2nd SafetyNet Conference
European Road Safety Observatory (ERSO)
Road Safety Management in Action
Evidence based policy setting for the European Community

Modelling road fatality trends in the European countries

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Project co-financed by the European Commission, Directorate-General Transport & Energy

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Background and motivation

• Fatality figures of the commonly available time series (e.g. 1991 onwards in CARE) show a decreasing trend in most EU countries.

• Considering longer time series (e.g. 1980 onwards in Eurostat) reveals a different trend for some countries: first increase – then decrease (level of motorization?).

• If even longer time series were available (e.g. 1960 onwards), one might be able to identify these trends for all countries, in slightly different forms.
Research questions

- **From a road safety point of view**
- Is the trend “universal”? What causes it? (we suspect rate of motorization)
- Does the trend happen at the same time in all countries? (no, why? What does this lag capture or represent?)
- Can we use this to make predictions? (for countries for which the break has not occurred yet)
Research questions

- From a statistical point of view:
  Structural changes in trends
Data collected

- **Time series data 1960-2005**
- 11 countries (AT, BE, CZ, D, NL, PL, ES, UK, GR, HU, MT) – some more are expected
- Sources include CARE, SafetyNet, CARE Experts, SafetyNet partners

- Vehicle fleet by vehicle type
- Fatalities per road user type
- Population
- GDP (less complete)

- Data completeness slightly varies among countries (e.g. UK from 1960, GR and CZ from 1965, AT from 1975)

- Analysis within the proposed framework of SafetyNet data analysis methodologies.
Personal risk vs. motorization
Methodology

- Simultaneous estimation of regression models with unknown breakpoints
  - Breakpoints’ locations
  - Slopes
- Using R statistical package with segmented package
- Number of breakpoints and initial guess for their values are assumed as input
Belgium – Personal risk* vs. motorization

Belgium – Personal risk* vs. time

* using “killed on the spot” definition
Spain – Personal risk vs. motorization

Personal risk (fat/100,000 pop) vs. Motorization (veh/1000 pop)

Spain – Personal risk vs. time

Personal risk (fat/100,000 pop) vs. Year

Data, Model 1, Model 2
Observations (1)

• The explanatory variable is motorization - not time
  – Time is useful in interpreting and comprehending
• Personal risk does not increase monotonically with motorization
  – Some distinct patterns can be distinguished
• Maximum personal risk (breaking point) seems to be consistent across countries
  – Around 20-25 killed/100,000 pop
• But the motorization/time range (breaking point) is wide in the countries examined:
  – Between 150 and 300 veh/1000 pop
  – Between 1965 and 1995
Observations (2)

- Different EU countries reached different motorization rates at very distant points in time
  - The modeled trends could be used to predict personal risk evolution for such countries
  - Predicting/expecting breakpoints can improve understanding of ongoing trends
  - Developing and third-world countries have not yet reached these motorization rates

- Macroscopic analysis of expected national/ regional risk trends
  - Enabling comparisons
  - Providing insight into the trends, similarities and differences
Observations (3)

• Personal risk depends on many exogenous factors, affecting (and obscuring) the underlying relationship, including social events and financial trends
  – Evidenced also by breakpoints without sudden motorization changes
  – Using the parsimonious vs. using the more detailed representation

• Personal risk at the national level depends highly on the measures, programmes and strategies implemented as well as on the overall road safety culture
Conclusions (1)

- Similar risk vs. motorization trends are observed in EU countries
  - Similar maximum personal risk
  - At different times and
  - Motorization levels
- Breakpoint estimation and analysis can help in:
  - Exploring underlying structural changes
  - Prediction of break-points for other countries
- Need to develop further insight into other contributing factors and extend the model
  - Functional form
  - Explanatory variables
Conclusions (2)

- It is interesting to compare a country’s performance with the expected average performance for its current level of motorisation, identifying thus the best performing countries.

- Demonstration of the practical value and application of SafetyNet data.

- More data and further refinement of methodologies are needed to support further analysis.
Further research

- Analysis of structure of trends for all EU countries
- Systematic identification of groups, capturing countries with similar trends
- Interpretation of patterns and prediction of trends for countries “behind the breakpoint”
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