

Summary:

Road safety measures: A catalogue of estimates of effect

This report contains a catalogue of estimates of the effects on road safety of selected road safety measures. The report is intended to be used as a reference manual in drafting the national transport plan for Norway for the term 2006-2015.

The catalogue has three parts:

1. A detailed inventory of current estimates of effects on road safety of a number of road safety measures.
2. An analysis of the cost-effectiveness and the benefit-cost value of road safety measures within the authority of the Public Roads Administration.
3. Guidelines concerning how best to estimate the expected effects of road safety measures for planning purposes.

Effects of road safety measures

The best current estimates of the effects on road safety are presented for road safety measures within the authority of the Public Roads Administration, as well as for other road safety measures that were judged to have a potential for improving road safety in Norway. Most of the estimates of effect are based on the Traffic Safety Handbook, but estimates have been updated on the basis of new studies reported in Norway.

The main points of the inventory of estimates of effects can be summarised as follows:

1. Effects are stated with respect to the number of people killed or injured in road accidents, and not with respect to the number of accidents. This reflects a shift of emphasis towards the prevention of fatal and serious injuries, instigated by the adoption of Vision Zero as the official long-term ideal of road safety policy in Norway.
2. Estimates of effects are given for (a) fatal injuries, (b) fatal and serious injuries, and (c) all injuries. To some extent, these estimates had to be derived indirectly, as most road safety evaluation studies do not report estimates of effect specified according to injury severity.

3. Three methods were employed to derive estimates of effect specified according to injury severity: (a) Interpolation, used to obtain an estimate of effect for serious injuries, based on published estimates for fatal injuries and all injuries, (b) The power model, used to derive estimates of effect based on the relationship between changes in driving speed and changes in the number of killed or injured road users, (c) The use of injury rates, specified according to injury severity.
4. Estimates of effects on property-damage-only accidents are not included.
5. The uncertainty of each estimate of effect is stated in terms of a 95% confidence interval.

The cost-effectiveness of road safety measures

Cost-effectiveness denotes the number of killed or injured road users a road safety measure can prevent, stated as a rate per million NOK it costs to implement the measure (1 NOK = 0.115 USD, April 2002). Cost-effectiveness was estimated for selected road safety measures carried out by the Public Roads Administration.

Data on the current use of these road safety measures were obtained from the regional offices of the Public Roads Administration. There are 19 regional offices, and 16 of these provided the data required. Based on these data, a set of normal values were estimated for cost-effectiveness. These normal values are intended for use in strategic planning of road safety measures. The term strategic planning refers to planning designed to determine the size of the road safety budget, allocate this budget between main categories of measures, and estimate the maximum improvement in road safety that can be attained by the most cost-effective use of a given budget.

Cost-benefit analyses

Cost-benefit analyses were performed for all road safety measures carried out by the Public Roads Administration.

These analyses included effects on road safety, mobility (travel time and vehicle operating costs), environmental factors (traffic noise and air pollution), and the benefits of (safer and more convenient) travel for pedestrians and cyclists. The latter item is new and has so far not been included in any cost-benefit analyses of road investments and traffic engineering measures in Norway.

The benefits of safer and more convenient travel for pedestrians and cyclists – obtained, for example, by means of traffic separation – include:

1. Reduced travel time
2. A reduced feeling of insecurity
3. Reduced need for providing school bus transport of children (if new facilities are safe enough to permit children to walk or cycle to school)
4. Improved public health, obtained by means of walking and cycling as a form of physical exercise
5. Reduced need of parking for motor vehicles.

Inclusion of these impacts of providing safer and more attractive transport facilities for pedestrians and cyclists is a major improvement as far as cost-benefit analyses of measures designed for these road users is concerned.

The analyses indicate that benefits are greater than costs for most of the road safety measures currently carried out by the Public Roads Administration.

Guidelines for estimating the expected impacts of road safety measures

Detailed instructions are given with respect to how to estimate the expected impacts of road safety measures on the number of killed or injured road users. Road authorities are recommended to employ the Empirical Bayes method in order to predict the impacts on road safety of measures taken. According to this method, unbiased estimates of the long-term expected number of road users killed or injured are obtained as a weighted average of normal accident or injury rates and the recorded number of accidents or injuries for a certain period before introduction of a road safety measure. The unbiased estimates have been purged of the effects of regression-to-the-mean.

Numerical examples are provided to show how to use the Empirical Bayes method.