Institute of Transport Economics
Norwegian Centre for Transport Research

Summary:

High-risk behaviour and high-risk groups in road traffic

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In addition to the well-known risk factors speeding, non-use of seatbelts, and drug influence, factors like illness, distraction and falling asleep contribute substantially to the number of road fatalities. The contribution of each factor to the number of fatalities is estimated as a function of exposure and relative risk. Vulnerable road users, young male car drivers, and heavy vehicles are the groups that contribute most to the number of fatalities. Targeting efficient countermeasures at the mentioned risk factors and groups is expected to yield considerable reductions in the number of serious road crashes.

From 2005 to 2010 a Strategic Institute Programme (SIP) with the title ”High risk behaviour and high risk groups in road traffic” was carried out at the Institute of Transport Economics (TØI). The programme was financed by the Research Council of Norway and the Ministry of Transport and Communications. This report summarizes the research results from the SIP.

In parallel with the SIP, the Norwegian Public Roads Administration in 2007 also initiated a programme on “high risk groups in road traffic”. Participation of TØI in several projects within that programme resulted in useful synergies with the ongoing SIP, regarding topics like elderly drivers, foreign-born drivers, motorcyclists, and analyses of exposure and risk for different groups.

Vulnerable road users make up a large share of fatalities

As a background for discussion and definition of the “high-risk” concept within the SIP, the official statistics of police-reported road crashes in Norway were analysed with a focus on fatalities. One reason for emphasizing fatal crashes was the adoption of the “vision zero” by the road authorities, implying a vision of reducing the number of fatalities and permanent serious injuries to zero. In order to approach this vision it was considered important to get as much knowledge as possible about characteristics of the most serious road crashes.

More than 30 % of the fatalities on Norwegian roads during the ten-year period 2000-2009 were vulnerable road users (pedestrians, motorcyclists or cyclists). Another large group is male car drivers below 25 years of age, making up 10 % of the fatalities.

Heavy vehicles and young male drivers are most frequently involved in fatal crashes

To get a complete picture of involvement in fatal crashes for different road user groups, one has to include also surviving drivers that are involved in the crashes,

in addition to all road users killed. Thus, both the *internal risk* (the risk of oneself being killed) and the *external risk* (risk of involvement in crashes where others are killed) can be captured.

One way of comparing crash involvement between different "high risk groups" is to show the proportion of all fatalities occurring in crashes with each respective group involved. In Figure S-1 the column for each "high risk group" is split into two parts, to show the share of fatalities both for the group itself (internal risk) and for other road users in crashes involving that group (external risk). Heavy vehicles, young male car drivers, and riders of motorized two-wheelers stand out as the largest high risk groups among motorized vehicles/drivers/riders. The risk patterns, though, are very different among these three groups. The riders of motorized two-wheelers have a high internal risk, whereas they constitute a relatively low threat to other road users. For heavy vehicles the reverse is true; they have a high external risk of being involved in crashes where other road users are killed, whereas the driver's fatality risk is low. Young male car drivers are in an intermediate position. They make up a rather high proportion of road users killed as well as of drivers being involved in crashes killing others.

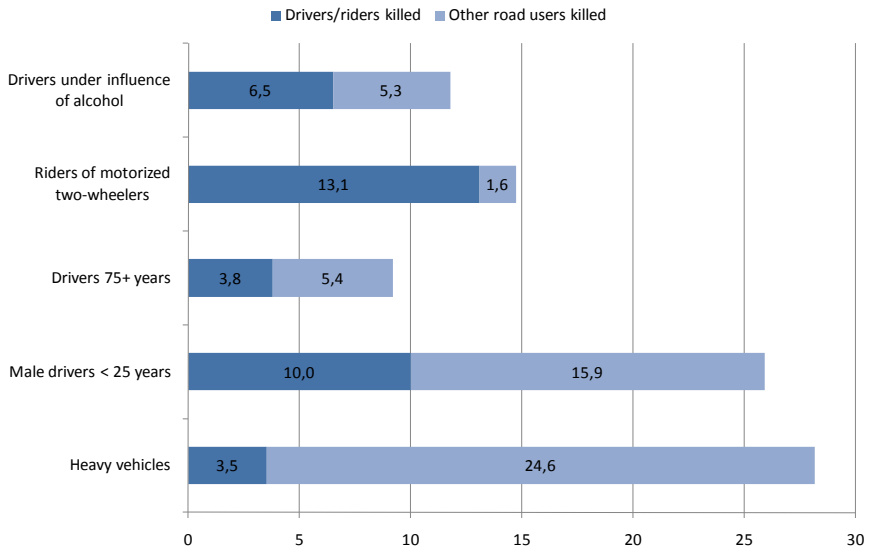

Figure S-1. Road users killed 2000-2009, by motorized vehicle/driver/rider involved and whether driver/rider or others were killed. Percentage of all fatalities. (Road user groups are partially overlapping.)

Number of crashes as a function of exposure and risk

An indicator of the contribution of a given risk factor to the total number of crashes (or killed, injured or crash-involved persons) is the so-called Population Attributable Risk (PAR). This is a measure of the proportion of crash events attributable to the elevated risk of a certain factor, or in other words a measure of the hypothetical reduction in the number of crashes had the factor not had any influence (i.e., if the relative risk of that factor were reduced to 1.0). The PAR of a risk factor is a function both of its prevalence (share of traffic volume) and of its relative risk. In our context a risk factor may be a characteristic of a group, a certain state or condition of a road user, or a risk-related behaviour. In this report

PAR estimates are expressed as percentages, thus they express the percentage increase in crash events caused by a risk factor.

An advantage of this indicator is that it enables comparisons between various risk factors regarding their contributions to the total number of crash events. Therefore, estimation of PAR for different risk factors has been emphasized in the SIP research, where necessary data on both exposure and relative risk are available.

Reduced vigilance: Distraction, inattention and sleepiness

An important part of the SIP research was a large survey among crash-involved drivers, focusing on risk factors related to distraction and other aspects of reduced vigilance. PAR values for the different risk factors were estimated on the basis of prevalence among not-at-fault drivers (proxy of exposure) and the prevalence ratios of at-fault to not-at-fault drivers (proxy of relative risk).

The distraction factor with the highest PAR value was conversation with passenger(s); it was estimated to have a contribution of 6 % to the number of crashes. Driving when being sleepy contributed 4.5 %, and using mobile telephones during driving contributed 0.6 %.

Varying crash contributions related to health problems

For all kinds of health problems and illnesses combined the contribution to the number of fatalities has been estimated to about 9 %. The conditions that contribute most are visual impairments and sleep-related problems. Sudden illness may also contribute substantially; for this condition PAR has not been estimated, but it has a relative risk as high as between 5 and 6, which indicates a possibly high contribution even with a relatively low exposure.

With the exception of the conditions mentioned, it seems that most health problems do not constitute a major problem in terms of the number of crashes. Most conditions have low to moderate PAR values, contributing to less than 1 % of fatalities. There are a few illnesses with a high relative risk, but they have generally a low prevalence and therefore contribute to few crash events, although they entail a high risk for the affected persons.

Speeding is the most important risk factor

Based on the PAR estimates, speed exceeding the limit is the single traffic violation that contribute most to the number of fatalities. About one-third of the fatalities are estimated to be caused by speeding. There may also be other accidents related to too high speed under the circumstances, even within the posted speed limit, so the total share of speed-related fatalities may be higher than the estimate mentioned.

Concerning other violations, non-use of seatbelts contributes to a large number of fatalities, about 15 %.

Violations in general, except speeding, non-use of seatbelts, and driving under the influence, contribute to about 6 % of accidents.

Drug and alcohol influence

Driving under the influence of alcohol and/or other illicit substances is an obvious and well-known risk factor, and it is important to estimate the potential reduction of fatalities that could be obtained by eliminating this risk. It is primarily car drivers under the influence that constitute the high-risk group, because drivers to a larger extent than other road users are responsible for crashes where others are killed or injured. Regarding alcohol, the estimates of the contribution to the number of fatalities vary from 7 to 16 %. For drugs or medicines the contribution is also about 7 %.

Drivers with a criminal record

Several studies have shown records of criminal behaviour to predict road crash involvement. There is, however, not yet sufficient knowledge about the share of driving made by drivers with a criminal record, and therefore it is difficult to estimate their contribution to crash events. This is clearly a topic that deserves more thorough consideration in future research.

Possible implications of PAR estimates

Although the PAR estimates can be considered indications of potential reduction in the number of crash events, there are also other considerations to be made when selecting risk factors to be addressed by countermeasures. It seems reasonable to consider first the factors with very high PAR values, such as e.g. speeding, young male drivers, or heavy vehicles. Assuming that the risk-producing effects of a factor can be prevented, PAR indicates the accident reduction that can be achieved. However, some risk factors are very difficult to change, so one has to consider the resources needed, in relation to the possible effects on relative risk. Thus, the PAR estimates are very useful in combination with knowledge about expected effects of different road safety measures, in order for authorities to choose the most cost-efficient measures.

It should be mentioned that it may be cost-effective to address even risk factors with very low PAR values, provided they can be easily changed. Especially factors that have a low PAR due to low exposure, but with a high relative risk, should be candidates for considering countermeasures, because a reduction of the relative risk may have large effects on the affected road users even if there are few of them.

Better crash and exposure data are needed

The estimates of exposure are uncertain for several risk factors that are discussed in the report. This means that also the estimates of relative risk and PAR are uncertain. There is therefore a need for better data on both exposure and risk, in order to obtain more precise estimates. There are also some factors that probably contribute considerably to serious crashes, but for which the statistics from police reports do not contain information on their presence in crashes. Examples of this include driving with a stolen car and/or without a valid driver’s license. Improvements of the procedures for collecting and recording data from crashes can result in better risk estimates for several factors.

Such improvements are important in order to target road safety measures appropriately at factors that represent the largest potential for reduction in the number of serious crash events.