Dimensions of road safety problems and their measurement

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A road safety problem

Any factor that contributes to the occurrence of accidents or the severity of injuries
Dimensions of problems

- Magnitude (size of contribution)
- Severity
- Externality
- Complexity
- Inequity
- Spatial distribution
- Dynamics
- Perceived urgency
- Amenability to treatment
Measuring dimensions

- **Magnitude** is indicated by *population attributable risk*
- **Severity** is indicated by *gradient in relative risk with respect to injury severity*
- **Externality** is indicated by *the imposition of risk by one group of road users upon another*
- **Complexity** is indicated by *the relative contribution of specific risk factors to overall risk*
Measuring dimensions

- *Inequity* is indicated by *degree of inequality in risk* and *lack of proportionality between risk and benefits of transport*
- *Spatial distribution* is indicated by the degree of geographic concentration of accidents
- *Dynamics* is indicated by *trend over time* in the size of a problem
Measuring dimensions

- *Perceived urgency* is indicated by *level of support for interventions* designed to solve a problem
- *Amenability to treatment* is a function of
  - Complexity
  - Perceived urgency
  - Knowledge of effective measures
An example of how to estimate attributable risk

*Group attributable risk* = \( \frac{0.906}{1.906} = 0.475 \)

*Population attributable risk* = \( \frac{0.098 \times 0.906}{(0.098 \times 0.906) + 1} = 0.082 \)
Assessing the contribution of speeding to injuries

Perfect compliance = 93% below speed limit

50 percentile speed = mean speed

Current compliance = 28% below speed limit

Speed limit = 90 km/h
Relative risk of injury to car occupants for selected combinations of parties involved (mean = 1.00)
An example (excerpt)

<table>
<thead>
<tr>
<th>Injured in</th>
<th>Counter-part</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Truck-trailer</td>
<td>Car</td>
<td>None</td>
</tr>
<tr>
<td>Truck trailer</td>
<td>45</td>
<td>65</td>
<td>338</td>
</tr>
<tr>
<td>Car</td>
<td>1150</td>
<td>20523</td>
<td>12832</td>
</tr>
</tbody>
</table>
An example of complexity
Inequality of fatality risk in road travel in Norway

Proportion of fatalities vs Proportion of travel

Gini-coefficient for distribution of fatality risk = 0.349

Gini-coefficient for income-distribution in Norway = 0.258
Profile of 20 km of road (accidents and injury severity density)
Injury rate for riders of heavy motorcycles in Norway 1985-2003

Number of injured motorcycle riders per million personkm of travel

Year

Relationship between support for stronger policy interventions and fatality risk attributable to selected road safety problems in Norway.

- Speeding
- Drinking and driving
- Pedestrian reflective devices
- Cycle helmets
Limitations of analysis

- Biased and incomplete accident reporting
- Availability of data (distractions, fatigue)
- Choosing the right level of analysis
- Possibility of statistical analysis (violations of expectations)
- Treatment of correlations between problems
Some observations

- A comprehensive analysis of road safety problems is needed to develop effective road safety programmes
- The analysis of road safety problems is complex, as these problems are multi-dimensional
- Analysis should start by choosing a taxonomy to help classify problems
Further observations

• A list of potential problems in each category of the taxonomy should be made
• The dimensions of problems to be emphasised in analysis should be chosen
• Create profiles of problems
• Determine promising targets for intervention based on these profiles