ROAD ACCIDENT DATA IN THE ENLARGED EUROPEAN UNION - LEARNING FROM EACH OTHER

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The European Transport Safety Council

The European Transport Safety Council (ETSC) is an international non-governmental organisation which was formed in 1993 in response to the persistent and unacceptably high European road casualty toll and public concern about individual transport tragedies. Cutting across national and sectoral interests, ETSC provides an impartial source of advice on transport safety matters to the European Commission, the European Parliament and, where appropriate, to national governments and organisations concerned with safety throughout Europe.

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Executive summary

Objectives

The present Review examines the current situation in the 25 countries of the European Union in relation to data on road safety and draws up a concrete set of actions for improving these data, paying particular attention to the SEC Belt countries (Southern and New EU Member States). The Review covers all aspects from data collection, gathering and entry into databases, to their processing, analysis and dissemination of results.

The objective of this Review is to evaluate existing methods for accident data collection and analysis, in order to identify the potential for road accident investigation at the national scale in the European countries. This evaluation of the national potential for accident investigation can help to propose guidelines for improved procedures of road accident data collection and analysis. At the same time, it will assist with accident research at European level.

The set of actions will be explicitly formulated as policy recommendations and will be promoted as part of an overall strategy to increase road safety in Europe. This strategy aims to contribute to halving the number of road deaths in the EU by 2010.

Methodology

The levels of motorisation and road safety and the gathering of accident data are not uniform throughout Europe. Thus, any analysis or comparison at European level should take account of these level and data differences among European countries in order to reach reliable conclusions.

In this Review, an indicative clustering of the 25 Member States of the European Union has been attempted, based on an earlier comparison of the road safety levels of the 25 countries up to 2001 (ETSC, 2003). From the investigation carried out within this Working Party, it also emerges that the New Member States, most of the Southern States, as well as Belgium and France (up to 2003) seem to have higher car occupant death rate per passenger car-kilometres than the Northern countries, indicating lower levels of road safety. Thus, a first clustering might divide the European countries between North-Western States on the one side and Southern and New Eastern Countries (SEC Belt countries) of the EU on the other side.

Furthermore, New and Southern countries do not make up a uniform group and have been subdivided. Consequently, three groups of EU countries were considered: the "Non SEC Belt countries" ("North-Western countries" hereafter), the "Old SEC Belt countries" ("Southern countries" hereafter) and the "New SEC Belt countries" ("New countries" hereafter). The level of road safety is not uniform within each group, so the groups should be viewed simply as broad clusters for the purposes of this Review.

A three-step methodology is adopted in this Report. Firstly, basic road safety data regarding the 25 European countries are analysed and compared. Secondly, the quality of available data is analysed, exploiting the results of a questionnaire-based survey in which experts from 22 European countries participated. Finally, the findings of this survey are summarised and recommendations for improving the existing situation are formulated.

Conclusions

Motorised road transport plays a central role in European societies. Most of the goods needed for everyday life are transported by road and the current generation has far greater opportunities for motorised travel in the course of work and leisure than their forefathers. Their advantages have been achieved, however, at a large cost. This Review has considered the data that are needed to measure the human and economic costs, in terms of the numbers of road accidents and of people killed and injured in these accidents.

The experience of many countries has shown that it is perfectly possible to introduce measures that greatly reduce this important economic and human cost but that reliable data are needed to quantify the scale of the problem and to identify the most effective solutions. Collecting road accident data is not "bureaucratic form filling", because it provides the essential information that each country needs to tackle one of the most widespread and serious problems that it faces.

Thus, the primary recommendation of this Review is that each country - and especially those in the SEC Belt (Southern and New Member States) - should recognise the seriousness of the problem of road accidents, in terms of the human and economic consequences. They should also recognise the essential role of collecting high-quality data on road accidents and on exposure in order to measure the scale of the problem and to devise effective countermeasures. This recognition should extend from the national authorities to local authorities, the police officers and all those who, in all countries, carry the principal responsibility for recording details of road accidents.

Collecting good quality data on exposure can be expensive, but these data are essential in order to calculate accident risks reliably and then to develop optimal policies for reducing those risks. Better policies based on more reliable information will lead to fewer casualties, so the cost of data collection will be amply justified by the benefits of the resultant casualty reduction.

Recommendations for improving data collection

- The design and operation of the national data collection system should not be "left to chance". It should be reviewed regularly to ensure that it meets the requirements of data users while not imposing unrealistic burdens upon the data providers, i.e. the Police. Naturally, police officers should be well trained to collect the accident data and make the best use of the national data collection system.

- Accident data collection should explicitly be accepted as a very important task for police forces and all those involved in the process, not something that they are implicitly expected to do in addition to all of their other responsibilities. The collection system should take account of the interests of data users, not just of the interests of the Police as data collectors.

- Regular studies of underreporting are needed, but this Review has found that few have been carried out even in the North-Western countries. Most countries report fatal accidents and road deaths almost fully, so this applies particularly to non-fatal accidents. When there is no information about the underreporting rates and their possible changes over time then it is impossible to interpret trends properly and decide, for example, whether a reduction in the number of accidents *reported by the Police* represents a genuine safety improvement. When national underreporting rates are known then corrections should be applied to aggregated accident data. When a study shows that the reporting rates have fallen then remedial actions should be taken to restore the rates. The improvement and standardisation of methodologies for tackling the underreporting issue of all types of traffic, including cyclists and pedestrians, is the first priority.

- Data on damage-only accidents should be collected, at least on a sample basis, or made available via insurance companies. This kind of data is necessary to complete the accident severity continuum, from those with material damage only to fatal accidents.

- Road safety is increasingly studied in an international context, for example the EU target of halving the number of road accident deaths. It is desirable to move towards a common system for recording road

accident data. This 'common system' would encompass all aspects, including the definitions of fatal, serious and slight injuries. The main advantage would be that data from different countries could be compared on a consistent basis. This recommendation would apply to all European countries, but the SEC Belt countries would benefit in particular as this would allow experience about effectiveness of measures to be shared more easily.

- Electronic systems have great potential to reduce the burden on the Police and speed up the data collection process. The equipment and software are expensive, however, and data could easily be lost if police officers do not use the new systems correctly. Also, there is a depressing history of large-scale IT systems that have failed to live up to expectations. It is necessary to see the results of major trials before deciding whether to recommend the adoption of these systems. Care should be taken to ensure that existing data quality checks are not discontinued if electronic data collection systems are adopted.

- The introduction of in-vehicle "black box" devices, recording vehicle situation before and during the accident (similar to those of air crashes) could allow for additional useful information to be collected. This additional information could include speeding as well as vehicle manoeuvres, which cannot be reliably identified by the usual police investigations.

- The Police often have difficulty in recording the location of an accident numerically as required by most national systems, yet it is essential for road engineers tasked with designing remedial measures. GPS systems provide a reliable means for recording this information. A prerequisite for the use of these systems is the existence of digital maps for the entire road network with specifications of road type and speed limit in each country, which is not the case for most EU countries.

- Harmonisation of the accident collection forms in the European countries could also be an option. However, before this harmonisation takes place the CARE accident database could be improved by using transformation rules for combinations of differently defined data elements to common data. Further harmonisation could be even more helpful. The harmonised accident collection system should concern common definition data on fatal and injury accidents (at least all serious injury accidents) combined with in-depth data from stratified samples of accidents, using uniform methodologies and allowing for the investigation of accident and injury causation.

- The case for collecting good quality information about the volume of road traffic per road type and road user category in each country is as

strong as for information about road accidents, although perhaps more difficult to explain to a layman. The availability of these data is poor in most European countries, which limits the strength of the conclusions that can be drawn from analyses of accident data. It is recommended that all EU member states should record exposure data, at least at the level of traffic volume by road type and vehicle type and/or road user category, but preferably also for the non-motorised modes, pedestrians and pedal cyclists. It would be helpful to adopt a common EU methodology for recording exposure.

- Exposure data in each EU country should be collected by qualified institutions, using a uniform methodology. These data should then be annually published.

Recommendations for improving use of data

The purpose of collecting high-quality data about road accidents is to improve road safety and this can be achieved in many ways. One is to improve road safety on the basis of researched effects of measures and another to educate the public by publishing information, most commonly in the form of research and annual statistical reports, and full use should be made of the Internet to allow easier access. These reports tend to be written in technical terms which laymen often find difficult to understand, however, so it is recommended that versions or extracts from these reports be made available that are expressed in ways that can be understood easily.

- To be most effective, road safety policy needs to be firmly based on evidence about the current road safety problems and the effectiveness of potential countermeasures. This Review has found that this practice is not widespread at present. It is recommended that policymakers should be helped to understand the importance of basing the development of new measures on rigorous analysis of the available evidence.

- If a significant and new road safety measure has been taken, then a programme for monitoring its effects should also be set out. The systematic assessment of the effectiveness of these measures will help future planning.

- Road accident data are complex. They include details of the accident circumstances, the vehicles involved and the people injured, and these can be influenced by a wide range of factors such as the road type, the vehicle speed and road user aspects, such as the age of the driver and/or other involved road users and the involvement of alcohol as well as the traffic volume of the road. The task of carrying out

thorough analyses is demanding. The improvement of road safety requires increased numbers of professional analysts with the necessary skills. The experience of the USA is instructive. There has been access to the FARS[1] database in the USA for several years and quite a few analysts regularly perform advanced types of analysis. As a result, awareness of the level of risk in road accidents and the effectiveness of countermeasures is more sophisticated in the USA than in most European countries. The operation of the EU CARE database is a first important step towards a more sophisticated approach in Europe. It is therefore recommended that wider access to national accident datasets, as well as to the CARE database, should be allowed to encourage a higher level of analysis and a more informed debate about the problem of road accidents and the ways of improving road safety.

- It is important to compare the risks of road travel modes with the risks of non-road modes so that transport safety budgets can be allocated most effectively.

[1] Fatal Accident Reporting System, maintained by the US National Highway Traffic Safety Administration.

1 Introduction

1.1 Background

Despite the important decrease in the number of deaths in the European roads during the last decade, there are certainly many more actions to be taken in order to achieve a further decrease of road accident victims in Europe. Road safety is considered to be a high priority issue in all European countries and consequently many efforts have been made to implement safety measures that will contribute to improving the situation. The lack of fully reliable and compatible data files throughout Europe is an important limitation of road safety analysis and of the related development of road safety measures.

Road safety is not equally distributed across Europe. The risk of being killed or injured in a road accident is much higher in some European countries than in others. A "North-South divide" exists in European transport safety: while North-Western European countries have developed and implemented plans and policies that have significantly improved road safety, Southern European countries generally suffer from greater road risk.

This contrast between safer and less safe Member States has become even more pronounced after the accession to the European Union of ten new countries in 2004. Several new Member States already suffered from low levels of traffic safety and an increase in the volume of road transport following their accession might well lead to an increase in accidents. In addition to a North-South divide in traffic safety, there is now also an East-West divide.

However, there is no reason to believe that these differences cannot be reduced or eliminated by improving traffic safety in the less safe countries. In Belgium, Estonia and France for example, the number of deaths has significantly dropped in recent years. These countries and several North-Western European countries could serve as examples of best practice to inspire other poorly performing countries.

This Review of improvements to the collection of road transport accident data is part of a larger ETSC project that aims to contribute to a long-lasting improvement of sustainable transport safety in countries with a lower level of safety in Southern, Eastern and Central European countries (SEC Belt). However, many of the conclusions of this Review will also apply to those countries whose level of safety may appear more satisfactory (Figure 1).

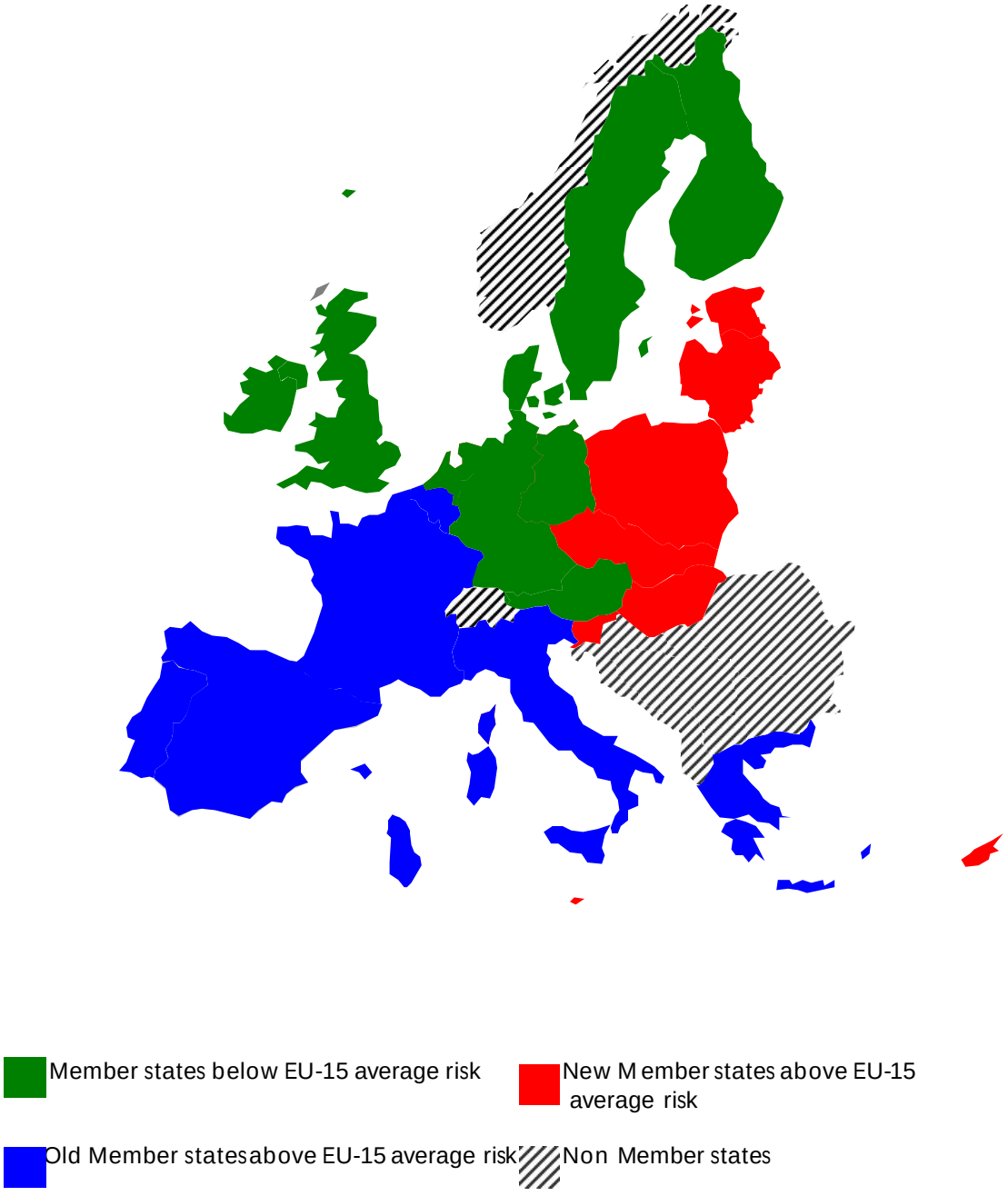


Figure 1. The "SEC Belt" countries

1.2 Objectives

The present Review examines the current situation in the 25 countries of the European Union as far as data on road safety are concerned and draws up a concrete set of actions for improving these data, paying particular attention to the SEC Belt countries (Southern and New EU Member States). The Review covers all aspects from data collection, gathering and entry into databases, to their processing, analysis and dissemination of results.

The objective of this Review is to evaluate existing methods for accident data collection and analysis, in order to identify the potential for road accident investigation at the national scale in the European Union. The ultimate goal is to provide conclusions and recommendations and to allow all Member States to learn from each other. This evaluation of the national potential for accident investigation can help to propose guidelines for improved procedures of road accident data collection and analysis. At the same time, it will assist with accident research at European level. The set of actions will be explicitly formulated as policy recommendations and will be promoted as part of an overall strategy to increase road safety in Europe. This strategy aims to contribute to halving the number of road deaths in the EU by 2010.

1.3 Methodology

1.3.1 Grouping EU countries

The levels of motorisation and road safety are not uniform throughout Europe. Thus, any analysis or comparison at European level should take account of these level and data differences among European countries in order to reach reliable conclusions.

In this Review, an indicative clustering of the 25 Member States of the European Union has been attempted, based on an earlier comparison of the road safety levels of the 25 countries up to 2001 (ETSC, 2003). This clustering is partially reconfirmed by the comparison that is based on recent death rates, as shown in Figures 2-4. Regarding Figure 2, the car occupant death rate per billion passenger car-kilometres is calculated by the use of the CARE deaths data (numerator) and the results of the Sartre-3 survey (sample of 1,000 passenger car drivers in each of 24 European countries) of self-reported annual mileage combined with the official passenger car fleet size from Eurostat (denominator).

Figure 2 shows that the New Member States, most of the Southern States, as well as Belgium and France seem to have higher car occupant death rate per passenger car-kilometres than the North-Western countries,

indicating lower levels of road safety. The figure shows a first clustering that divides the European countries between the North-Western States on the one side and the Southern and New States (SEC Belt countries) on the other side (with an exception for the location of Italy).

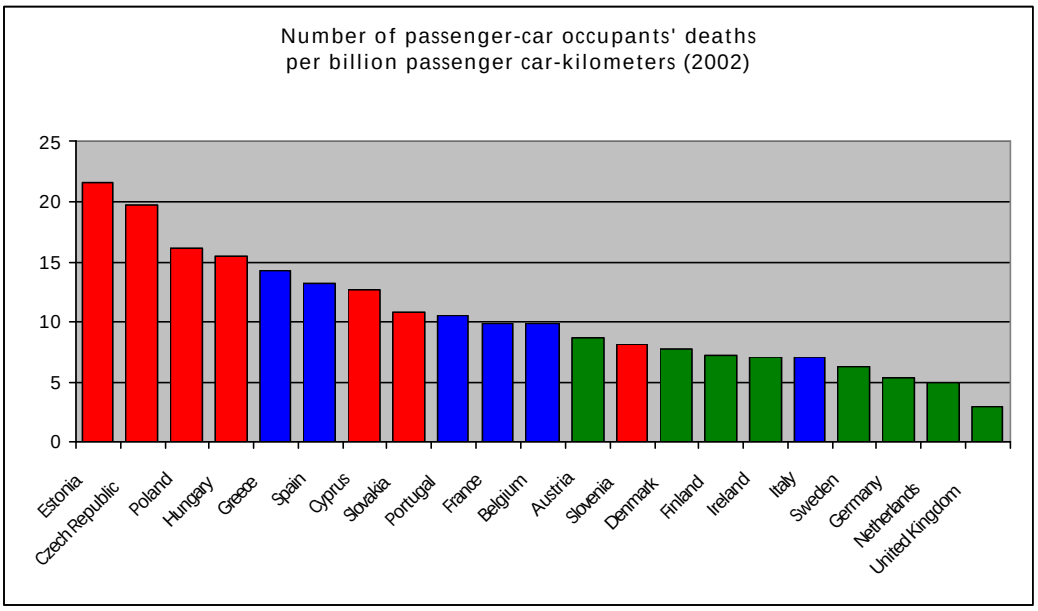


Figure 2. Indicative road safety levels in EU Member States
Passenger car occupants' death rate per billion passenger-car kilometres in 2002
(Source: CARE, Sartre 3, Eurostat)

With respect to Figure 2, it is noted that the relative order of the death rates may differ from the actual order of the death risks as a result of inaccurate estimates of the passenger car-kilometres, as based on data supplied by national samples of car drivers. Also, the low rate for Italy in the middle of the risk range for the North-Western Member States may also partially result from high underreporting of fatal accidents by the Police in Italy (see section 3.3).

New and Southern countries do not make up a uniform group and have been subdivided. Consequently, three groups of EU countries were considered, as shown in Table 1: the "Non SEC Belt countries" ("North-Western countries" hereafter), the "Old SEC Belt countries" ("Southern countries" hereafter) and the "New SEC Belt countries" ("New countries" hereafter). Since the road safety level is not uniform within each group, the groups should be viewed simply as broad clusters for the purposes of this Review.

"Non SEC Belt countries"	"Old SEC Belt countries"	"New SEC Belt countries"
"North-Western countries"	"Southern countries"	"New countries"
Austria	Belgium	Cyprus
Denmark	France	Czech Republic
Finland	Greece	Estonia
Germany	Italy	Hungary
Ireland	Portugal	Latvia
Luxembourg	Spain	Lithuania
Netherlands		Malta
Sweden		Poland
United Kingdom		Slovakia
		Slovenia

Table 1. The three groups of the European countries

Finally, it should be noted that the presence of Austria in the "North-Western" group, as well as the presence of France and Belgium in the "Southern" group is purely justified on the basis of their road safety levels, rather than their geographical position. Moreover, Belgium and France, though belonging to the SEC Belt when the present project started in January 2004, might by now have left this group of countries. However, for the sake of consistency with the previous ETSC report on estimated death risks for the 15 old and 10 new EU Member States up to 2001 (ETSC, 2003) and with the rest of the work, they will still be included in the SEC Belt group.

1.3.2 Assessing road safety data

The present Review attempts to examine the current situation in all 25 EU countries. The analysis covers several aspects related to road safety data: data collection, quality control and storage, processing, analysis and dissemination of results.

Road accident data are of particular interest but demographic information like population and road network length and exposure data like car-mileage, passenger-mileage and travel shares of non-motorised modes are also considered. These are needed to interpret the accident data and reach balanced conclusions about the level of safety. Previous investigations have demonstrated that suitable risk exposure data are not available in most European countries (ETSC, 1999). The lack of detailed exposure data is a fundamental barrier to road accident analysis and will be further investigated.

Key issues in this Review are availability of data, levels of aggregation, reliability of data, comparability at the EU level, underreporting rates and exposure data. Furthermore, data on vulnerable road users, like two-wheelers and pedestrians, are also investigated.

Basic questions to be considered are: Why do we need data? What types of data do we need? What level of detail is required? How do we process the data? How do decision makers use data?

This approach will lead to the identification of problem areas regarding road accident data in member states, in particular the SEC Belt countries. Actions that could lead to substantial improvements of the current situation in the SEC Belt will be drawn up using the expertise and experience of European countries with better levels of road safety.

In the following section, some basic road safety data regarding the 25 European countries are presented and compared, while in the third chapter of the Review the quality of available data is analysed. This analysis exploits the results of a questionnaire-based survey in which experts from 22 European countries participated. Finally, the findings are summarised in the last chapter of the Review and recommendations for improving the existing situation are proposed.

2 Basic road safety figures of the 25 EU countries

The White Paper of the European Commission for the transport policy set an ambitious target for 2010 of reducing road accident deaths by 50%, in relation to the total for 2000. However, reaching this target by the year 2010 will not be easy. The current situation regarding road safety at European level needs to be thoroughly investigated, taking into account the characteristics of all 25 Member States. The forthcoming enlargement of the European Union in 2007 will further complicate the task.

In this chapter some basic road safety figures are presented, allowing a preliminary comparison between groups of European countries. These data refer to all 25 European States, including the 10 New Member States that joined the European Union in 2004. The figures presented mainly concern road accident deaths, as only these figures are considered to be fairly comparable at the European level. Finally, it should be noted that adequate exposure data exist in only a few Member States and that this limits the range of results which can be presented in this chapter.

2.1 Road accident deaths

This section presents some basic figures related to road safety for all 25 Member States of the European Union. More specifically, the figures that provide insight into the magnitude of the road safety problem across Europe concern the number of road accident deaths, as well as the number of road accident deaths per million inhabitants. All these figures refer to a 14 year period of time (1991-2004). Furthermore, the death shares of pedestrians and (motorised) two-wheelers (2002) are presented to provide some insight into the reasons for differences in road safety among the 25 EU countries.

The analysis of absolute numbers of road accident deaths (Table 2) can be very detailed and may lead to fairly reliable comparisons as long as the common definition (death within 30 days) is used for data from all European countries. Unless the relevant exposure data are taken into consideration, however, these statistics can only be used as a general description of the road accident phenomenon and should be considered with care.

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
North-Western	Austria	1.551	1.403	1.283	1.338	1.210	1.027	1.105	963	1.079	976	958	956	931	878
	Denmark	606	577	559	546	582	514	489	499	514	498	431	463	432	369
	Finland	632	601	484	480	441	404	438	400	431	396	433	415	379	375
	Germany	11.300	10.631	9.949	9.814	9.454	8.758	8.549	7.792	7.772	7.503	6.977	6.842	6.613	5.842
	Ireland	445	415	431	404	437	453	473	458	414	418	412	376	339	379
	Luxembourg	83	69	78	65	70	71	60	57	58	70	69	62	53	49
	Netherlands	1.281	1.253	1.235	1.298	1.334	1.180	1.163	1.066	1.090	1.082	993	987	1.028	804
	Sweden	745	759	632	589	572	537	541	531	580	591	583	560	529	480
	United Kingdom	4.753	4.379	3.957	3.807	3.765	3.740	3.743	3.581	3.564	3.580	3.598	3.581	3.658	3.368
	Total	21.396	20.087	18.608	18.341	17.865	16.684	16.561	15.347	15.502	15.114	14.454	14.242	13.962	12.544
Southern countries	Belgium*	1.873	1.671	1.660	1.692	1.449	1.356	1.364	1.500	1.397	1.470	1.486	1.315	1.315	1.315
	France	10.483	9.900	9.867	9.019	8.891	8.541	8.444	8.918	8.487	8.079	8.160	7.655	6.058	5.530
	Greece	2.112	2.158	2.159	2.253	2.411	2.157	2.105	2.182	2.116	2.037	1.880	1.654	1.615	1.619
	Italy	8.109	8.053	7.188	7.091	7.020	6.676	6.713	6.314	6.633	6.410	6.682	6.775	6.015	5.625
	Spain	8.836	7.818	6.378	5.615	5.751	5.483	5.604	5.957	5.738	5.776	5.517	5.347	5.399	4.741
	Portugal	3.218	3.084	2.700	2.504	2.711	2.730	2.521	2.126	2.028	1.874	1.671	1.655	1.546	1.294
	Total	34.631	32.684	29.952	28.174	28.233	26.943	26.751	26.997	26.399	25.646	25.396	24.401	21.948	20.124
New countries	Cyprus	103	132	115	133	118	128	115	111	113	111	98	94	97	117
	Czech Republic	1.331	1.532	1.524	1.637	1.588	1.562	1.597	1.360	1.455	1.486	1.334	1.431	1.447	1.382
	Estonia	490	287	321	364	332	213	280	284	232	204	199	224	164	170
	Hungary	2.120	2.101	1.678	1.562	1.589	1.370	1.391	1.371	1.306	1.200	1.239	1.429	1.326	1.296
	Latvia	923	729	670	717	611	550	525	627	604	588	517	518	493	516
	Lithuania	1.093	779	958	765	672	667	725	829	748	641	706	697	709	752
	Malta	16	11	14	6	14	19	18	17	4	15	16	16	16	13
	Poland	7.901	6.946	6.341	6.744	6.900	6.359	7.310	7.080	6.730	6.294	5.534	5.827	5.640	5.712
	Slovakia	649	697	639	680	698	640	828	859	671	647	625	626	653	608
	Slovenia	462	493	493	505	415	389	357	309	334	313	278	269	242	274
	Total	15.088	13.707	12.753	13.113	12.937	11.897	13.146	12.847	12.197	11.499	10.546	11.131	10.787	10.840
	Grand Total	71.115	66.478	61.313	59.628	59.035	55.524	56.458	55.191	54.098	52.259	50.396	49.774	46.697	43.508

* Latest figures for 2002



decreasing increasing

The basis of the tables is year 1991. Depending on the evolution of each country during the following years the colour turns into blue (decreasing numbers) or red (increasing numbers).

Table 2. Road Accident Deaths
(Source: CARE, National Statistical Publications)

2.2 Road accident rates

A more informative comparison of the level of road safety is achieved by combining accident data with exposure and other additional data to calculate accident rates such as the number of road accident deaths per million inhabitants (Table 3 and Figure 3) or per mileage of motor vehicles or road accident deaths per distance travelled by road user category. However, the calculation of such rates depends directly on the availability and comparability of these additional data.

In the present Review, the rate of number of road accident deaths per million inhabitants is used to demonstrate the magnitude of this public health risk. Additionally, the rate of passenger car occupants' deaths per million passenger cars was calculated (Figure 4) allowing for conclusions on traffic risk to be drawn. Data on passenger cars were used because

only these figures were reliably available for all 25 Member States (data for passenger cars are considered to be more reliably comparable at European level than for all, including the remaining, vehicle categories since definitions and registration levels for the remaining vehicle categories are not uniformly specified throughout the EU).

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
North-Western countries	Austria	200	179	162	169	152	129	139	121	135	122	119	118	115	108
	Denmark	118	112	108	105	112	98	93	94	97	93	81	86	80	69
	Finland	126	120	96	95	86	79	85	78	84	77	84	80	73	72
	Germany	142	132	123	121	116	107	104	95	95	91	85	83	80	71
	Ireland	126	117	121	113	121	125	130	124	111	111	108	97	87	89
	Luxembourg	216	177	197	162	172	172	143	135	135	174	159	140	119	110
	Netherlands	85	83	81	85	86	76	75	68	69	68	62	61	64	50
	Sweden	87	88	73	67	65	61	61	60	66	67	66	63	59	54
	United Kingdom	82	76	68	65	64	64	64	61	60	60	60	60	62	56
	Average	117	109	101	99	96	89	88	82	82	80	76	75	74	66
Southern countries	Belgium*	188	167	165	168	143	134	134	147	137	144	145	128	128	128
	France	184	173	172	157	154	147	145	153	145	138	138	129	102	93
	Greece	207	210	209	216	231	206	201	208	201	193	178	151	147	153
	Italy	143	142	126	124	123	116	117	110	115	115	116	117	104	97
	Spain	227	201	163	143	146	139	142	150	144	143	135	129	128	110
	Portugal	326	310	271	251	271	272	250	210	200	184	163	160	150	125
	Average	190	179	163	153	153	145	144	145	141	138	135	128	115	106
New countries	Cyprus	150	189	161	184	162	174	155	149	150	147	129	129	128	154
	Czech Republic	128	152	148	158	154	151	155	132	141	145	130	139	141	135
	Estonia	312	184	210	242	223	144	192	195	160	149	146	163	120	124
	Hungary	204	203	162	151	154	133	135	133	127	117	121	140	131	127
	Latvia	346	274	257	279	242	220	212	255	248	247	219	221	210	220
	Lithuania	314	223	256	205	181	180	196	224	202	173	203	201	204	216
	Malta	45	31	39	16	38	51	48	45	11	39	41	41	41	33
	Poland	207	181	165	175	179	165	189	183	174	163	143	151	146	148
	Slovakia	116	128	110	119	123	115	146	152	120	116	114	113	120	113
	Slovenia	231	247	247	254	209	195	180	156	169	157	140	135	121	137
	Average	200	183	168	173	171	157	174	170	161	153	141	149	144	145
	Average	161	150	138	134	132	124	126	123	120	116	111	109	157	95

* Latest figures for 2002



decreasing increasing

The basis of the tables is year 1991. Depending on the evolution of each country during the following years the colour turns into blue (decreasing numbers) or red (increasing numbers).

Table 3. Road Accident Deaths per million Inhabitants
(Source: CARE, National Statistical Publications)

According to Table 3 and based on Figures 3 and 4, it seems that the two Member States showing the highest rates of "road accident deaths per million inhabitants" and "passenger car occupants deaths per million

passenger cars" are Latvia and Lithuania, which both belong to the "New countries" cluster. At the same time, Malta seems to have lower rates than the rest of the European countries. Furthermore, the Netherlands, Sweden and the United Kingdom are found to be characterised by a rather low rate of "deaths per million inhabitants", while the rates for Greece and Portugal on the one hand and for Poland and Czech Republic on the other hand are among the highest.

As far as the rate of "car occupants' deaths per million passenger cars" is concerned, it seems that the countries in the "North-Western" group have the lowest rates, while the highest rates occur in the "New" cluster. The only exception is Malta, where the limited length of the road network could contribute to the low death rates by restricting the average mileage per motor vehicle.

The rate of "car occupants' deaths per million passenger cars" only provides a relatively simple indication of the differences in risk. The hours spent in traffic, as well as vehicle and passenger kilometres or the travel kilometres per road user category are needed to conduct more complete analyses.

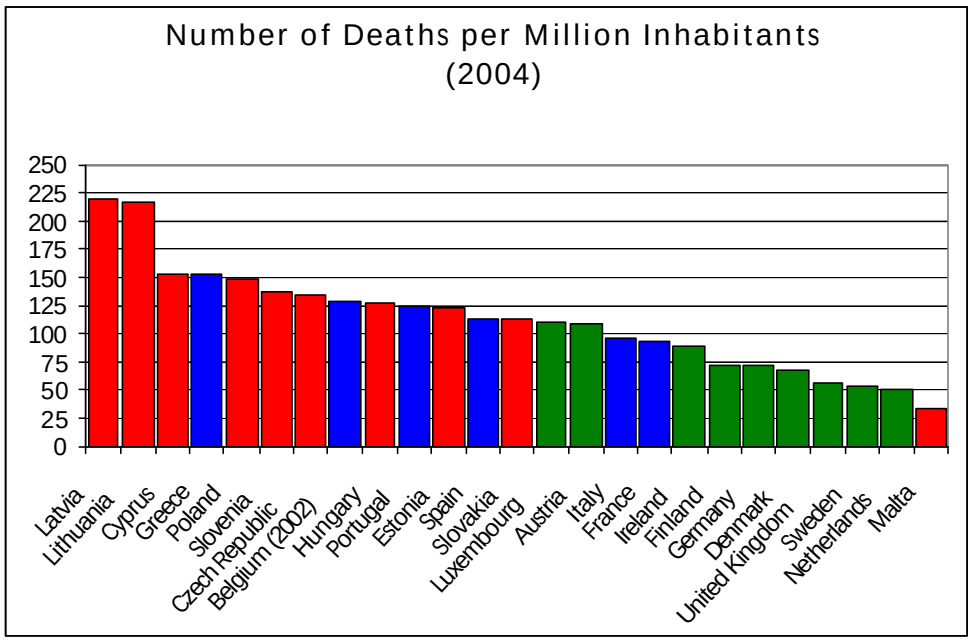


Figure 3. Road Accident Deaths per million Inhabitants for 2004

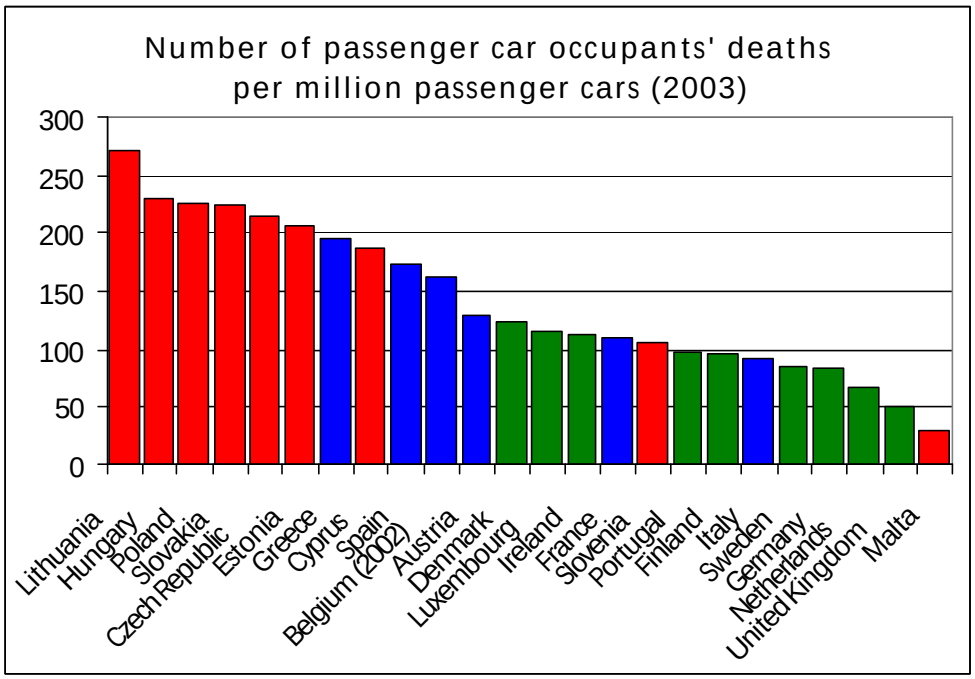


Figure 4. Passenger car occupants' deaths per million Passenger Cars for 2003

The average yearly number of deaths per million inhabitants for each of the three groups of countries has been calculated to investigate the changes in level of safety in each country group since 1991.

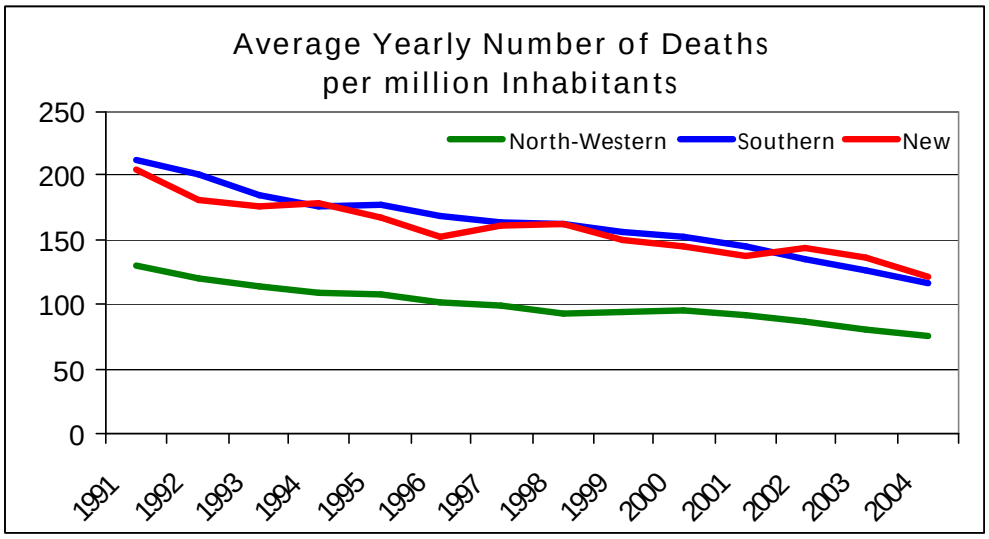


Figure 5. Average Yearly Number of Deaths per million Inhabitants

Figure 5 shows that the "North-Western countries" group had the lowest rate of deaths per million inhabitants, while the rates for the other two groups were broadly similar. The "Southern" cluster had the highest rate of deaths per million inhabitants during most of the period examined. Nevertheless, these death rates for all three groups decreased over this

period. Over the time period examined, the "Southern" cluster achieved the highest decrease (45%), followed by the "North-Western" group (almost 43%).

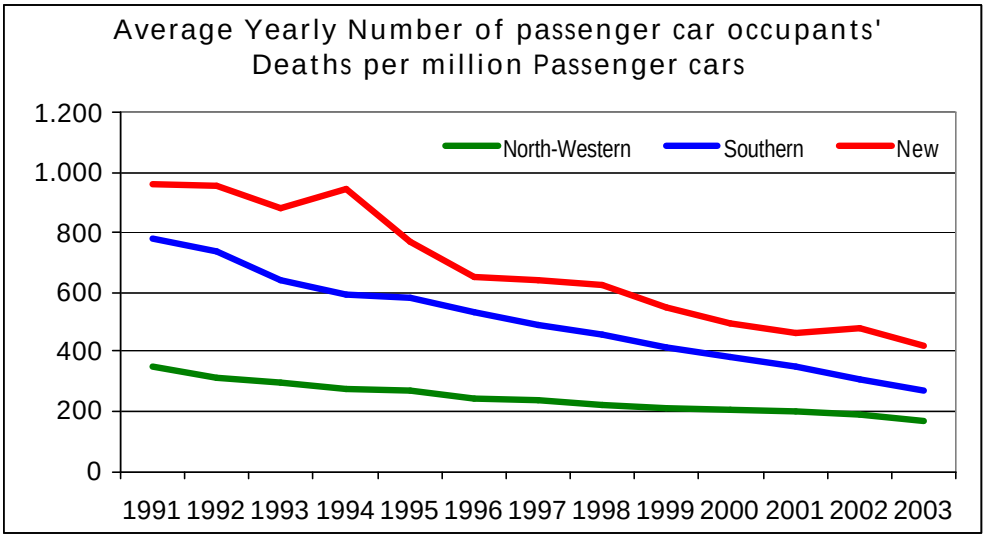


Figure 6. Average Yearly Number of passenger car occupants' Deaths per million Passenger cars

Based on Figure 6, one can observe that, even though the starting point of the three groups of countries is different, the respective trends have important similarities. More specifically, in "North-Western" countries, which show higher road safety levels, a decrease in the number of passenger car occupants' deaths of approximately 50% occurred between 1991 and 2003. At the same time, a similar significant reduction (over 65%) also occurred in the "Southern" countries and the "New" countries (56%). However, from 1994 to 2003 the rate decrease is largest for the New Member States.

The size of the vehicle fleet and the total motor vehicle mileage in Europe increased significantly during the period examined and this may have helped to improve road safety throughout Europe. Generally, the increase of the vehicle fleet and total mileage in each country increases the need for more and safer road environment, in which the drivers' behaviour tends to be also better (Koornstra, 1992, 1997). For example, the traffic share of the relatively safer motorways grows while speed on urban roads goes down as a result of increased traffic volume and enhanced police speed checks.

2.3 Vulnerable road users

The relatively higher risk of vulnerable road users, such as pedestrians and riders of two-wheelers is an additional traffic safety burden, which also contributes by nationally different shares of vulnerable road user categories in the traffic volume to the unequal distribution of road safety among European Member States. The following Figures (7-9) show the percentage of the death totals for pedestrians and riders of two-wheelers, both motorised and cycles.

The Figures show that the New Member States have the highest percentage of pedestrian deaths, whereas the respective percentage of riders of motorised two-wheelers is very low; both facts may be explained by the low level of motorisation. Northern and Southern States show the highest percentage of two-wheeler deaths, perhaps because better weather conditions in the Southern States result in higher volumes of two-wheelers traffic, while a higher total mileage of cyclists is found in several Northern States and especially in the Netherlands, where the risk per kilometre cycled is actually the lowest of all EU Member States (Koornstra et al., 2002). Finally, the high percentage of pedestrian deaths in the United Kingdom does not necessarily indicate higher risks of pedestrians in the UK but may be explained by the relatively low percentage of car occupant deaths resulting from the low death risk of UK passenger car occupants (see figure 4): this risk (per passenger car mileage) is lower than for any other EU country (Koornstra et al., 2002).

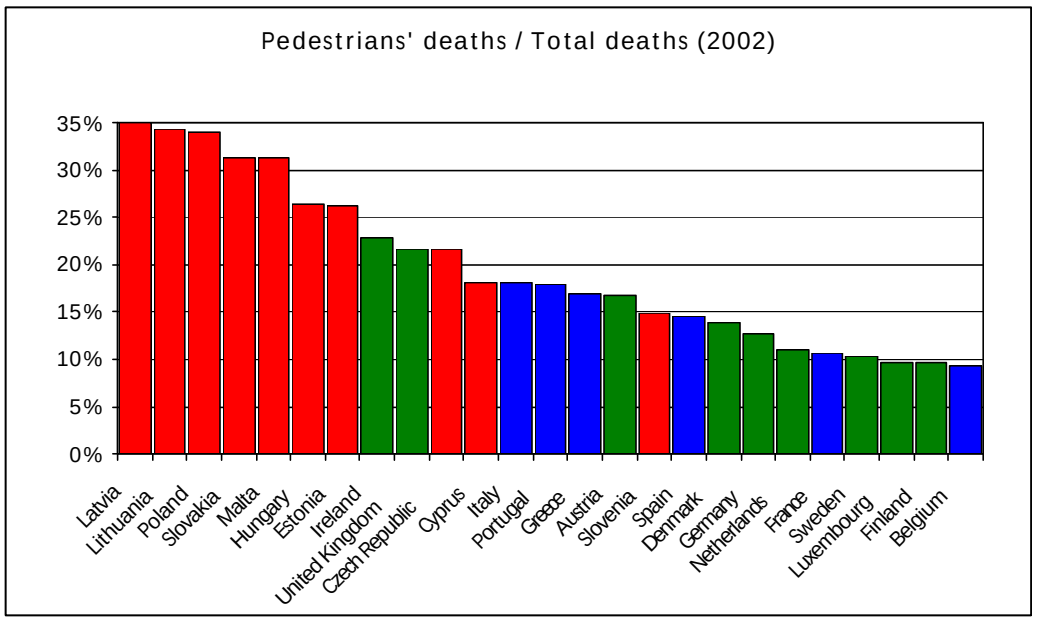


Figure 7. Pedestrians' deaths as a proportion of all deaths, 2002

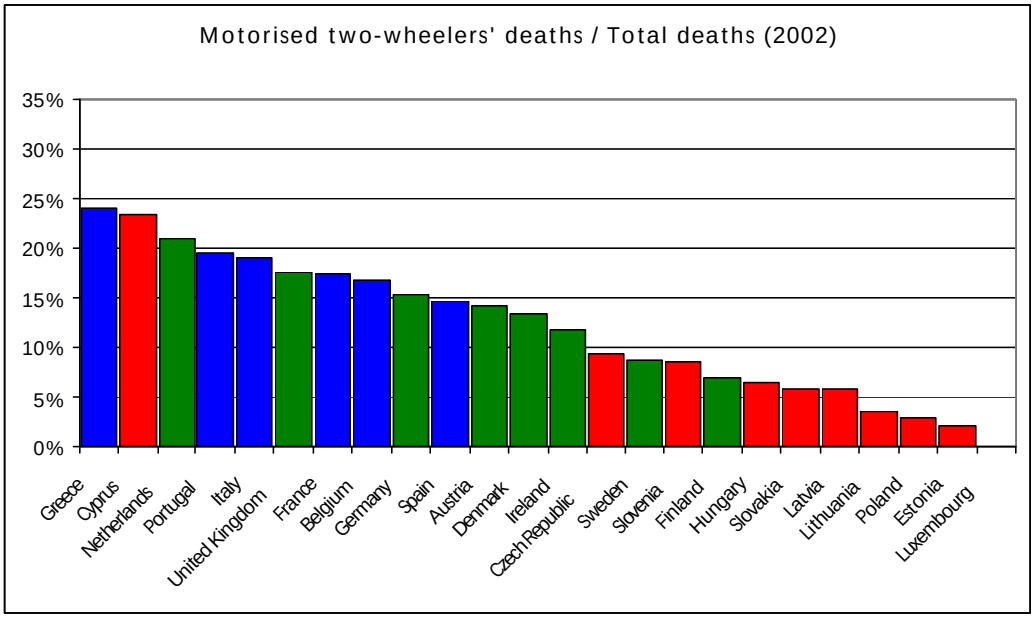


Figure 8. Motorised two-wheelers' deaths as a proportion of total deaths, 2002

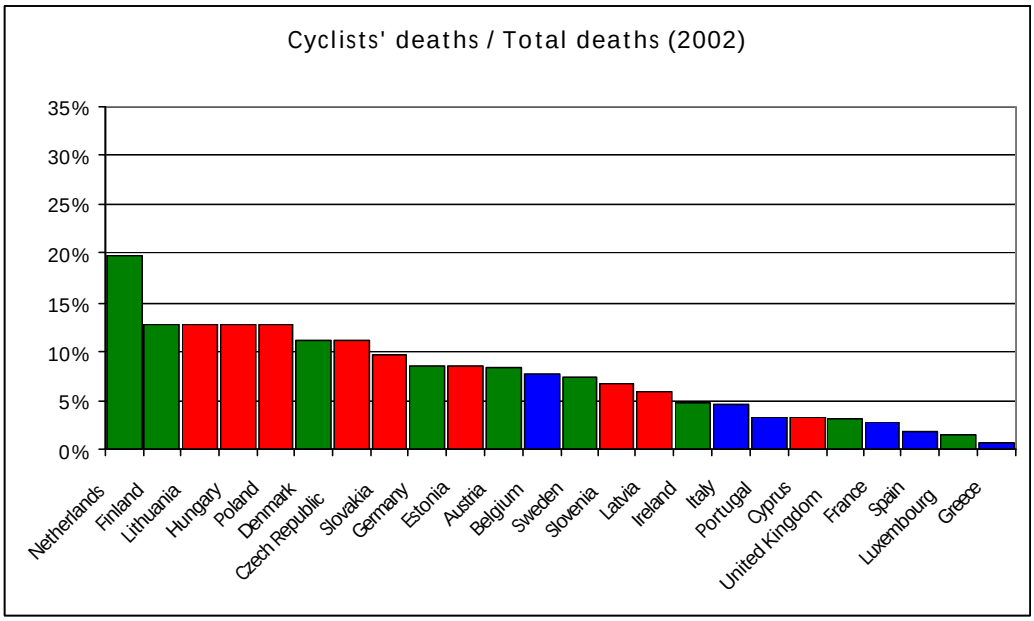


Figure 9. Cyclists' deaths as a proportion of total deaths, 2002

The three last figures might provide a basis for analysis into one of the potential reasons behind the relatively poor levels of road safety in the Southern and New groups of countries, namely their high levels of pedestrian and two-wheeler traffic. These figures constitute a primary basis for further and more in-depth analysis and open the discussion on the increased role of vulnerable road user risk in the various European countries. However, as illustrated by the discussion above, one needs the

relevant exposure data for these road user categories in each country in order to assess and compare their actual risk levels.

3 The quality of available road safety data

3.1 The questionnaire

To achieve the Review's objectives, data collected by a questionnaire-based survey were analysed, focusing on four topics:

- road accident data collection system
- road accident data quality
- exposure data
- road accident data analysis

Key issues taken into account in the present survey are:

- availability and disaggregation levels of data
- reliability and comparability of data among various European countries
- underreporting

The questionnaire was filled in by road safety data experts from most European countries representing different areas of the European Union, so that an overall view of the existing situation regarding road safety data issues could be obtained[2]. Experts from 22 European countries filled in the questionnaire (Table 5):

"North-Western countries"	"Southern countries"	"New countries"
Austria	Belgium	Cyprus
Denmark	France	Czech Republic
Finland	Greece	Hungary
Germany	Italy	Latvia
Ireland	Portugal	Lithuania
Netherlands	Spain	Malta
Sweden		Poland
United Kingdom		Slovenia

Table 5. Countries participating in the Review

The following section analyses and synthesises the answers to the questionnaire. Answers to each question are summarised and then examined in terms of consistency and comparability, to allow a further comparison of different European areas. The aim of this analysis is to define the current situation in Europe concerning availability, quality and analysis of road accident data, in order to identify existing advantages as well as deficiencies. By detecting deficiencies, it would be possible to develop clear policy recommendations for the improvement of the current situation.

[2] The complete text of the questionnaire is available upon request from the ETSC Secretariat.

3.2 The national road accident data collection system

In all countries participating in the present Review, road accident data are collected by the Police. When called to an accident, the Police draw up an accident report, which is then processed by the respective authorities. In most countries, this form (national road accident data collection form) is either revised every ten years, or occasionally. The only six countries that systematically revise their accident collection form are Denmark, Great Britain, Greece, Portugal, Hungary and Lithuania. The rest of the participating European countries revise their national road accident data collection form when this is considered necessary. Moreover, in some countries road casualty data are also collected by hospitals (Denmark, Netherlands, Greece, Sweden, Spain and Slovenia) or by governmental organisations (Belgium, Portugal, Hungary), which are often using a special separate accident data collection form (e.g. Portugal). It should be noted, however, that data collected by hospitals mainly allow only the aggregation to numbers of seriously injured persons per road user category and per type of injury. Furthermore, as far as information collected by the Police is concerned, this can possibly also be used in other special cases e.g. in a judicial process. In Portugal this is done with a special separate accident data collection form.

At the same time, in most of the countries road accident databases are maintained by the Police, Ministries, and Statistical Services. Only in five of the European countries participating in this Review road accident databases are maintained by hospitals (Denmark, Netherlands, Greece, Hungary and Slovenia), while in Belgium the hospital databases that exist are neither centralised nor systematically available. It should be noted that most of the databases maintained by hospitals contain mainly medical rather than accident details. Thus, they cannot really be considered as "accident" databases. However, if these databases are linked to police accident databases, they can then be relevant to road safety. Furthermore, medical data regarding road accidents are essential in cross-checking data collected by the Police, in terms of underreporting. Medical data play an important role in road safety analysis since they allow for the identification of the degree of accident underreporting of the police files.

In most of the countries participating in this Review, road accident data with material damage only accidents are collected by the Police. The Police draw up an accident report for material damage only accidents, when the damage is serious, exceeding a certain cost. The only five countries in which material damage only accidents are not recorded by the Police are Austria, France, Greece, Hungary and Malta. In these countries some information on such accidents may be obtained through insurance companies or respective organisations. More specifically, as far

as Austria is concerned, material damage only accidents were recorded up to 1994. Since 1995 only some regions have been collecting these data. Generally, it seems that damage only accidents are not reported systematically, as in most countries they are reported only when this is asked for, that is for financial compensation.

In some of the participating countries, such as Belgium, Finland, France, Germany and Spain, the insurance companies centralise road accident data, basically claims, at national level. The files of insurance companies provide information on damage only accidents. However, they are not exhaustive as at least two large categories of accidents are rarely included: many types of single vehicle accidents and accidents with minor material damages in which persons involved prefer to cover the expenses by themselves rather than involving the insurance company. Furthermore, in many cases data from insurance companies are considered to be of limited usefulness since many accidents are double-counted as registered by the insurance claims of both parties involved in the accident. In general, data from insurance companies are not used for accident analysis because they do not provide the necessary information in electronic form (e.g. location of the accident) and because of the confidentiality problems that characterise these business-sensitive data. More specifically, in most of the European countries, whether a central system of insurances data files exists or not, no access is granted to the road accident data. Finally, it is interesting to note that no road accident databases are maintained by insurance companies in the New Member States.

Apart from road accident data collected at national level, in most of the EU 15, data are also collected at local/regional level, even though this does not happen systematically. At the same time, New Member States do not maintain accident databases at local level, with the exception of Hungary, Poland and Slovenia. Nevertheless, road accident data collection at local/regional level relies on the respective authorities, while these data primarily concern damage only accidents or accidents that occurred on motorways and national road networks. Thus, not all data regarding road accidents are recorded.

Based on the existing situation regarding road accident data collection system, described above, it is widely believed that electronic filling-in of the accident collection forms would accelerate - as far as policemen are well trained to use them appropriately - the entire collection process and also enable quality control of the data. More specifically, modern electronic systems could expedite not only the collection process, but also the input process (up to six months). For example, road accident data could be available in national databases in just six months after the accident occurred. However, if the introduction of such systems is not preceded by the proper training of all the parties involved in the data

collection process, such as the Police, it might prove to be less beneficial than expected.

It is also worth mentioning that harmonisation of the accident data collection form and the related collection procedures at European level is also considered to be an important step towards improving comparability and compatibility of road accident collection. Before harmonising the accident data collection process, however, transformation by data combination rules to macro-aspects of accidents with consistent definitions can provide an efficient alternative for analysing existing road accident data, as successfully implemented in the CARE database (CETE SO, 2000; ETSC, 2001a).

It is commonly believed that all involved parties should be better trained and more motivated in order to improve the procedure for collecting road accident data. More specifically, since the Police are primarily responsible for collecting road accident data in European countries, police officers involved in the procedure should be trained to handle the particular issues involved with recording data and to understand the importance of the task. If all the involved parties could be persuaded of the importance of the task, then many benefits could follow. Furthermore, procedures should be as simple as possible, in order to be foolproof and robust, while it is highly important to provide the regional Police the necessary feedback, regarding accident data transmitted by them.

The use of Geographic Positioning Systems (GPS), in combination with Geographic Information Systems (GIS) could provide the accuracy required to record accident location. A prerequisite for the use of these systems is the existence of digital maps for the entire road network of each country, which is not the case for most of the EU countries. Other suggestions for improving the road accident data collection systems would be the refinement of definitions, the cooperation of several involved authorities and the linkage of databases, where relevant.

Finally, studies of the national road accident data collection system were carried out recently in only three of the New Member States (Hungary, Poland and Lithuania). On the other hand, a satisfactory number of relevant studies has been made recently in the EU 15 countries.

3.3 Road accident data quality

Accident data files present various limitations, which restrict their use and comparison at both national and international level. Since effective road accident analysis can only be conducted if it is based on reliable and compatible road accident data, the quality of these data is one of the

most important issues to be examined. Some basic limitations of the road accident data reported in the countries which participated in this Review are presented below.

One of the main problems of the national road accident data files covered by the present survey is that not all injury accidents are reported to and recorded by the Police. Underreporting varies according to accident severity, vehicle type and casualty age. Generally, underreporting is more frequent in the following types of accidents: single-vehicle accidents, pedestrian accidents and accidents involving two-wheeled vehicles (especially bicycles), while the underreporting rate is the largest for accidents that are characterised by combinations of these aspects.

The problem of underreporting, however, has not been thoroughly investigated during the past few years in nearly all countries. The EU 15, with the exception of the Netherlands, the United Kingdom, Belgium (not recently) and Spain, cannot assess the present level of accident data underreporting, due to a lack of recent relevant studies. This is surprising, since most countries consider underreporting to be a limitation regarding reliable accident data and consequently upon the analysis of road accidents. As far as New Member States are concerned, only in Hungary an underreporting study has been carried out (during the mid 1990s). The only countries that have carried out recent studies of underreporting are Netherlands, United Kingdom, Spain and Hungary. According to study-based estimates, the underreporting of death varies from 5% or 8% (Germany and Netherlands, based on national research reports) to 12% (France, based on an INRETS study for the region of Lyon) and 26% (Italy, based on a comparison of road deaths in the WHO-database of hospital reports of death per country with the Italian statistics of Police-reported road deaths). At the same time, underreporting of hospitalised casualties is estimated to vary between 30% and 60% (OECD-IRTAD, 1994).

Apart from the underreporting issue, other road accident data insufficiencies have also been reported by the present survey. One of these is that not all necessary road accident data are recorded in full detail or in many cases are not reported at all and thus can be considered of limited quality. More specifically, all New Member States, apart from Lithuania, Slovenia and Czech Republic consider their national road accident databases to lack some important data. This also applies to some of the EU 15 (Austria, Belgium, Greece, and Portugal).

The most frequently missing road accident data are those regarding speed. These data refer to speed of the vehicles involved in each accident, as well as to speed limits and whether they have been exceeded by the drivers. Many countries are able to provide data about accidents caused

by speeding but these data cannot be considered reliable. Speed data are reported as missing or not sufficiently detailed only in the EU 15. This may be explained by the fact that the New Member States have not considered the need for speed data yet.

Even though speed data are missing in most of the European countries, it should be noted that it may be unrealistic, even impossible, to collect these data. Collecting speed data is a very difficult task that the Police may not be in the position to carry out. Thus, a compromise is usually made between the needs of the data suppliers (the Police) and the data users (Local and Central Government). Today, reliable information on speeding can only be obtained through detailed analyses of data from in-depth investigations of selected road accidents.

Alcotests are carried out in all European countries participating in this Review. However, the extent and the availability of results and the accuracy of these tests differ considerably. Generally, data regarding both alcotest results and drug use are considered of limited quality by half of the countries. This is due to the fact that, even though in most of the European countries information about the presence of alcohol (or drug substances) in the blood of the driver must be filled-in in the road accident data form, an alcotest sometimes does not take place - mainly due to technical problems, like the transportation of the persons injured or killed in a distant hospital or the absence of the necessary alcotest equipment. Furthermore, even if an alcotest takes place, the results (available only some days after the accident at the hospitals) are not always included in the form, given the complexity of the administrative procedure necessary for forwarding the information from the hospitals to the responsible police authorities. Finally, the accuracy of these alcotests is not always guaranteed and, for legal reasons, it is sometimes impossible to obtain information on alcohol consumption in case of driver's death.

More sophisticated technology that enables an alcotest to be carried out soon after the accident occurred is increasingly used throughout Europe. However, budget limitations or even legislative limitations in most of the countries are barriers to implementing this new technology and improving data quality.

Other items of road accident data that are missing in many European countries, or considered to be of low quality, concern the use of helmet/seatbelt during an accident and the existence/activation of airbags. More specifically, as far as data regarding the use of helmet/seatbelt are concerned, in half the countries these data are not collected in detail, even though they are considered to be of great importance. Availability of data regarding seat belt wearing during an accident (especially in fatal accidents) is the poorest at the European level.

In some participating countries (Austria, Belgium, Greece, Portugal, Spain, Czech Republic and Poland), data regarding the exact location of the accident are either missing or are not considered detailed enough, because the exact identification of the accident location can be rather complicated. However, some countries (e.g. Austria) have begun to implement new measures that may improve the situation. Nevertheless, the accuracy of accident location varies considerably between countries and also between the various types of road network (inside and outside built-up areas). GPS allows accidents locations to be recorded systematically and accurately, but the equipment is not widely used.

Generally, it is noticed that New European Member States report to have fewer missing items of accident data and consider most of their road accident data to be adequately detailed. Although this may be in contrast to the commonly-held belief, it can be explained by the fact that the New States had better and more organised collection systems in previous decades, in which both the Police and statisticians participated. However, this seems to have changed, as only the Police are currently responsible for the accident data collection procedure. At the same time, limitations on both human resources and budgets have resulted in less effective data collection systems, especially in terms of organisation.

New Member States could provide an insight as to how the data collection system could be efficiently organised and at the same time how road accident data could be double checked for assurance of quality.

Apart from the above mentioned data quality problems, a number of inaccuracies in reporting the various values contained in the national road accident data collection form exists in all countries. These inaccuracies are inherent to the nature of the values contained in the form and are the result of the circumstances under which primary information is collected by the police officer and the way this information is entered afterwards. The level of accuracy sometimes falls because of lack of proper training of the police officers who collect the information. According to research in the field, factors such as accident time and location are reported relatively accurately whereas factors such as collision type, light and weather conditions and accident severity are more likely to be unreliable. This may be due to the subjective nature for some of these factors.

Another issue regarding road accident data quality is data comparability. The variable injury severity could not be considered comparable due to the incomparability of the definition of the term "injured persons" (slightly, seriously). It is noted that the issue of comparability is two-fold,

as both comparability among countries and comparability of the level of aggregation (comparable values in each variable) should be considered.

More specifically, based on the answers to the questionnaire only eight countries (Belgium, Germany, Netherlands, France - since January 2005, Greece, Spain, Cyprus and Latvia) use the same definitions regarding injury severity which is the following: "Seriously injured is an injured person who is hospitalised for at least 24 hours", while "Slightly injured is each injured person that is not fatally or seriously injured". Some other countries have other definitions such as "Seriously injured is a person suffering from injuries like e.g. fractures, concussion, internal injuries and severe general shock requiring hospitalisation for more than 7 days" and "Slightly injured is a person suffering from an injury of minor character, e.g. sprains, bruises not requiring or requiring hospitalisation for less than 7 days"; "Serious injury is an injury that needs hospital treatment and is admitted as an "in-patient" and "Slight injury is an injury that needs hospital treatment. No detention «in-patient» needed".

Moreover, in some countries, such as Lithuania and Finland, there is no clear distinction between seriously and slightly injured persons, while in the Czech Republic only an informal distinction is used, which is based on the Injury Severity Scale (ISS)[3]. The following table summarises the definitions used in the participating countries.

[3] In Lithuania, however, a definition of serious and slight injuries will be introduced as of 2006.

Countries	Definitions of seriously injured						Definitions of slightly injured					Criteria of injury degree
	Hospitalised	Hospitalised>24 hours	Hospitalised>7 days +serious injuries	Hospitalised+serious injuries	Serious injuries	Disability>24 hours, or very serious injuries	Other than seriously injured	Slight injuries	Not hospitalised	Hospitalised<7 days +slight injuries	Not known	
Austria						✓					✓	Disability+injuries
Belgium		✓					✓					Hospitalisation
Cyprus		✓					✓					Hospitalisation
Czech Republic												-
Denmark				✓				✓				Hospitalisation+injuries
Finland												-
France		✓					✓					Hospitalisation
Germany		✓					✓					Hospitalisation
Greece		✓					✓					Hospitalisation
Hungary				✓				✓				Hospitalisation+injuries
Ireland				✓				✓				Hospitalisation+injuries
Italy				✓				✓				Hospitalisation+injuries
Latvia		✓					✓					Hospitalisation
Lithuania												-
Malta					✓			✓				Injuries
Netherlands		✓					✓					Hospitalisation
Poland			✓							✓		Hospitalisation+injuries
Portugal	✓								✓			Hospitalisation
Slovenia		✓						✓				Hospitalisation+injuries
Spain		✓					✓					Hospitalisation
Sweden	✓						✓					Hospitalisation
United Kingdom				✓				✓				Hospitalisation+injuries
Total	2	9	1	5	1	1	9	7	1	1	1	

Table 6. Definition elements used for seriously and slightly injured persons

The result of these differences and the differences in underreporting of serious injuries is that the only figures that can be considered fairly comparable at the international level are those relating to fatal accidents. This presents a major problem, since non-fatal accidents greatly outnumber fatal accidents and it is important to study the full range of accidents. This major problem needs to be tackled in order to compare fully road safety levels across the EU.

As far as this problem of lack of comparability is concerned, no concrete solution for tackling it has been proposed yet. In previous years, a solution, considering "hospitalised persons as seriously injured" was under examination, but it has not yet been implemented. The term "hospitalised casualty" exists in official statistics only in Belgium. Generally, only data referring to fatal accidents should be considered for European level comparisons, until a well founded solution is implemented.

Finally, in most countries participating in the present Review, specific methodologies for data quality cross-checking have been developed and are systematically being used. The only three countries that do not use specific methodologies are three of the New Member States: Latvia, Malta

and Slovenia. However, in many countries, even though data quality cross-checking methods are being used, they could not be considered completely satisfactory. Moreover, in Austria and Finland cross-checking methodologies are used only on the number of deaths.

At the same time, in only four countries (Netherlands, France, Spain and Portugal), correction coefficients are used in order to improve road accident data insufficiencies. These correction coefficients mainly concern the correction for the number of deaths to "death within 30 days" after the accident but also corrections for underreporting of deaths and serious injuries (only in the Netherlands).

Generally, all of the European countries participating in the present Review consider their road accident data to be of high or medium quality, in terms of availability and compatibility for national use, despite of all the problems mentioned above.

3.4 Exposure data

The case for collecting good quality exposure information in each country is as strong as for collecting good quality information about road accidents. These exposure data allow accident and casualty rates to be calculated so that levels of risk can be compared. Chapter 2 contains some simple risk comparisons but more reliable conclusions could be derived from comparisons based on risks per population (public health risk) and per traffic volume (traffic risk). The more comprehensive the exposure data collected, the more detailed the calculation of risk and the more accurately high risk groups of road users can be identified and measures developed to reduce those risks.

A basic and available risk rate concerns the number of deaths per population, as it allows for the extraction of conclusions on fundamental road accident risk as a major public health issue.

As far as traffic risk is concerned, the most appropriate and recommended measurements of exposure are vehicle- and person-kilometres of travel (ETSC, 1999), as well as time spent in travel, the latter being less widely used in road safety analysis. However, these data cannot be collected in the required level of detail on other than a system-wide basis. In several EU countries, different systems exist and national exposure estimates are produced, whereas in some countries no data on vehicle- or person-kilometres are available.

Traffic counts systems are widely used and necessary for exposure estimates. In addition, vehicle- and person-kilometres of travel and time spent travelling should be collected through national travel surveys, to

provide information about person, vehicle and trip-purpose characteristics. The results of both methods should be combined and crossed checked by categories of road users, vehicles and road types, although this is impossible for some desirable combinations.

The comparability of national exposure data is often limited because of inconsistencies among the definitions (road network, vehicle categories) and characteristics (different use of transport modes in different countries, e.g. mopeds and motorcycles).

This section analyses the availability and comparability of exposure data across Europe. More precisely, it examines the exposure data which are necessary for further road accident analysis. These relate to:

- road users (population, number of drivers)
- vehicles (number of registered vehicles)
- road network (length of road types)
- vehicle-kilometres and person-kilometres.

Population statistics exist in all European countries as they are basic national statistics. These population data exist at least by age, sex and geographic area for all countries and are directly comparable as there are no differences in definitions. Furthermore, these data exist in disaggregate form in every European country and in aggregate form (age groups) in several international data files. Thus, population statistics are considered to be of high quality, in terms of availability and comparability in all of the countries.

As far as the number of drivers is concerned, data exist (based on the number of valid driving licenses) in every European country which, at least in theory, can be classified by age, sex, geographic region, driving license category and driving license age. However, driving license data are not available at the European level. Apart from this problem, data comparability and reliability also raise some concerns. Differences in driving license categories in use in the various European countries may result in non-comparability at European level of certain driver categories. Furthermore, a proportion of licensed drivers do not actually drive and this varies from country to country. Consequently, the comparability of these data is questionable.

Data on the number of registered vehicles is available and, for some types of vehicles, comparable between European countries. However, in some cases, non-active vehicles are included in the national databases and some

vehicle category definitions differ between nations, making the comparison of these data unreliable.

Road network data are available for all European countries but given that different road type classifications are used in the various European countries, comparisons at European level present important difficulties. These comparison difficulties are equivalent to the respective accident data dealing with the type of network (accidents inside/outside urban area, in the national/regional network, etc.). Moreover, data regarding network length in some countries refer only to motorways and national roads. It should be noted that road network data are not considered as reliable and compatible as the rest of the exposure data due to the particularities of the various types of road network in each country.

In the future, further links of accident data to road network data (already applied in some national cases) could enhance the possibilities for road accident analysis at European level. Especially, linking road accident data files with GIS containing all road characteristics could be very useful for detailed analysis of road accident causes related to the road environment.

Traffic data on vehicle and person kilometres are necessary for further road accident analysis. However, these data seem to be less available, compared to the rest of the exposure data. Furthermore, they are considered by many countries to be of low quality, in terms of reliability and comparability. The only countries that have vehicle-kilometres and person-kilometres data of high availability and quality are mostly the North-Western European States (ETSC, 1999). On the other hand, New Member States and Southern European countries have low availability of vehicle-kilometres and person-kilometres (with a few exceptions, such as Czech Republic and Slovenia).

The previously mentioned traffic data are calculated by the use of various methodologies, including sampled traffic counts, national travel surveys for representative samples of household members and fuel use estimations. Very often the use of newer and more accurate methods leads to the rectification of previous years' estimates. The methodologies used for the calculation of vehicle- and person-kilometres vary significantly among countries. In some countries all methods for the calibration of the traffic data are used, whereas in some other countries proper traffic data are not available.

Very often traffic data can be quite detailed as they refer to the different road types, vehicle types, the hour, the day of the week, the month, the driver/passenger/pedestrian age and sex and the geographic region. The degree of accuracy and the level of data aggregation vary significantly between European countries leading to hardly comparable traffic data

between European countries. Furthermore, the calculation of person-kilometres is more difficult than the calculation of the vehicle-kilometres. Therefore, only few countries have reliable data on person-kilometres of all road user categories.

The collection of reliable and comparable traffic data for all European countries implies an important workload consisting of finding the various national sources and elaborating the different studies. This workload is even higher when pedestrian and two-wheeler traffic data are considered. Traffic surveys coordinated at a European level could possibly lead to the identification of some Europe-wide uniform and comparable traffic data. Furthermore, it would be advisable to strive for a homogenous definition of the parameters regarding transport performance.

Finally, as far as exposure data are concerned, in most of the countries there are no systematic links among databases or among their aggregated results, which is considered a limitation for further road accident analysis.

3.5 Road accident data analysis

There is a growing need for road accident analysis at both national and European level, in order to identify and assess road safety problems reliably. It seems, however, that road accident analysis at European level cannot at present produce results comparable to those of national analyses, not only because of problems of accident data comparability and availability but also due to difficulties related to exposure data that were mentioned in the previous sections. The operation of the CARE system, the EU database with disaggregate road accident data, is the first serious attempt for EU wide analyses of several macroscopic road accident parameters.

As far as road accident analysis at national level is concerned, in most European countries, data analysis is carried out by the competent authority, as well as other organisations that have access to the disaggregate data files, such as research institutes, Ministries and the Police. Moreover, in some countries data analysis is carried out by insurance companies (Belgium), statistical services (Belgium, Austria and Hungary) and touring clubs (Austria). Furthermore, road accident analysis is also conducted at regional and local level in all countries (mainly in large cities or in provinces or regional departments) but not everywhere in a systematic way. The only three countries that do not conduct such analyses are Cyprus, Malta and Slovenia.

Annual reports on road accidents are mainly published in all countries by the responsible authorities. In the New Member States these data are usually available in paper form, whereas electronic form and Internet are not widely used (with the exception of Slovenia).

It should be noted that access to the national road accident data files suffers by data confidentiality problems, given that in all countries data are collected under the principle of confidentiality. Therefore, not all data are accessible to the public and there exist several different regulations for accessing the data.

Great Britain and Netherlands provide on-line access to disaggregate data files for the extraction of tabled information, while in Hungary an on-line access will be available by mid-2006. In all the other countries, the most usual way of accessing data is through requests to the competent organisations that provide aggregate results, most often in paper form. However, in every country a few specialised users have exceptional privileges such as direct or indirect access to the disaggregate data of national accident database. These specialised users are in most of the cases members of public organisations with a particular implication in road safety (national research institutes, ministries, local authorities, etc.).

More specifically, the usual road accident data users in most of the European countries could be categorised into four major groups:

- National Public Administration
  (Ministries, Statistical Services, Local Authorities, Police, Hospitals)

- Research and Scientific Institutions
  (Universities, Public and Private Research Institutes)

- Industry
  (Vehicle Industry, Road Construction Industry, Other Industries)

- Professional and Other Associations
  (Road Users' Associations, Consumers' Associations, Touring Assistance, Insurance, Disabled People Associations, Institutes for Alcoholics).

It is obvious that the users of road accident data are public or private organisations dealing with various aspects of road safety at national, regional or local level. They share the objective of improving road safety but each is involved in different road safety actions. These road safety actions concern general planning (planning, construction and maintenance of the road network, policy for vehicle ownership and vehicle construction standards, etc.), and/or specific actions (road design, drinking and driving, drivers' awareness and education campaigns,

driving school training programs, speed limits, intervention in high risk sites, network maintenance, signs, lighting, etc.). Furthermore, it seems that in the EU 15 there are more road accident data users, compared to the New Member States.

It is recognised that road safety issues are not considered as a first priority within the transport planning process, as no sufficient weight is generally attached to improving road safety. This fact could explain why road accident data analysis is not always followed by the implementation of appropriate safety measures. However, France, Germany, United Kingdom and New Member States, apart from Latvia and Poland, consider that safety issues are taken very seriously. Usually, accident analysis results lead indirectly to safety measures. In some countries, such as Belgium, analysis results lead to safety measures mainly on regional level, while on national level this happens less frequently. On the other hand, in Portugal analysis results scarcely lead to safety measures at local level.

Generally, implementation of safety measures usually takes many years, while in many cases road accident analysis results are not used. Feedback between accident analysis and implementation of measures occurs in all countries, apart from Greece, Malta and Slovenia. However, this does not happen in a systematic way.

All the European countries participating in the present Review do not consider the partially poor quality of road accident data and/or lack of comparability with other data to be a reason for failing to consider road safety issues as part of the transport planning process. Furthermore, all countries believe that road accident analysis results can be really useful for decisions taken at either national or regional/local level. However, there are some concerns regarding whether the decisions are always based on these results. More specifically, even though it is commonly believed that road accident data are not manipulated (or even abused), at least not deliberately, results from road accident analyses have been ignored in many cases. For instance, people who dislike the conclusions will sometimes disregard the evidence or, on the other hand, when analysis results support intended decisions, their importance is emphasised.

As far as the improvement of road accident data analysis both at national and local/regional level is concerned, most of the countries participating in the present Review believe that more funding is needed for studies of road safety issues. Other important actions for improving road accident data analysis systems in European countries include the establishment of cost-effectiveness or cost-benefit studies, access to disaggregate road

accident data and the correction of the deficiencies regarding road accident databases.

Finally, there are no studies regarding the description or evaluation of national road accident analysis systems in any of the participating countries, although in the Netherlands the research quality of the national institute for road safety research is evaluated every four year by an external visitation committee of knowledgeable scientists, also from outside the Netherlands.

3.6 Overall assessment

The first step towards safer roads is maintaining reliable and compatible databases throughout Europe which enable effective road accident analysis to be conducted. In the present Review, road accident data collection and analysis systems were examined in terms of reliability, comparability and effectiveness, respectively. Exploiting the results of a questionnaire-based survey, which was answered by experts from 22 European countries, the following preliminary conclusions were drawn:

Road accident collection system

- Road accident data are collected by the Police, while road accident databases are mainly maintained by the Police, Ministries and Statistical Services.

- Data regarding damage only accidents are collected by the Police and/or, with respect to damage claims, by insurance companies.

- The accident collection procedure at European level could have the potential to be improved by filling in accident report forms electronically and by the harmonisation of the forms throughout Europe provided that technological and procedural issues are properly solved.

Road accident data quality

- The most important limitation is underreporting of accidents, especially for the vulnerable road users (pedestrians, two-wheelers) and single vehicle accidents. This refers to both missing records (also for deaths not reported to some extent) and missing data elements of accidents. However, this issue has not been thoroughly investigated during the past few years in most of the European countries.

- Important limitations are missing road accident data or data unreliability on crucial road safety factors (alcotest results, use of helmet/seat belt, speed).

- New Member States have traditionally fewer road accident data missing, while their death rates are the highest in Europe.

- Road accident data comparability among European countries is essential, in order to carry out reliable comparisons. However, the definitions used in most of the European countries for serious and slight injuries differ in important respects.

Exposure data

- Public health risk can be easily calculated today as detailed availability of population data allows for the extraction of basic health risk rates, such as the number of deaths per million inhabitants.

- The main issues regarding exposure data (especially vehicle-kilometres and person-kilometres) are the failure to collect the relevant data and the inconsistencies in those data that are collected.

- In order to collect vehicle- and person-kilometres data, both the traffic counts system and national travel surveys should be used and then the results should be combined and crossed-checked by categories of road users, vehicles and road types.

- It can be expensive to collect good quality data on exposure, but the benefits undoubtedly outweigh the costs. Without these data, risks cannot be calculated reliably so that policies which are developed for risk reduction are unlikely to be the best possible. Thus, collecting these exposure data leads to better policy making with the vital benefit of fewer casualties: the value of this benefit justifies the cost of collecting good quality data on exposure.

Road accident data analysis system

- Road accident data analysis is carried out in most of the European countries by the competent Statistics Authority, as well as by other organisations such as Ministries, Research Institutes and the Police.

- The lack of direct access to user-based information from disaggregate road accident data files limits the scope for reliable analyses.

- Road accident data analysis is not always followed by implementation of appropriate safety measures, as improving road safety rarely has the highest priority in the transport planning process.

- Road accident data analysis should be improved both at national and local/regional level. Most of the experts believe that more funding of studies relevant to road safety issues could contribute towards achieving this objective.

- Other important actions towards improving road accident data analysis systems in European countries concern the establishment of cost-effectiveness or cost-benefit studies, access to the disaggregate road accident data, as well as the correction of the deficiencies regarding road accident databases.

4 Recommendations

Motorised road transport plays a central role in European societies. Most of the goods needed for everyday life are transported by road and the current generation has far greater opportunities for motorised travel in the course of work and leisure than their fore fathers. Their advantages have been achieved, however, at a large cost. This Review has considered the data that are needed to measure the human and economic costs in terms of the numbers of road accidents and of people killed and injured in these accidents.

The experience of many countries has shown that it is perfectly possible to introduce measures that greatly reduce these human and economic costs but that reliable data are needed to quantify the scale of the problem and to identify the most effective solutions. Collecting road accident data is not "bureaucratic form filling", because it provides the essential information that each country needs to tackle one of the most widespread and serious problems that it faces.

Thus, the primary recommendation of this Review is that: each country - and especially those in the SEC Belt (Southern and New Member States) - should recognise the seriousness of the problem of road accidents, in terms of the human and economic consequences. They should also recognise the essential role of collecting high-quality data on road accidents and on exposure in order to measure the scale of the problem and to devise effective countermeasures. This recognition should extend from the national authorities to local authorities, and the police officers and all those who, in all countries, carry the principal responsibility for recording details of road accidents.

Collecting good quality data on exposure can be expensive, but these data are essential in order to calculate accident risks reliably and then to develop optimal policies for reducing those risks. Better policies based on more reliable information will lead to fewer casualties, so the cost of data collection will be amply justified by the benefits of the resultant casualty reduction.

4.1 Recommendations for improving data collection

- The design and operation of the national data collection system should not be "left to chance". It should be reviewed regularly to ensure that it meets the requirements of data users while not imposing unrealistic burdens upon the data providers, i.e. the Police. Naturally, police officers should be well trained to collect the accident data and make the best use of the national data collection system.

- Accident data collection should explicitly be accepted as a very important task for police forces and all those involved in the process, not something that they are implicitly expected to do in addition to all of their other responsibilities. The collection system should take account of the interests of data users, not just of the interests of the Police as data collectors.

- Regular studies on underreporting are needed, but this Review has found that few have been carried out even in the North-Western countries. Most countries report fatal accidents and road deaths almost fully, so this applies particularly to non-fatal accidents. When there is no information about the underreporting rates and their possible changes over time then it is impossible to interpret trends properly and decide, for example, whether a reduction in the number of accidents *reported by the Police* represents a genuine safety improvement. When national underreporting rates are known then corrections should be applied to aggregated accident data. When a study shows that the reporting rates have fallen then remedial actions should be taken to restore the rates. The improvement and standardisation of methodologies for tackling the underreporting issue of all types of traffic, including cyclists and pedestrians, is the first priority.

- Data on damage-only accidents should be collected, at least on a sample basis, or made available via insurance companies. This kind of data is necessary to complete the accident severity continuum, from those with material damage but no casualties to fatal accidents.

- Road safety is increasingly studied in an international context, for example the EU target of halving the number of road accident deaths. It is desirable to move towards a common system for recording road accident data. This 'common system' would encompass all aspects, including the definitions of fatal, serious and slight injuries. The main advantage would be that data from different countries could be compared on a consistent basis. This recommendation would apply to all European countries, but the SEC Belt countries would benefit in particular as this would allow experience about effectiveness of measures to be shared more easily.

- Electronic systems have great potential to reduce the burden on the Police and speed up the data collection process. The equipment and software are expensive, however, and data could easily be lost if police officers do not use the new systems correctly. Also, there is a depressing history of large-scale IT systems that have failed to live up to expectations. It is necessary to see the results of major trials before deciding whether to recommend the adoption of these systems. Care

should be taken to ensure that existing data quality checks are not discontinued if electronic data collection systems are adopted.

- The introduction of in-vehicle "black box" devices, recording vehicle situation before and during the accident (similar to those of air crashes) could allow for additional useful information to be collected. This additional information could include speeding as well as vehicle manoeuvres, which cannot be reliably identified by the usual police investigations.

- The Police often have difficulty in recording the location of an accident numerically as required by most national systems, yet it is essential for road engineers tasked with designing remedial measures. GPS systems provide a reliable means for recording this information. A prerequisite for the use of these systems is the existence of digital maps for the entire road network with specifications of road type and speed limit in each country, which is not the case for most EU countries.

- Harmonisation of the accident collection forms in the European countries could also be an option. However, before this harmonisation takes place the CARE accident database could be improved by using transformation rules for combinations of differently defined data elements to common data. Further harmonisation could be even more helpful. The harmonised accident collection system should concern common definition data on fatal and injury accidents (at least all serious injury accidents) combined with in-depth data from stratified samples of accidents, using uniform methodologies and allowing for the investigation of accident and injury causation.

- The case for collecting good quality information about the volume of road traffic per road type and road user category in each country is as strong as for information about road accidents, although perhaps more difficult to explain to a layman. The availability of these data is poor in most European countries, which limits the strength of the conclusions that can be drawn from analyses of accident data. It is recommended that all EU member states should record exposure data, at least at the level of traffic volume by road type and vehicle type and/or road user category, but preferably also for the non-motorised modes, pedestrians and pedal cyclists. It would be helpful to adopt a common EU methodology for recording exposure.

- Exposure data in each EU country should be collected by qualified institutions, using a uniform methodology. These data should then be annually published.

4.2 Recommendations for improving use of data

The purpose of collecting high-quality data about road accidents is to improve road safety and this can be achieved in many ways. One is to improve road safety on the basis of researched effects of measures and another to educate the public by publishing information, most commonly in the form of research and annual statistical reports, and full use should be made of the Internet to allow easier access. These reports tend to be written in technical terms which laymen often find difficult to understand, however, so it is recommended that versions or extracts from these reports be made available that are expressed in ways that can be understood easily.

- To be most effective, road safety policy needs to be firmly based on evidence about the current road safety problems and the effectiveness of potential countermeasures. This Review has found that this practice is not widespread at present. It is recommended that policymakers should be helped to understand the importance of basing the development of new measures on rigorous analysis of the available evidence.

- If a significant and new road safety measure has been taken, then a programme for monitoring its effects should also be set out. The systematic assessment of the effectiveness of these measures will help future planning.

- Road accident data are complex. They include details of the accident circumstances, the vehicles involved and the people injured, and these can be influenced by a wide range of factors such as the road type, the vehicle speed and road user aspects, such as the age of the driver and/or other involved road users and the involvement of alcohol as well as the traffic volume of the road. The task of carrying out thorough analyses is demanding. The improvement of road safety requires increased numbers of professional analysts with the necessary skills. The experience of the USA is instructive. There has been access to the FARS[4] database in the USA for several years and quite a few analysts regularly perform advanced types of analysis. As a result, awareness of the level of risk in road accidents and the effectiveness of countermeasures is more sophisticated in the USA than in most European countries. The operation of the EU CARE database is a first important step towards a more sophisticated approach in Europe. It is therefore recommended that wider access to national accident datasets, as well as to the CARE database, should be allowed to

[4] Fatal Accident Reporting System, maintained by the US National Highway Traffic Safety Administration.

encourage a higher level of analysis and a more informed debate about the problem of road accidents and the ways of improving road safety.

- It is important to compare the risks of road travel modes with the risks of non-road modes so that transport safety budgets can be allocated most effectively

Bibliography

CETE SO (2000) CAREPLUS. A proposal for improving the comparability of road accidents within EU Member States using the CARE Database, CAREPLUS Consortium, Bordeaux.

Chisvert Perales, M. J. (2000) Fuentes de datos en análisis de accidentalidad por tráfico: descripción, definiciones, calidad y representatividad, Instituto Universitario de Tráfico y Seguridad Vial, Universidad de Valencia.

COST 329 (1998) Models for traffic and safety developments and interventions-Final Report of the Action, European Commission, DG VII-COST Secretariat, Brussels.

ETSC (1997) Transport accident costs and the value of safety. European Transport Safety Council, Brussels.

ETSC (1999) Exposure data for travel risk assessment - Current practice and future needs in the EU. European Transport Safety Council, Brussels.

ETSC (2001a) EU transport accident, incident and casualty databases - Current status and future needs. European Transport Safety Council, Brussels.

ETSC (2001b) Transport accident and incident investigation in the European Union. European Transport Safety Council, Brussels.

ETSC (2003) Transport safety performance in the EU - A statistical overview, European Transport Safety Council. Brussels.

Frantzeskakis, J., Yannis G., Handanos, J. (2000) The potentials of accident analysis systems for the evolution of road safety measures in Europe, XIII ICTCT Workshop, Corfu.

IBSR (2004) How the national traffic estimates are made, Road traffic Statistics Branch at the Department for Transport.

Koornstra, M. J. (1992) The evolution of road safety and mobility, IATSS Research, 16: 129-148.

Koornstra, M. J. (1997) Trends and forecasts in motor vehicle Kilometrage, road safety, and environmental quality, pp: 21-32 in Roller, D., ed. (1997) The motor vehicle and the environment – Entering a new century. Proceedings of the 30th International Symposium on Automotive Technology & Automation, Automotive Automation Limited, Croydon.

Koornstra, M. J., Lynam, D., Nillson, G., Noordzij, P., Pettersson, H-E., Wegman, F. & Wouters, P. (2002) SUNflower: A comparative study of the development of road safety in Sweden, the United Kingdom and the Netherlands, TRL/VTI/SWOV, SWOV, Leidschendam.

OECD-IRTAD (1994) Underreporting of road traffic accidents recorded by the Police, at the international level, Special Report of the OECD – Road Transport Research Programme and Public Roads Administration of Norway, Paris/Oslo.

OECD (1995) International Road Traffic and Accident Databases, OECD Seminar, Helsinki.

OECD (2000) International seminar on Road Traffic and Accident Data needs for the new century, OECD Seminar, Vienna.

Pérez, C. et al. (2004) Estudio de la mortalidad a 30 días por accidentes de tráfico (EMAT-30), Ministerio de Sanidad y Consumo, Madrid.

Simpson, H. F. (1996) Comparison of hospital and police casualty data: a national study, TRL Report 173: TRL Limited, Crowthorne.

Yannis, G. (2000) Traffic and accident analysis priorities and data availability in European countries, International Seminar on Road Traffic and Accident Data Needs for the New Century, Vienna.

http://www.bast.de/htdocs/fachthemen/irtad/, web page of the International Road Traffic and Accident Database (IRTAD).

http://www.unece.org/, web page of United Nations Economic Commission for Europe (UNECE).

http://europa.eu.int/comm/transport/road/figures/accidents/care/index_en.htm, web page of DG TREN - CARE.

http://sartre.inrets.fr/english/sartre3E/indexS3.html, web page of Sartre 3.

http://europa.eu.int/comm./eurostat, web page of Eurostat.