Cost/Benefit Analysis: An Explanation and a Critique

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Cost/benefit analysis is a technique used by researchers who view themselves as scientific in orientation. However, it is not well understood by many persons who are interested in disability studies especially the social impacts of genetic engineering. This lack of understanding is regrettable because cost/benefit analysis is simply a type of decision making which most people use.

The literal interpretation of cost/benefit analysis is that a person measures the cost of an outcome and the benefits of that outcome. A ratio between the two are calculated dividing the cost by the benefit. If the number is greater than one, the costs are more than the benefits and presumably that outcome would not be sought. If the number is less than one, the benefits outweigh the costs and presumably that outcome would be pursued.

When a cost/benefit analysis is carried out the ratio is sometimes less than one. Many people are not comfortable with this way of expressing the ratio. If costs equal 1 and benefits equal 12, then the results (1 divided by 12) equals 0.08. It was argued that a result less than one conveyed a false impression that the benefit of the outcome was very small when actually the benefit was (in this example) 12 times the cost. It is said that it is better to express the ratio as 12 (12 divided by 1). Consequently, it became customary to do benefit/cost analysis (dividing the benefit by the cost) while still calling it cost/benefit analysis. People must pay attention to how the ratio is obtained so as to not be misled.

A common technique closely related to cost/benefit analysis is cost/effectiveness analysis which is simply comparing two cost/benefit analyses. You could calculate two ratios and determine that one outcome (usually a medical procedure) produces a higher number than the other. The outcome with the higher number is the preferred one, the most effective procedure. Or you could calculate the net return (benefit minus cost) for the two procedures and say that the outcome with the highest net return is the preferred one. In this case the problems are only compounded.

The basis for cost/benefit analysis and related techniques is based upon the definition of a "rational man" as it is used in economics and in public choice. According to this definition a person calculates the probable benefits of an outcome minus the cost of obtaining that outcome. The result is the return for carrying out the action. It is often expressed as R = PB - C where R is the return, P is the probability of obtaining the benefits if the act is undertaken, B those benefits, and C the cost incurred if the act is done. If the return is greater than zero (the probably benefits are larger than the cost) and the person performs that act, then the person is rational. If the return is zero (the probably benefits equal the cost) or less than zero (the probable benefits are less than the cost) and the person performs the act, then the person is not acting in a rational manner.

The world is more complex than this simple scenario as economists and some public choice researchers will admit. However, instead of cautioning people about their analysis, they simply use Bayseian statistics (the probability that something will occur given the probability that something else will occur) or other more sophisticated techniques. Since the result is usually expressed in dollars (numbers), there is an apparent certainty of the outcome with the largest number being the preferred one.

The problems with cost/benefit analysis and its related techniques are many. First, it assumes that the sum of benefits in a society is static, a zero sum game. That is, what someone gets another loses. While it is true in many individual cases, it is not true in many other cases and it is not true for all of society. Some people give the John Donne argument: the bell tolls for everyone, we have a universal dependence on each other.That argument carries only limited weight. A better argument is that technological advances demonstrably have reduced costs and increased benefits over history. However, since the static argument holds in many cases

this problem with cost/benefit analysis can be circumvented by its users. For example, it is argued that budgets are finite and that there are only a limited amount of benefits in a situation and therefore it is a zero sum game. Such an assumption is often obscured in public policy discussions when it is clearly not correct.

The second problem concerns data sources. The data bases used in many analyses are poor. Often it is estimated data. Sometimes data from one decade is compared with data from another decade. The responsible analyst adjusts for these differences, but they can not always be reconciled. For example, if we use dollars in an analysis, do we use present dollars or future dollars discounted in some manner? If we project into the future in regard to savings (or costs), do we include interest rates and/or opportunity costs because that dollar can not be used for something else? Of course, there are customary ways of handling these data questions, but each one introduces a bit of uncertainty into the result.

The third problem involves the measurement of social welfare. The welfare of an individual is based upon that person's utility for things in life. The welfare of society is based upon the summation of individual utilities. But it is not possible to measure utility in a manner so that one person's utility function (how that person values the world) is comparable to another person's utility function. In order to sum individual utilities into social welfare, they must be measured in the same way. The easy answer for economics and public choice is to translate everything into dollars. However, a billionaire may (probably does) have a different amount of utility for $100 than a person living in poverty. Economists acknowledge the impossibility of comparing different utility functions, but go ahead anyway assuming that everyone has the same utility for dollars. So do cost/benefit analysts in genetic engineering even when so many variables can not be translated into dollars.

The fourth problem in cost/benefit analysis concerns the sophisticated techniques used. These techniques frequently involve estimates of the mathematical parameters of a set of data. There are always confidence intervals around an estimate. That is, if one comes up with a result of 25 it may be 25 +/- 15 which means the answer ranges from 10 to 40. Perhaps that result is sufficiently precise for the analysis. Perhaps it is not. When joined with the problems of imprecise data and measurement of utility, the result may be unintelligible.

The final problem with cost/benefit analysis is in our culture and not necessarily in the technique. People simply believe that a number represents something real. If a researcher produces a number which appears to be reasonable, other people tend to accept it. However, with problems of data, measurement, and use of estimation procedures the number may be meaningless. On the other had, it may not be meaningless, but how do we know if it is?

In spite of these problems many people make decisions using cost/benefit analysis all the time. Although not always certain of the figures, if the relative magnitudes of the costs and the benefits are clear (one is very large and the other is very small) it is easy to estimate the ratio. In other situations the size of the costs and the size of the benefits are not known and a decision is avoided. In other cases they are precisely known and the analysis is done.

In genetics people use cost/benefit analysis often. In the January 1994 issue of geneWATCH Paul Billings and Ruth Hubbard discuss a study in Colorado which estimated that a person with Fragile X Syndrome costs the state over a lifetime $1,609,852.63 more than a "normal" person costs. They do discuss the problems in diagnosis and the eugenic policy implications of the study. However, the dollar figure is just as specious as the certainty of diagnosis. One thing which reveals how ludicrous is the figure is the 63 cents at the end. In no way can one be that specific in a cost/benefit analysis over a life time. Variables over a life time can not be perfectly predicted and measured.

Many discussions of the quality of life of a person with a disability rest upon cost/benefit analysis. Jack Kevorkian's victims are said to have such a low quality of life that they wish to commit suicide. Most non-disabled persons who express a wish to commit suicide are given counseling and change their mind. A person with a disability, however, is assumed to have a life of very low quality and therefore that person is making a rational, informed decision to end their tragic life. That is, the cost of continued living far outweigh the benefit. In this case it is the negative stereotypes of people with disabilities which cause the measurements of both costs and benefits to be skewed.

The Oregon Plan for rationing health care is also based upon a quality of life argument which rests upon a cost/benefit analysis. The social and personal benefits of many disabled persons are estimated to be very low. People can not imagine how persons with disabilities can bear to continue to live. Therefore, the cost of treatment will always outweigh the benefit of living and the treatment should not be provided.

People who perform studies in economics, in public choice, in genetic engineering, and in other areas of decision making must learn the technical side of statistics and data analysis. They must understand the limitations of cost/benefit analysis. Such a result is not a likely outcome. Consequently, people who read and who may use these studies must be cautious.