



State-of-the-art on Risk Exposure Data

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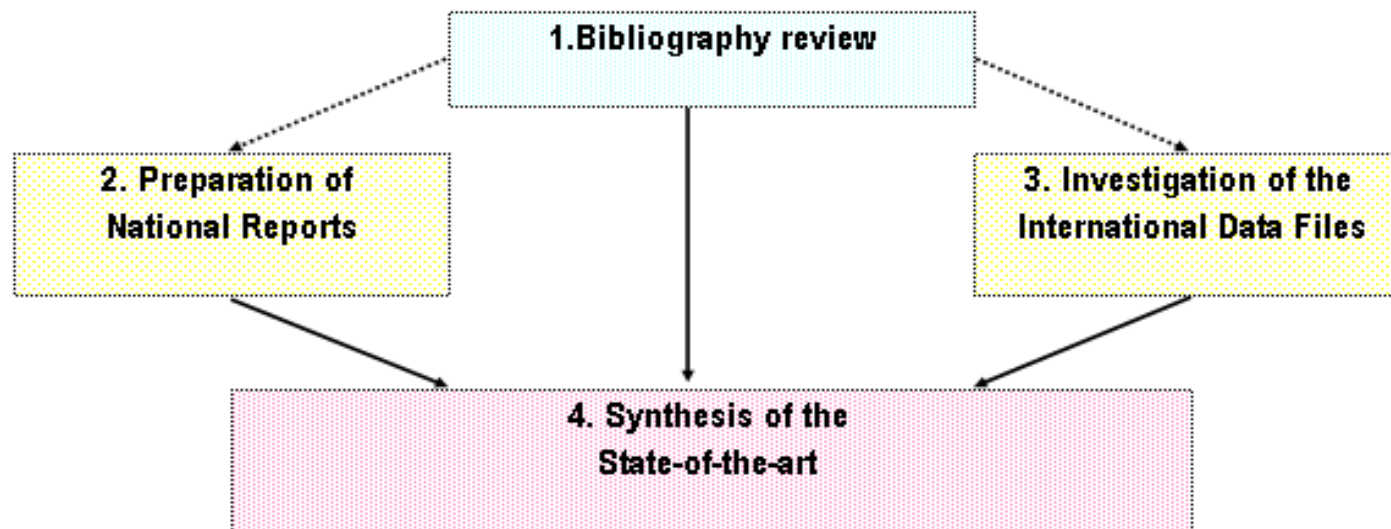


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<http://safetynet.swov.nl/>

Objectives and methodology

- **Objective:** The analysis of the state-of-the-art in risk and exposure data availability, collection methodologies and use in the European Union
- **Methodology**



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

RED in road safety analysis

- **Statistical distributions:**
 - The concept of risk
 - Statistical properties of accident data
 - Relationship between accidents and exposure
- **Needs and uses of risk figures:**
 - Road safety comparisons
 - Fatality and mortality rates
 - Properties and limitations of risk rates

Best theoretical exposure measure

| Road safety Outcome | Accidents / Persons | Persons | Accidents | Accidents / Persons | Accidents | Persons | Persons | Accidents / Persons | Persons |
|---------------------------------------|----------------------|---------------------|--------------------------|---------------------|---------------|--------------|-------------------|---------------------|-----------------|
| Amount of exposure | Vehicle - kilometres | Person - kilometres | Road Length | Fuel consumption | Vehicle Fleet | Population | Driver population | Number of trips | Time in traffic |
| Context of analysis | Traffic | Traffic - Mobility | Traffic - Infrastructure | Traffic | Traffic | Epidemiology | Traffic | Traffic - Mobility | Traffic |
| Temporal variation | • | • | | • | | | | • | • |
| Regional variation | • | • | • | | | • | | • | • |
| Potential Disaggregation level | | | | | | | | | |
| Road User category | | • | | | | • | | • | • |
| User characteristics | • | • | | | | • | • | • | • |
| Vehicle characteristics | • | • | | • | • | | | • | • |
| Road network characteristics | • | • | • | | | | | • | • |

- Different exposure measures may be used according to the context of the analysis
- 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 RED collection methods

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

Travel surveys

- The main advantage of **national travel surveys** (compared to traffic counts) is that these surveys have persons as a unit, making it possible to compare groups of persons
- Experiences with travel surveys indicate that particular short travels (by foot and by bicycle) are often not reported, whereas motorized trips are often overestimated
- Different use of various transport modes in different countries (e.g. mopeds and motorcycles)
- Travel surveys normally have other purposes than to give exposure data

Traffic counts

- **Traffic counts** are not suitable to distribute exposure according to person characteristics (age/gender groups)
- Traffic counts are continuous over time and may give good estimates of average annual daily traffic (AADT), but there are practical problems involved in calculating vehicle kilometres from AADT (complex mathematical models required)
- Measurement points may or may not be representative of the national / regional traffic (local or urban roads usually not included)
- Problems are also encountered in vehicle classification (insufficient level of detail, two-wheelers not detected by sensors etc.)

Vehicle and driver registers

- The problem when using **vehicle and driver registers** to estimate risk is that these are very crude estimates of exposure, giving quite uncertain risk estimates
- Quite often the registers are used to calculate risk in combination with sample studies of average driving distances
- Data from such database are known to lead to some (but often uncalculated) overestimations:
 - Scrapped vehicles not removed from the files
 - Deceased drivers not removed from the files
- More accurate estimates can be obtained through vehicles inspection data (not available in most countries) or vehicles taxation databases (not accessible in most countries)

Road registers

- In most countries the available information concerns the main road (motorways, national and rural roads etc.)
- Information on roadway geometry and regional/local road length estimates are less available

Other methods

- Model for vehicle kilometres based on fuel sales
- Odometer readings at regular vehicle inspections

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 is quite diverse.
- The disaggregation level theoretically possible for an exposure measure is seldom achieved in practice
- Data from different sources are often used to produce a national exposure estimate
- It is not always clear how the exposure estimates are obtained from the data collected by means of the various methods.
- The national exposure and risk estimates may not always be comparable at EU level.

Overview of the International Data Files (IDF)

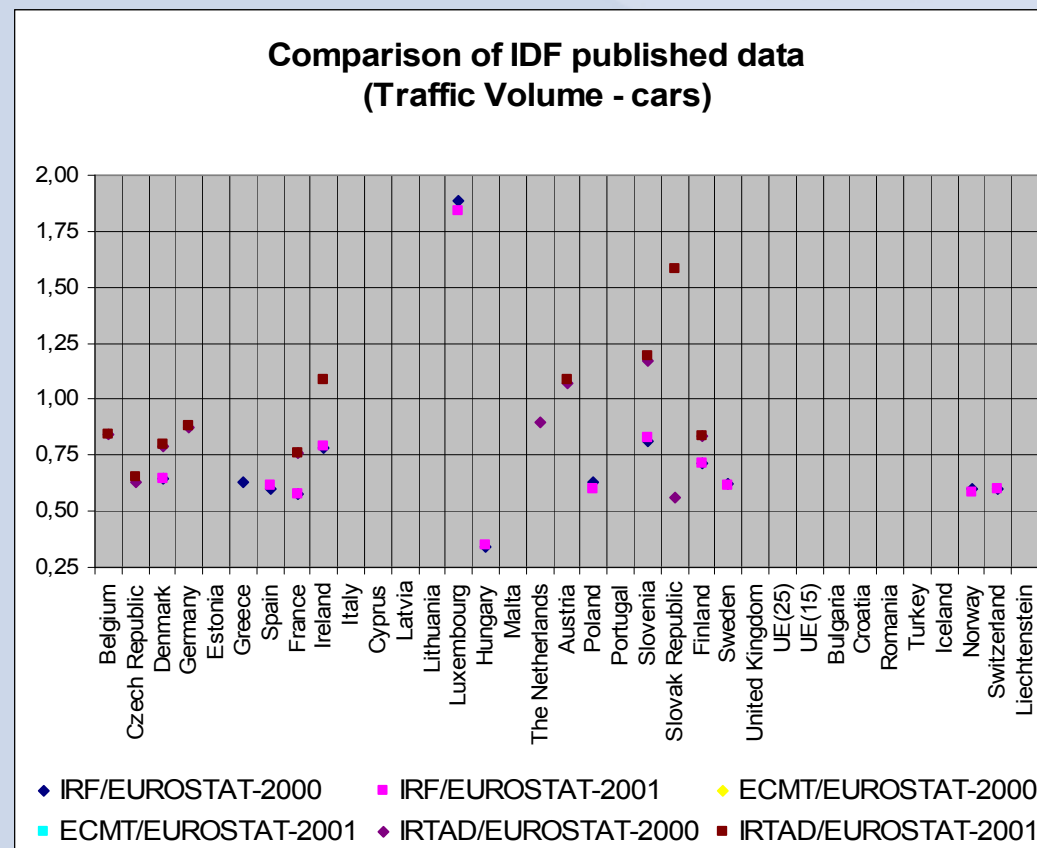
| | Eurostat | ECMT | UNECE | IRTAD | IRF |
|-------------------------------|----------------------|-------------------|------------------------|----------------------|-------------------|
| Interview information | | | | | |
| Date of interview | 17/5/2005 | 11/2/2005 | 13/4/2005 | 11/2/2005 | 17/11/2004 |
| Location | KuSS, Vienna | ECMT, Paris | UNECE, Geneva | BASt, Koeln | IRF, Geneva |
| Contact person | Mr. Hans Strelow | Mr. Mario Barreto | Mr. Miroslav Jovanovic | Dr. Andreas Schepers | Mrs. Muna Mudbary |
| Data File description | | | | | |
| Number of countries | 25 | 50 | 55 | 29 | 84 |
| Available time series | 1960- | 1960- | 1960- | 1970- | 1995- |
| Transport statistics | • | • | • | • | • |
| Accident statistics | • | • | • | • | • |
| Other statistics | • | | | • | • |
| Data collection method | Common questionnaire | | | questionnaire | questionnaire |
| Additional collection methods | various surveys | | motor traffic census | surveys | |
| Disaggregate/Aggregate data | aggregate | aggregate | aggregate | aggregate | aggregate |
| Access to the data | free/on-line | free/on-line | free/on-line | members only | members only |
| Publications* | ••• | •• | •• | ••• | • |
| Data quality control | limited | limited | limited | limited | |
| RED availability** | | | | | |
| 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 | •• | • | • | • | •• |
| Fuel consumption | •• | • | | | • |

RED in the IDFs

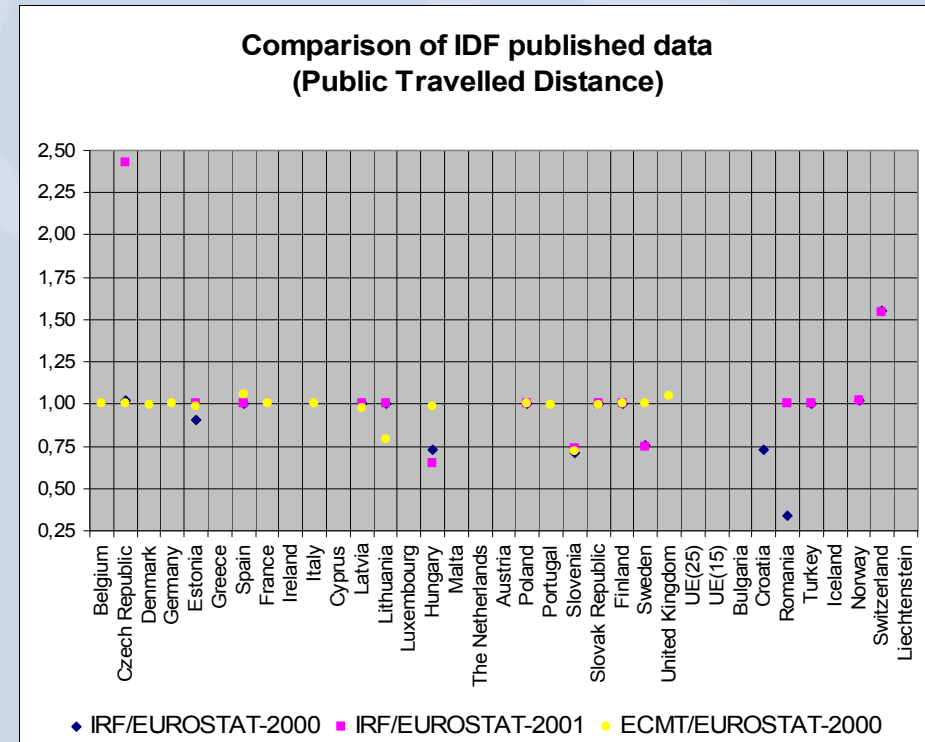
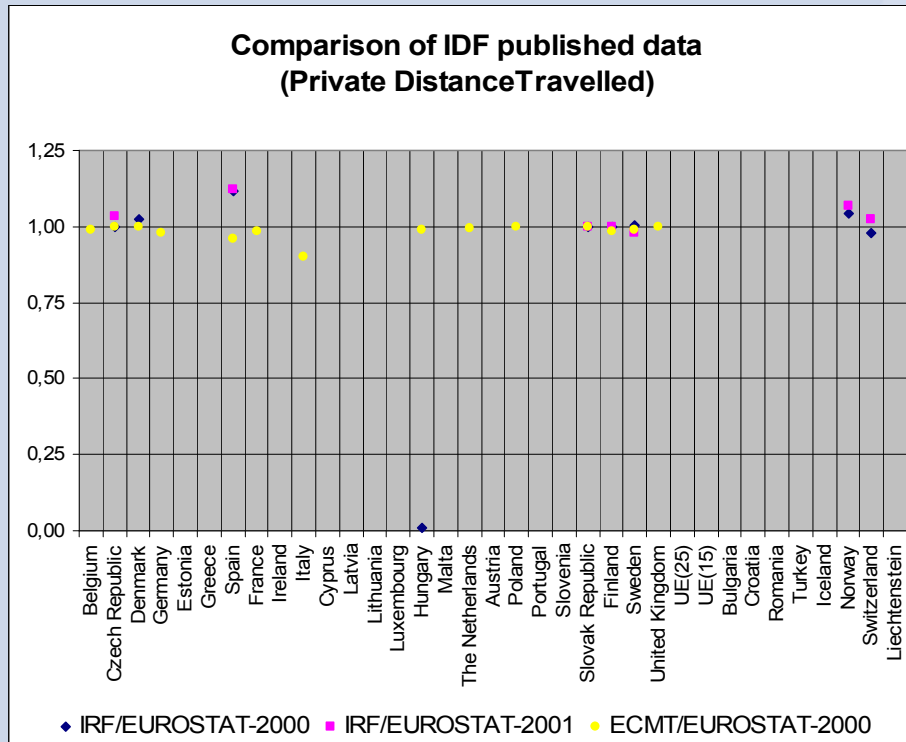
- **Analyzed IDF:** Eurostat, ECMT, IRTAD, UN/ECE, IRF
- **Comparative analysis of the available RED:**
 - Comparison of 2000 and 2001 data from EUROSTAT and other International Data Files by means of a ratio, where the denominator is EUROSTAT data and the numerator is the other IDF data.
 - Exposure data examined:
 - Road length (motorways, main roads, secondary roads)
 - Vehicle kilometres
 - Passenger kilometres (private / public travel)
 - Vehicle fleet (cars, heavy vehicles, twowheelers)
 - Population

Comparison of vehicle-kilometres

- Considerable differences among the IDF: +/- 80%.
- Availability and disaggregation of vehicle kilometres varies significantly among the IDF



Comparison of passenger-kilometres



- Data on passenger kilometres travelled by private transport do not differ significantly within the IDF (10%, +12%)
- Data on passenger kilometres travelled by public transport have large variations

Published RED by the IDF

- **Synthesis:** The overall situation as regards the published RED provided by IDF in publications available to general public

| Exposure indicator | | International data file (IDF) | | | | | |
|--------------------|-------|-------------------------------|------|-------|-------|-----|-----|
| | | EUROSTAT | ECMT | UNECE | IRTAD | IRF | IRU |
| Road length | (km) | ● | - | ● | ● | ● | |
| Traffic volume | (vkm) | ● | ● | ● | ● | ● | |
| Transport activity | (pkm) | ● | ● | ● | ● | ● | |
| | (tkm) | ● | ● | ● | - | ● | |
| Vehicle stock | - | ● | ● | ● | ● | ● | |
| Population | - | ● | ● | ● | ● | ● | |
| Driving licenses | - | - | - | - | - | | |
| Fuel sales | (t) | - | ● | - | - | ● | |

Synthesis of IDF with RED

- The objectives and scopes of these data files differ among the various data providers making them to function complementarily in most of the 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 RED limits significantly the comparability of the detailed national data
- On the other hand, the International Data Files including RED provide useful aggregate information in a systematic way and are currently the only sources allowing international comparisons
- More effort is required to further improve the availability and 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 and 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 of travel
- A **common framework** should focus on the collection of disaggregate time series of exposure by road user, mode 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.
- Additional data sources could be exploited to benchmark or validate the exposure estimates
- The specific calculation process of exposure measures should be defined and standardized