

## Viability of a common approach to health and environment costs

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### Summary

A common approach to costs is needed to assess whether the number of avoided deaths justifies the sacrifices made to achieve that aim. The use of cost-benefit analysis depends on both the ability to estimate the willingness to pay for the reduction of health-related risks and the institutional conditions. Discussion of its relevance and feasibility in practice is also necessary. In the field of health-environment, specific questions are raised in relation to distributive impacts and uncertainty. However, approaches in health and environment economics rely on similar principles. The same main difficulty is encountered: reconciling approaches that directly estimate the willingness to pay for the reduction of health risks and those where preferences are constrained to comply with standard public-health criteria of the QALY kind.

**Keywords:** cost-benefit analysis; value of a statistical life; uncertainty; co-benefits.

### Introduction

As Hammitt reminds us [1]: *“Measures for summarizing individuals’ preferences for changes in health risk are useful for evaluating a wide range of public and private decisions that affect, inter alia, environmental quality, product safety, and medical procedures. An objective of quantification is to help determine whether the net change in health risks associated with an intervention justifies the opportunity cost of the resources used to achieve it”*. But how is cost-benefit analysis (CBA) relevant to highlight health-environmental choices? Starting from the experience, we review the obstacles and solutions to apply it to this field.

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## **1- Experience return**

The United States implement these principles by submitting environmental regulations to cost-benefit analysis. By these means, the balance between the impacts of pollution on health or natural resources, and the economic costs of policies, is estimated on the basis of indicators incorporating all the different costs.

This framework was applied by the Environmental Protection Agency (EPA) to the Clean Air Act (CAA), for instance [2]. The first assessments published in 1997 concluded that the results obtained following the measures introduced in the 1970s were “socially” very favorable, with a ratio of a factor of 10 or more between the benefits provided and the cost of achieving them. The assessment of new measures applied at the end of 1990 also concluded that the results were positive.

The reduction of premature death linked to particle pollution accounts for a predominant share of the benefits. Next are the reduction in mortality linked to ozone exposure and the morbidity avoided (myocardial infarction, chronic bronchitis). While the conclusion is that the benefits substantially outweigh the costs, the latter are still significant. Thus, a rigorous comparison of the benefits of regulations and their costs is essential in order to ensure their efficacy. In this respect, the 2010 report updated the methods used to assess the different costs and advantages considered. So the obligation to implement CBA has encouraged ongoing improvement of methodologies to ensure the relevance of evaluations, firstly in terms of the way in which benefits are converted into monetary units, since this task of ‘monetarizing’ health impacts is obviously a delicate one.

Also, CBAs produced results that were sometimes surprising. While they showed that only 5% of expenditure had eliminated more than 99% of risks, they also recommended more prevention, such as that of certain physical risks in the workplace, or those related to water

pollution and transport. Despite this demonstration by example that a common approach to costs was not detrimental to environmental ambitions, the idea of clarifying choices in this way is still very much a subject of debates.

## 2- The issues

Why insist on the need for CBAs in the areas of health and the environment? Firstly, because the efficacy of preventive policies is greatly heterogeneous. Despite it is true that the prevention of social ills (smoking, drinking, obesity, etc.) is very ‘cost-efficient’, it is impossible to draw a general conclusion on it. In fact, the distributions of \$ / QALY<sup>2</sup> type cost-efficiency ratios appear very similar for both prevention and cure [3]. In other words, the performance of preventive measures must be assessed on a case-by-case basis.

Moreover, to build these policies, it is not enough to compare partial efficacy ratios. Synthetic balance results<sup>3</sup> must be considered. If not, there is a risk of neglecting measures whose positive ratio is not remarkable, but whose wide scope may provide high overall benefits. So CBA is all the more necessary in situations of diffuse benefits<sup>4</sup>. This may explain observed bias against pollution prevention policies, as shown, for instance, by the *Lancet* study [4].

In addition, health and environment policies have multidimensional impacts. In referring to partial ratios, there is a danger of overlooking policies whose efficacy comes from the combination of ‘co-benefits’ (in terms of education for the reduction of unhealthy housing for instance, or in terms of climatic and health benefits for phasing out coal). There is also a danger of paying insufficient attention to trade-offs that need to be considered.

This is already true for health impacts. For example, the promotion of biking provides cardiovascular benefits, but the risk of accidents must also be borne in mind. Effects can also

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<sup>2</sup> Quality-adjusted life years

<sup>3</sup> i.e. net social value created. Indeed, setting a required threshold of efficacy implicitly defines a willingness to pay for the health benefits.

<sup>4</sup> Even more if they impact populations who have little influence on decision-making processes compared to powerful industrial interests.

be contradictory for the individuals involved. Hammitt [1] mentions the case of pregnant women eating fish, with neurocognitive methylmercury-related risks for the child against cardiovascular risks due to omega-3 deficiency for the women.

Above all, health-environmental measures must take into account impacts other than on health, mainly those related to climate and biodiversity. Here, CBAs are essential both to evaluate synergic impacts on solid grounds and to clarify trade-offs to be managed. The neglect of particles emissions of wood energy, mistakes made in the management of vehicles fleets through a bonus system considering only CO<sub>2</sub> emissions (so not NO<sub>x</sub>, fine particles, etc.), the difficulty to compare nuclear risks with the cost of these emissions, show the general nature of the problem.

The case of diet illustrates this issue, with congruent health-climate impacts caused by methane, but also more complex ones. For example, increasing the consumption of fruit and vegetables and reducing that of meat benefit both health and climate goals. But, if a reduction of cheese and cream consumptions increases that of meat, the positive health-effect has a negative counterpart in terms of greenhouse-gas emissions (and also various other ones, on eutrophication, acidification and land use). So policy building must take into account the relative weight of different items, which highlights health impacts in this particular case [5].

### **3- Viability: state of the art**

*“As soon as we move on from general principles to monetarization, we are prey to the feeling that the data, the studies, are still dramatically insufficient for truly solid scientific work [...] However, if we resign, certain nuisances will continue to be overlooked in results, so counting for zero in calculations because it is impossible to know what figure to choose between eight and twelve.” [6].*

In terms of principles, the monetary estimation of benefits refers to the notion of willingness to pay (WTP for a risk reduction or an improvement of quality of life, such like the value of a statistical life or VSL for the risk of death, for instance), reflecting the choices we all make in balancing between more consumption of goods and the improvement of our health situation: how much of our income are we ready to sacrifice to reduce a given risk or enjoy a better quality of life?

The approach is then to estimate the corresponding WTP values based on the observation of real choices involving this kind of judgement. In the case of the CAA, the VSL used involved the synthesis of twenty-six studies assessing the risk premium in wages attributable to workplace hazards. Another approach consists in using experimental economics. It raises other methodological problems linked to perception and memory bias with regard to health episodes experienced.

However, the same underlying idea is that to avoid risks of paternalism, only the viewpoint of ‘citizens’ revealed preferences’ must be considered. As Treich stresses [2], this supposes that citizens actually make the decisions that are most in their interest. Yet research in psychology, sociology, etc. identifies cases where the perception of risks by the public is different to that of experts.

That has very concrete implications which can be illustrated with respect to policies related to indoor and outdoor air: certainly, the ‘polluter pays principle’ only applies to the latter; but can we act as if the public were fully aware of the high levels of pollution reached in homes and cars? We might as well challenge regulations on carbon monoxide emitted by heating appliances! Just as public health cannot ignore problems of addiction, then health-environmental policies must inform the public of risks and protect them when necessary. We must also decide to what extent public decisions should reflect public opinion or not when the latter only recognizes the most obvious catastrophes.

Upstream, the values revealed by econometric research raise questions, especially in relation to the impact (rather downplayed) of the duration and severity of health episodes [1]. The alternative often favoured in practice is to synthesize health impacts in terms of a QALY-type indicator and assume a constant value of QALY. However, this can be criticized since a constant WTP/QALY is not empirically validated. That type of difficulty is not completely specific: transport practitioners tend to consider only time saved, while economists wish to differentiate the attributes of transport quality. The difficulty with health economics is that it remains hard to express the superiority of one approach or the other in general terms: VSL or ‘monetarized’ QALY.

#### **4- Specific methodological problems**

Two other issues are particularly tricky when dealing with health-environmental problems: the first concerns transition ‘from the individual to the collective’ point of view; the second, the fact that, beyond valuation problems considered above, there are generally many uncertainties about some impacts (see endocrine disruptors, nanotechnologies, etc.).

About the first topic, it must be recalled that the CBA provides a synthetic appraisal of the opportunity of a policy under the hypothesis of simultaneous implementation of proper transfers to distribute the surplus equitably. In practice, the tendency is to act as if this question could be left to general income redistribution, what is justifiable only when costs and benefits are naturally distributed among all agents. In the circumstances of health-environmental problems, we must consider how the benefits will actually affect poor and vulnerable populations.

Thus, in this context, the CBA must also clarify the impacts on different categories of population: *“It is therefore obvious that a policy can be justified for reasons other than efficacy. However, it remains that the CBA will provide information on losses (if they exist) in*

*terms of efficacy resulting from such a policy. In the field of prevention, these losses of efficacy mean that more lives could have been saved for the same cost. So this efficacy argument should be seen as remaining important on a purely ethical level.”[2]*

The second problem involves the ‘precautionary principle’, relating to situations where uncertainty about impacts and the danger that some will be irreversible combine. Two cases should be differentiated here. On the one hand, there is an idea of very general significance: that in an uncertain environment, projects involving the greatest irreversibility should be penalized and those providing more adaptive flexibility favoured. When the different possible outcomes can be the subject of risk quantification, the underlying notion is that of ‘option value’. This does not challenge the fundamental principles of the CBA, but the identification of strategies to be considered in situations where a steady improvement of information can be anticipated. In that case, assessment and management are closely connected.

Situations of radical uncertainty, characterized by the impossibility (given the state of scientific knowledge) of judging between different more or less plausible hypotheses, raises more delicate questions. On this point, recent theoretical developments – often at the crossroads of economics and psychology – introduce a distinction between risk aversion and ‘ambiguity’ aversion. Indeed, when the uncertainty cannot be defined in terms of probabilities, individuals tend to behave as if events will go badly for them.

Finally, this analysis leads to qualified conclusions with regard to methodological obstacles. Consequently, good CBA governance is of great importance. CBAs must be assessed according to scientific criteria; they must specify what has not been quantified and aspects related to distribution, and detail the way in which scientific uncertainty has been taken into account; the certification of assessments and the manner in which public or institutional debates can employ them are crucial for their use in the decision-making process. Even so, we

have a significant range of instruments to assess the CBA balance of health-environmental policies.

## **Conclusion**

Contrary to what is often believed, the main obstacle to the viability of the CBA does not lie in the area of methodology but in the institutional context. In this regard, we should remember that rigorous assessment before the marketing of new chemical products only became compulsory during the last decade [4]. Similarly, the critical factor in the development of CBA for environmental regulations has generally been a legal obligation to do it, as in the USA.

Certainly, health-environment assessment requires skills. But we have instruments at our disposal to evaluate the net benefits of protective measures while remaining aware of redistributive and solidarity issues, uncertainty over some impacts, and the psychology and issues of the presentation of reforms.

Stating this is in no way an attempt to relativize the ethical issues. As Tirole stresses: *“Certainly, the introduction of monetary considerations clashes with our views about the sanctity of human life. Life is ‘priceless’. Yet budgetary choices in the field of health can reduce or increase mortality. However, we will never willingly admit that we are passing these judgements, which make us almost as uncomfortable as Sophie, forced to decide which of her two children will live given the threat that both will be gassed if she refuses to choose.”*



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