

Risk exposure data availability, collection methodologies and use in the EU

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Introduction

- Comparing risk rates, especially at international level, may be a very complex task.
- In theory, continuous exposure measurements of different road user categories in different modes and different road environments would be required and could provide detailed exposure estimates to the degree of disaggregation of the respective accidents data
- In practice, such measurements are not possible
- Road safety analyses need to compromise to some approximations of the actual exposure, which may be more or less accurate and representative

Objectives

- The objective of this research is the analysis of the state-of-the-art in risk and exposure data availability, collection methodologies and use in the European Union
 - Explore the concepts of exposure and risk, as well as the theoretical properties of the various exposure measures in use in road safety
 - Present an overall picture of the existing methods for collecting exposure data for national risk estimates
 - Investigate the potential of international risk comparisons through the International Data Files with exposure data

This work was carried out within the scope of the SafetyNet project of the 6th Framework Program for Research, Technological Development and Demonstration of the European Union

Methodology

- An exhaustive bibliography review was carried out
- Additionally, a set of National Reports was created by the Institutes involved in the analysis, providing representative examples of exposure data availability, collection methods and use from seven representative European countries
(DK, FR, EL, HU, NO, NL, PT)
- A separate survey was devoted to the investigation of the International Data Files, by means of personal interviews with the maintainers of the related databases of several international organizations
(Eurostat, ECMT, UNECE, IRTAD, IRF)

Risk exposure data for road safety analysis

- In road safety analysis, exposure data can be used in two manners:
 - To obtain risk data in the form of outcome per unit of exposure.
 - To describe differences in the road safety situation.
- Different exposure measures are used, according to:
 - data availability and quality
 - the particular objective of the analysis.
- These measures may vary significantly in terms of the potential level of disaggregation and the possible underlying bias in their estimates

Best theoretical exposure measure

| Exposure measure | Road safety Outcome | | Context | | | Variation | | Disaggregation potential | | | |
|-----------------------------|---------------------|---------|---------|----------|--------------|-----------|----------|--------------------------|----------------------|-------------------------|----------------------|
| | Accidents | Persons | Traffic | Mobility | Epidemiology | Temporal | Regional | Road User category | User characteristics | Vehicle characteristics | Road characteristics |
| Vehicle - kilometres | • | • | • | | | • | • | | • | • | • |
| Person - kilometres | | • | • | • | | • | • | • | • | • | • |
| Road Length | • | | • | | | | • | | | | • |
| Vehicle Fleet | • | | • | | | | | | | • | |
| Population | | • | | | • | | • | • | • | | |
| Driver population | | • | • | | | | | | • | | |
| Number of trips | • | • | • | • | | • | • | • | • | • | • |
| Time in traffic | | • | • | | | • | • | • | • | • | • |

- No general rule can be adopted
- Vehicle- and person-kilometres of travel and time in traffic are closer to the theoretical concept of exposure
- Other exposure measures are also often used because they involve less complex collection methods

Overview of data collection methods

| Method | National Travel Surveys | | | | | | | Traffic counts | | | | Vehicle register | | | | Driver licenses | | | Road length | | | | | | | |
|-------------|-------------------------|----------------------|------------|----------|-----------------|------------|----------------|----------------|----------------|--------------------|----------------------|---------------------------|-------------|-------------------|-------------------|------------------|-------------|------------------|-------------|----------|-------------------|------------------|------------------|---------------|-----------------|---|
| Country | Distance travelled | Time spent in travel | -by gender | - by age | - by experience | - by mode* | - by road type | AADT | Traffic volume | - hourly variation | - seasonal variation | - vehicle classification* | New entries | Scrapped vehicles | - by vehicle type | - by vehicle age | New entries | Deceased drivers | -by gender | - by age | - by license type | - National roads | - Regional roads | - Local roads | - Intersections | |
| Norway | • | | • | • | | • | | • | • | • | | • | • | | • | | • | | • | • | • | • | • | | • | |
| Greece** | • | | • | • | • | • | • | • | • | • | • | • | • | • | •• | • | • | • | • | • | • | • | • | • | | • |
| Portugal | | • | | | | •• | • | • | • | • | • | •• | • | | • | | • | • | • | • | • | • | • | | | |
| Netherlands | • | • | • | • | | •• | | • | | | | | • | | •• | | • | | • | • | • | • | • | • | • | |
| France | • | • | • | • | • | •• | • | • | • | • | • | | • | | •• | • | • | | • | • | • | • | • | • | | |
| Hungary | | | | | | | | • | • | • | • | •• | • | | •• | | • | | • | • | • | • | • | | | |
| Denmark | | | • | • | | •• | | | • | • | • | • | • | | •• | | • | | | | • | | | | | |

* more bullets indicate a more detailed classification

** the travel survey in not official; traffic counts system was operational up to 1993

Synthesis of collection methods

- The features and specifications of each method may vary significantly among countries
- Accordingly, the availability, disaggregation and comparability of exposure measures (in terms of definitions, variables and values) are quite diverse
- The disaggregation level theoretically possible for an exposure measure is seldom achieved in practice
- Data from different sources (collection methods) are often used to produce a national exposure estimate
- In general, it is not always clear how the exposure estimates are obtained from the "raw" data collected by means of the various methods.
- Consequently, national exposure estimates, when available, are seldom comparable at EU level, especially for vehicle- and person-kilometres

Overview of International Data Files (IDF) with exposure data

| Data file | Data File description | | | | | | | | | Data availability | | | | | |
|-----------------|-----------------------|----------------------|----------------------|---------------------|------------------|-------------------|--------------------------|-------------|----------------------|----------------------------|------------------------------|----------------------------|-------------------|--------------------------|--------------------------|
| | Number of countries | Examined time series | Transport statistics | Accident statistics | Other statistics | Collection method | Disaggregate / Aggregate | Data Access | Data quality control | Vehicle-kilometers by mode | Passenger-kilometers by mode | Number of vehicles by type | Number of drivers | Population by gender/age | Road length by road type |
| Eurostat | 25 | 1960- | • | • | • | Quest. | Agg. | free | limited | • | • | • | | • | • |
| ECMT | 50 | 1960- | • | • | | | Agg. | free | limited | • | • | • | | • | |
| UNECE | 55 | 1960- | • | • | | | Agg. | free | limited | • | • | • | | • | • |
| IRTAD | 29 | 1970- | • | • | • | Quest. | Agg. | members | limited | • | • | • | | • | • |
| IRF | 84 | 1995- | • | • | • | Quest. | Agg. | members | | • | • | • | | | • |

Quest: questionnaire

Agg.: aggregate

Synthesis of IDF with exposure data

- The objectives and scopes of these data files differ among the various data providers making them to function complementarily in most cases
- The quantity and quality of available data contained inside the IDF varies significantly among the IDF
- The differences in data among the IDF are partly due to the different national sources and definitions used. However, another reason may concern insufficient data quality control within the IDFs.
- The exposure data available in the IDFs are in a much more aggregate form than the exposure data collected at national level

Conclusions

- Significant efforts are made at national level to improve data availability, disaggregation and reliability
- The lack of a common European framework for the collection and exploitation of exposure limits significantly the comparability of the detailed national data
- On the other hand, the International Data Files including exposure data provide useful aggregate information in a systematic way and are currently the only sources allowing international comparisons
 - However more effort is required to further improve the quality of these data
- A series of problems, namely poor data availability, insufficient reliability, inappropriate disaggregation and limited accessibility are the main limitations to the full exploitation of risk exposure data at European level

Recommendations

- The existing exposure data should be gathered and harmonized
- Priority should be given to the collection of vehicle- and person-kilometres
- A common framework should focus on the collection of **disaggregate time series of exposure by road user, vehicle and network characteristics**, and should be organized to provide data in a consistent and systematic way
- Both travel survey and traffic counts methods should be exploited, allowing for flexibility, high level of disaggregation and continuity over time in the exposure estimates
- The specific calculation process of exposure measures should be defined and standardized