

**Summary:**

# **Traffic safety indicator for road user behaviour and vehicle condition**

A traffic safety performance indicator based on five component indicators related to user behaviour and one related to vehicle condition is developed.

- Percent use of seat belts in "a typical car"<sup>1</sup> in urban areas
- Percent use of seat belts in "a typical car" in rural areas
- Percent complying with the rules on daily rest periods
- Percent complying with the rules on longest daily driving time
- Percent heavy vehicles with approved brakes
- Percent fulfilment of goal regarding the number of hours of private driver training in combination with formal driving lessons, seen in relation to an optimal situation<sup>2</sup>

The indicators are weighted together to form an overall performance indicator for traffic safety. An overall aim with every traffic safety effort is to reduce the number of accidents and the number of injured. In this report, according to the "Vision Zero", we address the group of killed or severely injured traffic victims. The value of the indicator is a function of the component indicator values. The principle is that each component indicator is given weight according to the significance it has for the number of killed or severely injured. We find these relative weights by calculating the effect on the expected number of killed or severely injured as a consequence of one percentage point of change in the component indicator values.

The indicator will be used by the Public Road Administration both on a national and a regional level. The indicator, and a thereby associated data tool that is specific to each region, will be used in planning and evaluation of traffic safety efforts. With the exception of regional data, the data we use and the calculations we do in the development of the indicator, is in the same time a sufficient documentation of what is needed in the development of the data tool.

On request from the Public Road Administration the indicator is measured on a scale from 0 to 6, in such a way that the "current state" yields a value of 3,00.

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<sup>1</sup> "A typical car" denotes a car with an average number of occupants. The use of seat belt is then a weighted average of the use among drivers and passengers.

<sup>2</sup> The indicator on driver training is a new one and is being developed in this report.

We use data on numbers of injured and killed that are relevant to the six indicators. Mainly that is the number of killed or severely injured victims in police reported accidents that involve:

- Private cars : drivers and passengers, in urban and rural areas;
- Heavy vehicles;
- Young drivers during driver training and their first period after obtaining a driver's licence.

We have mainly used data from the 5 year period 1998-2002. The "current state" is estimated from the 3 year period 2001-2003.

*Table S.1: The relative weight of the component indicators*

Id.	Component indicator	Decline in expected annual number of killed or severely injured due to one percentage point of increase in component indicator value	Relative weight
1	Use of seat belts in "a typical car" in urban areas	1.843	0.112
2	Use of seat belts in "a typical car" in rural areas	12.121	0.737
3	Complying with daily rest periods	0.186	0.011
4	Complying with the longest daily driving time	1.003	0.061
5	Heavy vehicles with approved brakes	0.814	0.050
6	Driver training, fulfilment of goal	0.481	0.029
Sum		16.448	1.000

Source: TØI report 750/2004

The indicators on use of seat belts are quite dominating. Clearly, increased wearing rate for seat belts is associated with the largest estimated reduction in the number of killed or severely injured per percentage point of improved state.

The component indicator values are denoted  $D$  and the relative weights  $r$  and the overall indicator  $TI$ . We have decided to use a power function,  $g$ . Then, with the assumptions we have made and the interpretation of relative weights,  $TI$  is uniquely determined as:

$$TI = g \left( \sum_{i=1}^6 D_i r_i \right) = 6 \left( \sum_{i=1}^6 D_i r_i / 100 \right)^{5,61}$$

For "current state" the  $D$ 's are 84, 92, 92, 95, 75 and 21 percent, respectively.

## Linearity

According to the assumptions made in the calculations, a change in a component indicator value has a linear effect on the number of killed or severely injured. For example, an increase in the use of seat belts from 80 to 81 percent, gives the same reduction in expected number of killed or severely injured as an increase from 90 to 91 percent. Because the relative weights perfectly reflect the significance of the

indicators,  $\sum(D_i r_i)$  also has a linear effect on the expected number. The overall indicator is not linear, but within moderate intervals a linear relationship can be used as an approximation.

### Maximum reduction in the number of killed or severely injured

Table S.2 shows the expected reduction in the number of killed or severely injured in the case that all indicators are at 100%. That is, *everybody* uses seat belts, *every* driver of a heavy vehicle complies with the regulations of driving and rest hours, *every* heavy vehicle has approved brakes and *everyone* taking driving licence in young age is following an optimal schedule of driver training.

Estimated indicator values for the period 1998-2002, to the nearest whole percent, are 85, 91, 92, 95, 73 and 21, respectively.

*Table S.2: Maximum reduction in expected annual number of killed or severe injured*

Indicator	Category of accidents and persons involved	Expected annual number of killed or severely injured 1998-2002 level	Max. reduction in the exp. annual number of killed or severely injured From 1998-2002 level
	Drivers in urban areas	77.15	17.05
	Passengers in urban areas	42.37	10.08
<b>Use of seat belts in "a typical car" in urban areas</b>			<b>27.13</b>
	Drivers in rural areas	541.65	75.29
	Passengers in rural areas	256.14	33.81
<b>Use of seat belts in "a typical car" in rural areas</b>			<b>109.10</b>
	Accidents involving heavy vehicles	185.80	
<b>Complying with rules on daily rest periods</b>			<b>1.49</b>
<b>Complying with rules on longest daily driving time</b>			<b>5.02</b>
<b>Heavy vehicles with approved brakes</b>			<b>22.30</b>
	Accidents involving young drivers (*)	171.86	
<b>Driver training, fulfilment of goal</b>			<b>37.96</b>
	Sum	1274.97	<b>203.00</b>

\* Accidents involving private car drivers of the age 18-19, as well as accidents during private driver training.  
Average over 3 year period 2000-2002.

Source: TØI report 750/2004

As we can see, 100 % use of seat belts in rural areas accounts for more than half the total potential of improvement. The indicator value was 91% in the calculations. Hundred percent compliance with the regulations of hours of service and rest, only gives a modest contribution. The values of these indicators also were quite high. Approved brakes on heavy vehicles contributes more than ten percent, mainly due to the low value of that indicator (73%). This is even more obvious for driver training, where the value is very low (21% of the optimal situation).