubts about the utility theoretical background of CUA, since they feel that in the case of QALYs, these are a measure of preferences for health status and not a welfare measure. In addition, a problem when using CUA is that the only utility of the health sector which is of relevance is the improvement of QALYs. Utilities which are used for individual decision-making under uncertainty can, under certain assumptions, be added to provide a group utility function. QALYs are designed to aggregate the total health improvement for a group of individuals in one single measure. Torrance & Feeney (82), reviewed utilities and QALY's and draw the conclusion that utilities were particularly appropriate for use as utility-adjustment weights for QALYs. Further, Feeney & Torrance (30), demonstrated that the utility measurement approach could be viably incorporated into clinical trials and used to assess quality-of-life outcomes. They concluded that 'when study-specific utility instruments are carefully developed and deployed, they are reliable, valid, and responsive'.

In contrast to CEA and CUA, which both try to reach a given goal for as little cost as possible, CBA is used to answer the question whether the given goal is worth pursuing. The cost side is determined in the same way as in the application of the other analytical methods. The benefit side, however, is now determined in monetary units, which has the advantage that it is possible to compare projects across sectors. The measurement of benefits in the same unit as costs is necessary to assure possible improvements in allocative efficiency (22). A CBA indicates whether a new intervention should be introduced by determining the net benefits of the specific programme, i.e., positive net benefits imply that social welfare would increase, and the programme should be introduced. This is also illustrated in equation (1) above.

Another way to explain equation (1) is to say that the present value (PV) of a given investment should be positive or determine what the internal rate of return has to be to ensure that PV is positive. Finally, whether an intervention should be introduced could also be determined by looking at the ratio between cost and benefit, to determine if costs are higher or lower than benefits.

Quantifying benefits in CBA: Willingness to Pay

The choice of method when measuring benefit is a much discussed issue. Previously, following Becker (7) many studies applied the human capital approach[4] (see for example Brooks (12)), but this method, due to the criticism from health economists such as Mishan (55), has been replaced by measurement techniques which can be divided into measuring revealed preferences (actual markets) and measurement of stated preferences (hypothetical markets) (56). When considering the distinction between direct and indirect methods, the direct measurement of benefit involves assessing benefit directly through the respondent's actions in a market. The indirect method is an alternative method to use when it is not possible to obtain direct answers or observe economic actions.

Benefit is determined by asking individuals to give a valuation of outcome, where outcome in general is an expression of self-sacrifice, i.e., how much is the sacrifice (e.g., expressed in terms of risk, money or quality of life) from going from one condition to another. Thus, this is a situation where individual judgements are used to determine the weights in equation (1). The question then is: how should this sacrifice be measured?

[4] The earliest attempts at valuing human life concerned themselves with the capital value of a man. In the late eighteenth century, Sir William Petty, as the first person, calculated the average value of a human being (14). Since then, researchers have looked into the issue of human capital with great interest (27;44;68).

Willingness-to-pay (WTP) and willingness-to-accept (WTA) have become techniques to measure benefits, especially in situations where there is a need to elicit the value of a public good or of non-marketed resources. The use of WTP to measure health care benefits offers many potential advantages over other approaches, although there is a debate in the economic literature about the advantages and disadvantages of the approaches (20;34;67). WTP techniques are increasingly used to measure health benefits (21). Different applications of these methods exist, which are described in, for example, Cummings *et al* (17) or Mitchell & Carson (56), where thorough evaluations of these survey instruments and detailed citations to the seminal works and specific applications are given.

One method for valuing a non-market resource is called Contingent Valuation (CV), where the idea is to determine the alternative point on the respondent's indifference curve which is as good as in the initial situation where no change has occurred. Three distinct approaches to ask CV questions exist: *open-ended*, where the respondent is asked to mention the amount he would be willing-to-pay; *closed-ended*, where the respondent is asked whether he would be willing-to-pay a specific amount and, *bids*, where the respondent is first asked whether he would be willing-to-pay a specific amount and then the question is repeated using a higher or lower bid value depending on the response to the first question.

The use of dichotomous choice questions, where respondents are asked hypothetical questions concerning whether they would accept or reject a bid value for a good, is a popular way of determining WTP in contingent valuation studies. The closed-ended format was introduced into CV by Bishop & Heberlein (9) and gained widespread acceptance in the mid-1980's , one reason being that the open-ended question format typically produces an unacceptably large number of non-responses (19) and therefore there was a need for alternative approaches. Preference for the closed-ended approach

over the open-ended has further been endorsed by the U.S. National Oceanic and Atmospheric Administration's panel (NOAA (59)) which recommended this type of question as the preferred method of data collection. As a consequence the demand for statistical techniques has been rising since statistical issues have become pressing after the introduction of this indirect method of measuring WTP.

6. Issues concerning CBA and CEA/CUA

There are considerable controversy among health economists concerning the advantages and disadvantages of using the alternative evaluation approaches. This section counters some of the issues

(i) CEA/CUA and CBA in the context of efficiency

As mentioned before, cost-benefit analysis values costs and benefits in monetary terms to assure that an improvement in allocative efficiency is recognized. McGuire *et al* (54) define allocative efficiency as the Pareto criterion. The difference between CBA and other economic evaluation techniques, i.e., CUA and CEA, is that the latter type of analysis might improve technical/productive efficiency, but not allocative efficiency. Policies directed at technical/productive efficiency will not necessarily achieve the optimal allocation of resources and may even exacerbate distortions. Also restriction of application to a single health delivery setting may generate distortions. When the objective of the analysis is to consider allocative efficiency, CBA would still be the chosen technique. Furthermore, if the aim is to contribute to the determination of priorities among programme areas, CBA is the only technique that can be used.

(ii) The use of ratios in CEA/CUA and CBA when assessing cost and benefit

Usually a CEA or CUA assesses the incremental costs and incremental effectiveness of an intervention relative to the one previously used or a base line alternative. Comparison between changes in benefits and costs leads to four common alternatives: (i) dominance, where benefits increase and costs decrease when the new intervention is introduced; (ii) a situation where benefits decrease and costs increase as a consequence of the new intervention; (iii) a situation where costs as well as benefits increase or (iv) a case where costs as well as benefits decrease. When situation (iii) is the case it is necessary to determine the new intervention's incremental cost-effectiveness ratio to see if this ratio is as least as favourable as other competing projects. In situation (iv) the cost-effectiveness ratios of the old and new interventions are compared to determine if the standards of cost-effectiveness are fulfilled. In CBA, on the other hand, because the same unit of measurement is used for costs as well as benefits, no use of ratios is required (87).

(iii) Application of CEA or CBA? What are the differences and equalities?

CEA has long been recognized as a convenient approach for guiding health care decisions. Garber & Phelps (32) showed that within the framework of standard von Neumann-Morgenstern utility maximization CEA can offer a valid criterion for choosing between health interventions. Whilst there is a broad acceptance of CEA within the health care field, CBA is viewed much more sceptically (31). Typically, one argument against CBA is the concern that the methodology favours interventions that improve the health of the wealthy over those of the poor. As pointed out by Kenkel (42), however, this argument is questionable for several reasons, one being that many health interventions do not have a wealth bias, and further, many studies were not able to determine a strong connection between WTP for morbidity improvements and income; in particular, for less severe health conditions, income elasticities were low.

Phelps & Mushlin (63) mention four differences between CEA and CBA. One

difference is that CBA typically determines 'in advance' the marginal value of a benefit, e.g., QALY or a life year, and then calculates net benefits. In contrast, CEA typically calculates the 'price' of a QALY or a life and leaves the decision unstated. When decisions have been made on the basis of CEA, the same judgements have been made as if a CBA had been undertaken. Hence, in this way the difference might be considered as a difference in reporting style.

A second difference is the level of aggregation. Often CEA is applied at a highly disaggregated level, in contrast to CBA which could be applied at a much more aggregated level, e.g., society. Aggregating individual valuations to a societal level implies that interpersonal value judgements are made. This might be one of the greatest concerns people have about the application of CBA, that this aggregation might not be done appropriately.

The third difference pointed out is the measurement of multi-dimensional benefits where, as mentioned earlier, CBA has the advantage that all types of benefits are converted into a common metric, where in a CEA some of the conversions might be more difficult to carry through.

Finally, a fourth difference between CEA and CBA arises in the case of joint production. Here, applying CBA involves adding up all benefits and costs from all dimensions of a project and comparing them against each other. CEA would look at the marginal CE ratios along the different dimensions. The difficulty lies then in determining incremental costs in the case of joint production.

Despite these four possible differences Phelps & Mushlin (63) conclude that decisions made about medical resources using CEA are analogous to those using CBA, as long as the cost-benefit analyst and the cost-effectiveness analyst agree upon the marginal

value of a QALY the conclusion will be the same. The two techniques express assumptions and results differently, but deliver the same information.

Williams (89) states:

> *The 'ideal' CBA will have all inputs and outputs evaluated in money terms....But since it is unlikely that any but the most low-level CBA will....succeed in evaluating all inputs and outputs in commensurable terms, the distinction between actual CBA and actual CEA will only be a matter of degree* (89).

Having Williams' statement in mind, that in practise the inputs in a CBA and a CEA are often the same, this implies, as argued by Phelps & Mushlin, that the two methods might deliver the same information. In some situations CEA, even though it is not based on the Pareto condition, would be an easier, and sometimes also a more appropriated technique, to apply than CBA. The statements above may help in justifying such a choice. But as Mooney (57) pointed out 'ease cannot be allowed to dictate use; it is a question of what is best for which question'.

Williams (89) argued that the distinction between actual CBA and actual CEA would only be a matter of degree. However, the principal difference between CEA and CBA as described by Johannesson (36) is that the WTP per QALY gained is assumed to be constant and the same for everyone in CEA, whereas the WTP per QALY gained may vary with the income and the size of the health gain in CBA. Thus, only in a situation where the WTP per health effect is constant and the same for all individuals would CEA and CBA yield the same result. Thus, for CEA to be useful for decision-making, information about the WTP per unit of health effects is required. An assumption of constant WTP per unit of health effects seems unrealistic. In the case of more than one

individual there is no reason to believe that WTP is the same among individuals or among groups of individuals. If, for example, two different programmes are evaluated, one in each of two different patient groups, and the first programme gives a lower cost-effectiveness ratio than the second programme, CEA would say that the first programme should be implemented. However, if the second patient group has the highest mean WTP per health effect a CBA would recommend that the second programme would be implemented.

Further, instead of variation in WTP among groups, WTP might also vary according to the magnitude of improvement in health effects[5]. CEA would in that case not distinguish between the size of the improvement for any of the groups in contrast to CBA, where different weights might be used for the different health improvements. This would imply, as stated by Johannesson (36), that 'the difference between CEA and CBA would be that in a CEA it is assumed that the WTP for a health change is the same for all individuals and for all sizes of the change in health'. The importance of these differences is in practice an empirical issue, where CEA in Johannesson's view should be regarded as a subset of a CBA. CEA would in that case be used to estimate the cost function of producing health effects, and combining this information with a WTP per unit of health effects would make it possible to perform a CBA.

As argued by Donaldson (23), whether practitioners regard CBA and CEA to be almost equivalent depends on whether analysis types are defined in terms of (i) what question is being addressed; or (ii) what is measured: Recently, according to Donaldson, the latter definition has become more used in health economics, and in this case CEA and CBA would be almost equivalent. In a CBA, however, who benefits and who bears the

[5] The importance of the referencepoint when respondents are asked about their WTP, is an issue, which has much been discussed in the literature, among others, Kahneman & Tversky (40), Kahneman *et al* (41) and McDaniels (53).

costs is analysed, which raises issues concerning the distribution of health. When using CEA, no interpersonal comparisons of utility are made. Thus, moving to a higher isoquant for an intervention, implying a higher level of outcome, can only be achieved by the allocation of more resources to it. Since these resources have an alternative use this involves interpersonal comparisons which only can be done in a CBA, meaning that when using definition (i), CBA and CEA would not be equivalent.

(iv) Decision rules for CBA and CEA

A CEA is only capable of comparing interventions whose benefits are measured in the same units of effectiveness (31). It is thus not possible to use CEA when deciding upon how many resources should be spent on interventions other than health care. CBA on the other hand is able to illuminate these types of decisions.

Net benefits versus CB-ratios

Earlier, there was a widespread use of the human capital approach and benefits were measured in terms of what impacts the programme being evaluated would have on the present value of future earnings (44;68). A new programme that adds to total resources has no opportunity costs so this would result in improved social welfare, and the decision rule that a programme that would generate positive net benefits should be implemented would be valid to use. However, since the introduction of the contingent valuation approach involves that sacrifices made in order to receive the good being evaluated would be related to the individual's private consumption, which decision rule would be most correct to use (i.e., the issue of net benefits or cost-benefit ratios) has been questioned.

As mentioned above, when performing a CBA one rule would be that an intervention should be adopted if net benefits exceed net costs as shown in equation (1). This is the traditional way of considering CBA as a decision tool (63;80). In accordance with

this, Drummond *et al* (26) suggest that, in a fixed budget situation with more than one project, these projects should be ranked with respect to their net benefits.

Boardman *et al* (11) also recommend the use of net benefits instead of cost-benefit ratios. A policy should be adopted if those who will gain could compensate the losers and still be better of. That is, the Kaldor-Hicks criterion is applied which, as mentioned above, is the basis for the potential Pareto efficiency rule, that only programmes with a positive net benefit should be adopted. In the case of multiple programmes that have independent effects, and no constraints on input exist, all policies that have positive net benefits should be adopted. Or more general, in a situation where multiple programmes may enhance or interfere with each other, the combination of programmes that maximizes net benefits should be chosen. Boardman *et al* strongly recommend the use of net benefits as a decision rule and mention two arguments against the use of cost-benefit ratios: First, that ratios can sometimes confuse the choice process when the programmes considered are of different scale. Secondly, that it is possible to manipulate with cost-benefit ratios, since they are sensitive to whether the negative willingness-to-pay amounts are subtracted from benefits or added to cost.

Other researchers, however, suggest the use of cost-benefit ratios, a suggestion that is often being used by analysts comparing programs (11). For example Pearce & Nash (62) and Johannesson (36) suggest that when choosing between different projects cost-benefit ratios instead of net benefits should be ranked if it is possible to identify the costs relevant for the budget, since this ensures that those programmes that are most beneficial to society are implemented first. Enemark & Gyrd-Hansen (28) go further by arguing that cost-benefit ratios should be used also where no budget restrictions exist. Enemark & Gyrd-Hansen suggest that in principle, one should evaluate all health programmes, and implement the one which generates most benefits relative to cost, then re-evaluate the remaining programmes, since the introduction of the first

programme might have affected the shadow price of the alternative uses of resources. The ranking of projects would, however, require that guidelines were established to ensure consistency as to which effects to be included on the cost side and which to be included on the benefit side. In this context, if it would be possible to identify the costs relevant to the budget, cost-benefit ratios could be used, which may generate the necessary information needed for priority setting and which was missing when measuring net benefits, if it was not possible to give an insight in the resource implications involved.

Part of the conclusion seems intuitively appealing since of course it would be most appropriate to make decisions having full information available, that is in this case to rank programmes and then re-evaluate the remaining programmes after one has been implemented. Also the reason for ranking CB-ratios instead of net benefits as a decision criterion when having a fixed budget is clear. With a fixed budget, the marginal benefit per DKK should be the same for everybody, meaning that under this condition the amount of resources used for the separate programmes should be adjusted until they together add up to total cost. In the case of no fixed budget the conclusion is more debatable. Of course, one could argue that there would always be a fixed budget, and an opportunity cost. However, if in theory there would be no scarce resources, it is difficult to see the reason for necessarily having to use CB-ratios. Then, if it is possible and efficient to receive an extra amount of benefit for some extra costs, why should society (or another decision-maker) not be willing to pay the extra amount of money needed to receive these benefits, if no budget limits exists? Hence, in this case net benefits would be an appropriate decision rule.

(v) CEA/CUA and CBA - conclusions

CEA/CUA are often referred to as a type of 'decision-maker approach' to economic evaluation, since the aim is to maximize the objective, the decision-maker would like

to be maximized and to include the relevant costs and benefits. This approach could be related to the decision rules of CEA/CUA since in this case only the costs that influence the budget of the decision-maker would be included. In a CEA, typically, first the benefits which appear as a consequence of the intervention are determined, which are then valued at some predetermined rate. This is also illustrated through the point made by Gold *et al* (33), that 'CEA is not a complete decision making process. The information it provides is, however, crucial to good decisions'. Information about the societal WTP per QALY gained is necessary if CEA should be a useful tool for decision-making. This information could then be used as a decision rule, in the same way as the value per statistical life is used in a CBA of investments in projects such as the building of new roads. An alternative, using a fixed budget as a decision rule would, however, not involve a societal perspective since in the real world costs outside the given budget would not be included (37).

Finally, concerning the scepticism about CBA that has been raised, Kenkel (42) argues that 'when the economics profession eschews cost-benefit analysis of health-care interventions we are not giving our clients our best service..... as experts we should make the case that much of the scepticism that greets cost-benefit analysis of health interventions is not well-founded.' A controversial statement, since of course, the choice of method will always depend on the circumstances and the good or service being evaluated. Hence, in some situations it might be at least or even more appropriate to undertake a CEA instead of a CBA.

7. The use of economic evaluation for the purpose of decision making and priority setting

The use of economic evaluation for the purpose of decision making and priority setting is in practice, however, another issue. The aim of economic evaluation of health care programmes is to serve as an aid to decisions and affect policymaking (35). The considerations and messages provided by economists might, however, not be used in practice by policy makers and health care professionals in the way intended by the economist when the evaluation was carried through. That is, if economic evaluation does not influence final decisions (which in some case could be a decision that not is optimal but nonetheless satisfactory) concerning resource allocation to health care programmes, there would be no point in carrying out these types of analysis. Priority setting involves recognition of that resources are scarce and that the objective is to try to maximise benefits from the resources available at the same time, considering aspects of equity. Though, as pointed out by Mooney (58), even this is closely related to economics, which is first of all a theory concerned with the allocation of resources, and hence economics should be able to contribute to priority setting, the extent to which this actually is accomplished is rather limited. Of course, economic analysis can be difficult, especially because of the limitations of the data and measurement techniques available, however, these difficulties do not involve the 'correctness' or otherwise of economic theory in its usefulness in determining efficiency, or the use of efficiency as objectives of health care. Another objective would be equity, meaning in this context a uniform distribution of health care or a distribution of health care that is regarded as fair, even though the latter, may involve both equalities and inequalities, for example with respect to financing, consumption or health status. The data and measurement problems mentioned exist, however, no matter which approach is used for prioritization (58).

Economic evaluation studies used for the purpose of decision-making is increasing, however, it is rather unclear how any of the study results are actually used and thereby contribute to the decision process. Warner & Luce (86) conclude that only a few of the

CBA-CEAs which have contributed to the political process have actually played an important role in the decisions that were made, and Drummond (25) found that there was little evidence of the use of economic evaluation studies in decision-making concerning health technologies. Davies *et al* (18) reported the results of a European study that indicated that economic evaluation has had a relatively low impact on healthcare policy and decision-making, and Russell *et al* (72) stated that cost-effectiveness analysis seldom is used to inform decisions about health services in the United States. Why does there seem to be so relatively little use of economics generally in health care policy making? Is the reason for this that the analyses are based on assumptions concerning decision-makers and decision processes that are too simple to be used in real situations, that is, does economic evaluation just not fit into the decision making process?

In economic theory we use the concept of the 'economic man' who goes into the market determined to maximize his output given his budget constraint. In this situation he compares prices and qualities and does not make any choices without having full information. According to Bakka & Fivelsdal (6) the process that a rational individual goes through when making choices has a specific pattern which they describe as: it is always possible for the individual to make a decision when a set of alternatives are given; he ranks the consequences of the alternatives in relation to his preference scale; the ordering of preferences is transitive; he maximizes utility by always choosing the alternative which has the highest priority on the preference scale; and finally, if the situation is repeated at some further point of time the choice would be the same. Hence, in this case, economic evaluation should be a tool that would help the rational individual by providing information about the impact of, for example, implementing a new programme, thereby making the implications of a decision more transparent.

The reason why economic evaluation may not be used even though it could add

information to the decision process would then be that the decision maker might not act as rationally as the 'economic man' model suggest. In *Administrative Behaviour* Simon (77) argued that the 'administrative man' (i.e., the decision maker) was only a poor approximation of the economist's rational man. The reasons being that problems were too numerous, the environment too complex and analytical capabilities too limited and there were rarely enough time and information available, for the decision maker to rationally analyse all problems. In other words, it would be impossible to keep up with the demands of the rational model. The process of policy decision making is described in the policy cycle model (52;61) which as a production model creates policy in a fairly orderly sequence of stages. An issue is placed on the agenda and gets defined; alternative solutions are suggested as the issue moves through the legislative and executive branches of government; a solution is implemented by the executive agencies and constantly challenged and revised by interested actors; finally, the policy-making process provides a means of evaluating and revising implemented solutions. In a way, the policy-making process parallels the cognitive steps of the rational model of decision making. Government becomes a sort of rational decision maker.

However, according to Lindblom's 'muddling through' model from 1959 (49) the decision-maker is no rationalist but instead an individual who feel his way and takes small steps at a time, thereby reducing uncertainty and avoiding serious and permanent mistakes. Vrangbæk (84) also considers a situation where the decision-maker is not fully rational and describes a model which combines limited rationality assumptions with ideas concerning the influence of cognitive and normative institutions. In this model individuals are influenced by cognitive and normative structures which design their expectations for the outside world. Thus, these are incorporated when considering the benefits and costs of interventions. The individual's strategy of action is affected by expected utility, expected costs, future expectations and internalized norms. In a trial-error learning process the individual's preference structure is developed as time goes by and he or she receives more knowledge about possibilities

and limitations.

The model describing decision-makers as always acting as rational individuals and that policy is developed accordingly has been further criticised for being unrealistic. The garbage can model developed by Cohen *et al* (13) is a reaction to this. Here organisations are regarded as a place where solutions are gathered, these organisations then look for decision situations where the solutions can be used. The decision situations are described as garbage cans where different problems and types of solutions can be combined as they arise. As explained by Vrangbæk, Kingdon (43) uses the garbage can approach in developing a model for agenda setting and policy decision making. The process considers three independent steams: *the problem steam*, which is composed of the problems that reaches the public decision-agenda; *the policy stream*, where solutions are developed through interaction between the different players in the organisation; and *the political steam*, where attention is created towards different initiatives and these initiatives are implemented if a possible solution exists. According to Kingdon, policy changes then happen when these three streams meet by coincidence, or if a decision-maker has an interest in promoting a special solution-model.

Parsons (61) argued, that economic evaluation and decision analysis are taken into account in the design phase of the policy, followed by a phase of political evaluation as to the acceptance of a policy or programme by the public. This rationalization of public opinion in forms which allow policy-makers to make judgements/evaluations about the legitimacy of policy and programmes may be regarded as consistent with the logic that is embedded in CBA: that all factors in a decision can and ought to be quantified so as to provide a more rational basis for decision-making (60). Therefore, as described by Albæk (3), the political process is to a considerable extent engaged in trying to make contrary opinions and interests join common compromises, to ensure that society functions. To do so skills other than just scientific ones like economic

evaluation might be necessary.

The use of economic evaluation in the Swedish health care system has been reviewed by Jönsson (39), who concludes that economic evaluation is one of several factors influencing a decision-making process. It is thus difficult to determine the contribution of an evaluation study to the outcome of the decision-making process, and no evidence is given as to whether the evaluation was the decisive factor. The major reason why such studies have been rather rare and had a limited influence on decisions is, according to Jönsson, that the decision-making structure at the moment is not responsive to evidence about cost-effectiveness. If the decision-maker's incentives are in contrast with the goals of the effective use of resources, as also described by Robinson (71), the aim of economic evaluation to ensure efficient allocation of resources might be of only limited practical value. As stated earlier by Alban (1), who looked into the use of economic appraisal in Denmark, when it comes to changing behaviour according to the results achieved, it is most important for the use, that those which the appraisal is directed at, are involved in the process.

The question of why there seemed to be so relatively little use of economics generally in health care policy making has further been examined by Mooney (58). This was done in relation to three countries: Australia, Denmark and the UK. The main barriers mentioned for using economic evaluation were that in an environment where decisions had to be taken quickly the use of economic evaluation would take too long. In addition it was felt that the decision-making process also needed to consider existing policy and political factors. Communication between health economists and decision makers was not good enough and health economists had to be more aware of the decision makers' needs'. Misconceptions of economics and the fact that few people had the skills to conduct such analyses were also seen as barriers. The nature of the decision-making process was also seen as being 'too political' to allow economic analysis to have much influence since it was difficult to introduce rational tools of analysis. And finally,

resistance to new ideas and problems in applying economic appraisal appeared as one of the suggestions for the apparent barriers. Mooney therefore drew the conclusion that 'unless there is a demand for health economics there is no way that the thinking and techniques of health economics will take off to a greater extent than at present', and suggested that there might be a need to make economic evaluation more acceptable and appealing to potential consumers. Health economists might not be good enough at selling their product and their communication skills need improvement. It is of importance to understand the nature of decision-making. In medical decision-making, for example, only by understanding the reason for doctors' behaviour it is possible to influence their incentives to make them behave more efficiently.

In order to determine the role of economic evaluation in healthcare decision-making and to identify the barriers that prevent its use in healthcare decision-making, Späth and colleagues (78) conducted a literature search of papers addressing the use of economic evaluation. The study showed that inputs that were reported to have greater impact on the decisions than economic evaluations were: the effectiveness and safety of a therapy; political and strategic interests of different stakeholders; cost-containment in the short run; and equity issues; the order mentioned indicating the decreasing frequency of the respective inputs. The authors identified several barriers for the use of economic evaluation such as, the lack of methodological quality in the evaluations; the fact that decision-makers were not trained in the health economics field, the use of inappropriate data with respect to the setting, the reluctance to deny a therapy for cost reasons and counter-incentives to taking efficiency into account.

That decision analysis can be regarded as an emerging discipline that is largely sold by suppliers rather than sought by costumers is also the opinion of von Winterfeldt & Edwards (91). Even though this has changed to some extent since they wrote their book, analysts must still often convince clients about the usefulness of decision

analysis. They mention that the client-analyst relationship might contain hidden agendas, an example would be a situation where the client might need justification for a decision already made. However, most analysts try to identify values and reduce them to an orderly structure and they might be able to uncover hidden agendas and incorporate them in the analyses, which should make the decision-maker less resistant with respect to the use of such tools for decision-making.

The extent to which economic evaluation has an impact on policy-making and decisions concerning health programmes seems to depend on the interest decision-makers have in actually using this decision-tool and, in addition, the laws and regulations used for resource allocation Johannesson (35). This interest further depends on the organisation and incentives embodied in the system of which the decision-maker is part. As a result, if laws or regulations were to require economic evaluation, or if changes in the health care system would increase the incentives to consider both effects and costs then the use of economic evaluation might increase.

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