Road accident data analysis: from correlation to causation and policy support

George Yannis, Professor
National Technical University of Athens
www.nrso.ntua.gr/geyannis
Road safety is ideal for spending money for nothing

If you cannot measure it, you cannot improve it
(Lord Kelvin)

Road Safety is a typical field with high risk of important investments not bringing results
The ‘pyramid’ of road safety management systems

- The road safety management ‘footprint’ of a country at specific point in time

- **Level 1**: Structural and cultural characteristics (i.e. policy input).
- **Level 2**: Safety measures and programs (i.e. policy output).
- **Level 3**: The operational level of road safety in the country (road safety performance indicators)
- **Level 4**: Final outcomes (i.e. road casualties).
- **Level 5**: The total social costs of road crashes.
Road safety data to support evidence-based policies

- Fatalities and their evolution
- Exposure
- Safety Performance Indicators
- Causation (in-depth accident investigations)
- Health indicators
- Economic indicators
- Driver behavior, attitudes etc.
- Road safety rules and regulations
- Road safety measures assessment

*Do we have the data we need?*

*Do we need the data we have?*
Necessary Exposure Data and Performance Indicators

Exposure indicators
• Vehicle- and person-kilometres of travel
• Time spent in traffic
• Number of trips
• Vehicle fleet
• Population

Safety Performance Indicators
• Road user behavior (e.g. speeding, alcohol)
• Vehicles (e.g. crashworthiness, fleet age etc.)
• Infrastructure (e.g. meeting design and safety standards)

The most useful data are often the least available
Road accident analysis techniques

- Descriptive and qualitative analysis
- Linear regression
- Generalised Linear Models / Non-Linear Models
- Multilevel analysis
- Time series analysis
- Cost-Benefit Analysis

Conventional analysis techniques may not be appropriate for the complex and hierarchical nature of road safety outcomes.
Challenges of road accident analysis

Lack of data
(accidents, injuries, exposure, performance indicators,...)

Data not comparable
Data incompatible
Insufficient data details
Low reliability of data

Correlations but not Causations
Lack of standard methodologies
Analyses not solution oriented
Data monitoring and analysis for policy support
Fundamental directions for road accident analysis

- Streamline road safety monitoring by exploiting also new technological advances (big data)
- Establish the links between accident causation and injury causation
- Establish the links:
  - between measures and behaviour
  - between behaviour and risk
- Focus on the most cost-effective measures
- Improve the transferability of methods and experiences
- Bridge the gaps between research and policy
The future of road accident data analysis