

**Summary:**

# **The valuation of transport safety**

## **A state-of-the-art review for the RISIT programme**

In 2002 the Research Council of Norway initiated a new research programme on risk and safety in transport (RISIT). As an introduction to this programme, it was decided to prepare state-of-the-art reviews of selected topics. One of these topics is “The valuation of transport safety”, which is the subject of this report.

The most important use of valuations of transport safety is in cost-benefit analyses (CBAs). A cost-benefit analysis is a method that provides the basis for a systematic and consistent treatment of different impacts of measures/projects. The theoretical basis of CBAs is economic welfare theory. For a CBA to provide a basis for decision making consistent with the assumptions on which such analyses are based, non-market goods that are included must be valued with correct relative prices, and the welfare effects must be based on people’s preferences (measured by their willingness to pay).

### **Large variations in valuations of transport safety in various countries’ cost-benefit analyses**

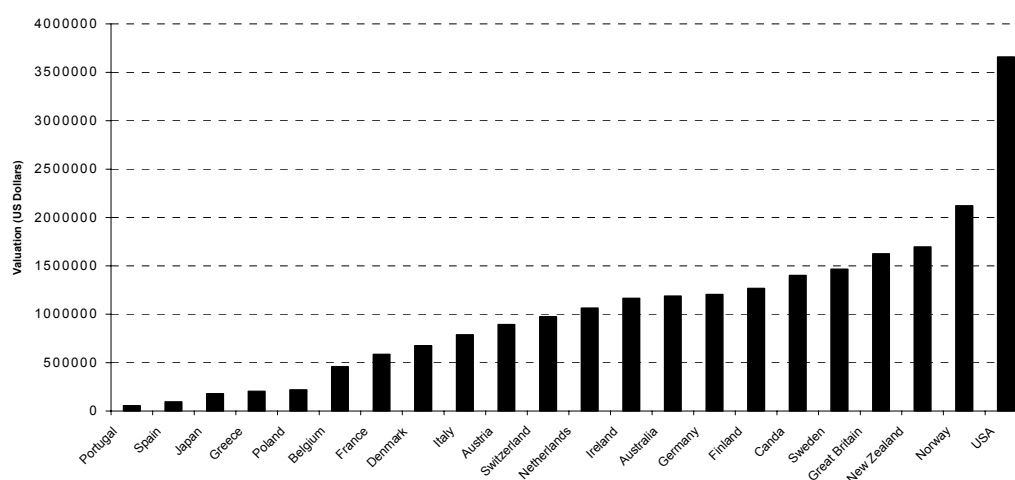
Costs related to traffic accidents are often divided into the following three components: **direct costs**, such as damage to vehicles and property, the costs of emergency services, medical treatment, burial etc., **lost production** for the society resulting from injury or death and **human costs**, in the form of pain, suffering and grief.

The methods for estimating the value of human life can be divided into three main categories: **human capital methods** (output methods), which find net or gross lost production due to injuries or death, plus any direct costs, **revealed preference methods**, which are based on individuals’ preferences in real markets such as insurance markets or compensation from lawsuits, or politicians’ preferences implicitly revealed through political decisions, and **stated preference methods**, which are based on individuals’ preferences in hypothetical markets.

Not all countries’ cost estimates include human costs, and there are also differences in the components that are included in direct costs and how lost production is calculated in various countries. Such differences give rise to variations in the cost estimates, making it difficult to make comparisons between countries. Nor is comparison easier when the methods used to calculate costs partly overlap, potentially resulting in double counting.

Figure S.1 shows that transport safety is valued very differently in various countries. This may be explained in part by circumstances such as differences in definition, the components that are included, income differences, differences in culture and tastes and the assessment year. But the most important explanatory variables are whether human costs are included, and if so, whether these are based on people's preferences or not, and methodological problems that give rise to great uncertainty in the valuation estimates.

Kilde: TØI rapport 634/2003



Source: TØI report 634/2003

Figure S.1 Official valuations of a traffic fatality in various countries ranked in ascending order. Unit: purchasing-power-parity-adjusted 1999 USD.

It is customary to use the same valuation in all modes of transport, and such valuations are largely based on valuation studies done for road transport.

### No basis for differentiating the valuation of safety between various modes of transport

Few valuation studies have investigated people's willingness to pay for a reduced transport risk on different means of transport. Any justifications for differentiating the valuation of safety between means of transport must therefore be based on a small number of studies. It is also likely that the valuation of reduced transport risk is related to people's subjective perception of risk and insecurity connected with different means of transport. Differences related to the risk source's potential for disaster, the probability of a fatality if an accident occurs and the degree of control a person has are likely to be important parameters.

Although most will agree that a valuation of statistical (objective) risk should be included in CBAs, one cannot disregard the fact that perceived risk and insecurity also have effects on welfare that ought to be included. A key factor is that in order to form an opinion of what one actually can put a value on, such hypothetical valuation studies must deal with both these risk parameters. Because of the known methodological weaknesses of current valuations, differentiating the valuation of safety between different modes of transport cannot be recommended just yet.

## **Weaknesses of current knowledge and previous valuation studies**

What is essential for measuring people's preferences in studies of willingness to pay are that they understand what goods they are being asked to place a value on and that they are presented with choices that enable them to state their preferences. The value of goods, market as well as non-market goods, is also context-dependent. It is therefore crucial that the context for the task of valuation corresponds to the context in which the results will later be used.

All of these key, basic and necessary assumptions have been violated in previous valuation studies. People did not understand what the change in risk meant when these were presented in the form of small probabilities. They were unable to state their preferences when the choices presented were so difficult that inconsistent and simplified responses were the rule more often than the exception. And people were presented an isolated valuation context that did not correspond to the context the valuation was to be used in. The fact that researchers are now aware of such methodological weaknesses is essential for doing better valuation studies in the future.

## **Need for new and better valuation studies**

Current valuations have major weaknesses, resulting in erroneous input into CBAs and thus erroneous results in respect of socio-economic assessments and priorities. But insofar as transport authorities wish to use CBAs as a tool for making decisions and setting priorities, there is a large and pressing need for new and better valuation studies.

The acknowledgement of weaknesses of previous valuation studies and of weaknesses in, and obsolescence of, the data these studies are based on, lead us to advise against choosing simpler solutions than doing a new, comprehensive valuation study, which in principle ought to include all goods one wishes to place a value on and all modes of transport. It does no good to patch up current valuations by making new and more refined price adjustments, by updating studies of the literature or by making other minor adjustments. Current valuations are now outdated, in respect of both the data and of valuation methods.

## **Cost-benefit analysis should deal with uncertainty in valuation**

No examples were found of any formalised uncertainty analyses being done in any country in connection with CBAs of transport projects. Our primary recommendation is to use probability distributions for the various input components in CBAs and perform Monte Carlo simulations that arrive at an uncertainty interval through random drawings from the various distributions. The probability that a measure will be socio-economically profitable will be evident from a CBA containing Monte Carlo simulations of all types of uncertainty. This information will be far more valuable for decision makers than the results of sensitivity analyses done on the basis of extreme outcomes with a low probability of occurring. All CBAs should highlight uncertainty in this manner.