Deliverable D3.10a:

Safety Performance Indicator for Alcohol

Data Quality in Selected Countries and Comparison with Other Alcohol Indicators

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Executive Summary

In the SafetyNet safety performance indicators (SPIs) have been developed for seven areas, including alcohol and drugs. During the data collection for the alcohol SPI several indications appeared to the effect that the quality of the data might not be as good as necessary for international comparison. If the data required are collected and compiled in different ways in different countries, and even the calculation may vary, the SPI results cannot be trusted for comparison. Five countries were selected for an in-depth study of data quality, the Czech Republic, Austria, France, Sweden and Norway. United Kingdom should also have been included, but the data provided was considered good enough and no further study was done.

The quality of the data provided for the alcohol SPI for five countries have been studied more closely. For France it is concluded that the SPI is likely to have the right level. For Austria and the Czech Republic the conclusions are that the SPIs provided are obviously too low, but it is difficult to make exact estimates of the SPI. For Sweden and Norway new estimates are made, which are considerably lower than the ones provided to SafetyNet.

Of a total of six countries (including United Kingdom) studied, the data quality is considered good enough for two countries. For the four countries with data shortcomings two have too low SPI results and two have too high SPI results. Consequently, there may be reasons to believe that more countries have incomplete alcohol SPI data. There are several reasons found in this study why the data sets are incomplete:

- The costs of autopsy of killed drivers are too high when there is no reason to check for alcohol as the killed drivers cannot be punished.
- Testing people killed in accidents may be legally prohibited unless there is a strong suspicion.
- Privacy. Even if autopsies including alcohol analysis are carried out, the results are not reported back to the police for reasons of privacy.
- Time-consuming routines. The police may have to make formal requests to the hospitals to get the results of the autopsy.
- Death occurs several days after the accident. When the person dies several days after the accident, and the accident then gets the status of a fatal accident, it is too late to check the BAC.
- Incomplete or no publication. Data needed are collected, but no statistics are compiled or the statistics are published in a way which makes the SPI calculation impossible.

The possibilities of improving the data quality will vary from country to country, but for Sweden and Norway it should be quite easy to compile and publish the data needed, and the Czech data quality study shows how more difficult improvements can be made.

To validate further the quality of the SPI results, factors expected to correlate with the alcohol SPI were correlated with the SPI, based on existing data. These factors are legal alcohol limit, alcohol consumption, motorisation, and self-reported drinking-and-driving behaviour. Except for the legal BAC limit, there was no positive correlation between these factors and the SPI. This finding may be an indication that the alcohol SPI based on the present data is not valid, but there may also be other, more substantial reasons for this finding.

The results of the data-quality and correlation studies indicate a need to improve the quality of the data required for the alcohol SPI. Most importantly, the total number of drivers involved in fatal accidents, the number tested for alcohol and the number not tested, should be reported, in addition to the number of alcohol positive and negative drivers among those tested. When these figures are made available, adjusted SPI results can be estimated, as shown in chapter 2. Until these improvements are made, it is advisable to take utmost care in comparing the alcohol SPI results across countries.

Contents

1 Background and objective

Road safety research has through the years revealed a number of risk factors, such as high speed, alcohol impairment, lack of protection, poor light conditions etc. A risk factor for accidents is any factor that increases the probability of accident occurrence (Elvik & Vaa, 2004, pp. 48-66). Thus, for road safety authorities it is important to control such factors, to know whether a particular risk factor is becoming more or less important in their country or region, and to know how these risk factors compare with other countries.

Road safety authorities on national and provincial levels need some indications on the state of road safety in the country or other geographical area, and valid time series for road safety. The numbers of road accidents, fatalities and injuries are of course the most important indications of the road safety situation, but these statistics do not show in detail the causes or risk factors producing the road accident problems. Safety Performance Indicators (SPIs) can show in more detail the state of risk factors and the trends in these as well as the potential for reduction of this kind of accidents.

A work package within the European SafetyNet project has developed methods for data collection and estimation of such SPIs and done the collection and estimation for a majority of European countries.

1.1 Safety performance indicators

Work package 3 in the SafetyNet project deals with safety performance indicators (SPIs). According to Vis (Ed., 2005, p. 13) *"Safety Performance Indicators are the measures (indicators), reflecting those operational conditions of the road traffic system, which influence the system's safety performance".*

That is, SPIs may be described as a measurement of a factor causally related to crashes or injuries. SPIs are used in addition to the accident or casualty statistics to indicate safety performance or understand the process that leads to accidents. They also provide the link between the casualties from road accidents and the measures to reduce them (Assum 2007).

The SafetyNet project has developed SPIs for the following seven areas (Hakkert, Gitelman and Vis (Eds.) 2007):

1. Alcohol and drugs
2. Speeds
3. Protective systems
4. Daytime running lights
5. Vehicle passive safety
6. Roads
7. Trauma management.

Vis (Ed. 2005) describes the state of the art for road safety performance indicators, Hakkert, Gitelman and Vis (Eds. 2007) describes the theory for each of the seven safety performance indicators and Hakkert and Gitelman (Eds. 2007) is a detailed manual that describes how to establish the necessary systems of data collection for producing national SPIs for each one of the seven areas and how to make them comparable on a European level.

1.2 Alcohol use as a safety performance indicator

Alcohol and drug use among motor vehicle drivers are known to be important accident risk factors.

Driving under the influence of alcohol is known to be an important risk factor (Elvik & Vaa, 2004, p. 975). The risk of driving under the influence of drugs is less documented. The number of drugs is big. There are legal, medical drugs in prescribed doses, medical drugs in abuse doses, and illicit drugs as well as combinations of two or more drugs and combinations of drugs and alcohol. Assum et al. (2005) show that the accident risk of a driver who has taken morphine or heroin is 32 times higher than the risk of drivers with no drugs or alcohol, alcohol alone above 1.3 g/l gives a risk 87 times higher, and the combination of alcohol above 0.8g/l and drugs gives a risk which is 179 times higher than that of drivers with no drugs or alcohol.

Most European countries have provided some data on alcohol use among drivers, whereas only six countries were able to deliver data on drug use for drivers involved in fatal road accidents (Vis and van Gent 2007 (Eds.), p. 14). Consequently, this report focuses on the quality of the alcohol SPI.

An SPI should ideally be measured independently of accidents and of the accident countermeasures. In the case of alcohol, drugs and driving the “ideal” safety performance indicator would be the prevalence and concentration of impairing substances among the general road user population, but as described by Assum et al. (2007, 2007a) this ideal may be difficult to achieve in practice. Consequently, three SPIs were proposed for alcohol and drugs. The one finally applied for alcohol is:

> *The percentage of fatalities resulting from accidents involving at least one driver impaired by alcohol.*

Based on this definition the SafetyNet project has collected data for European countries (Vis and Van Cert (Eds.) 2007). Questionnaires were sent in 2005 and 2006 to the 25 member countries at that time plus Norway and Switzerland. Even after two questionnaires to each country, it was difficult to collect exactly the information needed, and a follow-up by e-mail was necessary to several countries.

Of the 27 countries approached, 23 provided data for 2004-2005 that could be used to calculate the safety performance indicator for alcohol. Figure 1 shows the result for 2005. The SPI average is 18.8 % and the SPIs vary from 4.8 % in Czech Republic to 72.2 % in Italy.

The SPIs vary a lot from country to country. The Czech Republic, Austria, Belgium and the Netherlands have very low SPI and the countries in South Europe; Italy, Spain, France and Portugal have very high SPIs. Especially the SPI for Italy is high, more than twice as high as the second highest and 15 times higher than the lowest SPI. The SPI for Italy is likely not to be correct, but no answer has been received to follow-up questions to Italy.

The question may be asked in general whether very low or very high indicator values reflect the real situation or if there is a methodological explanation to the extreme values.

Thus, it has been decided to compare the alcohol SPI used in the SafetyNet project with other indicators to try to assess its quality. In addition some in-depth studies of the SPI for the countries with the most extreme SPI will be conducted.

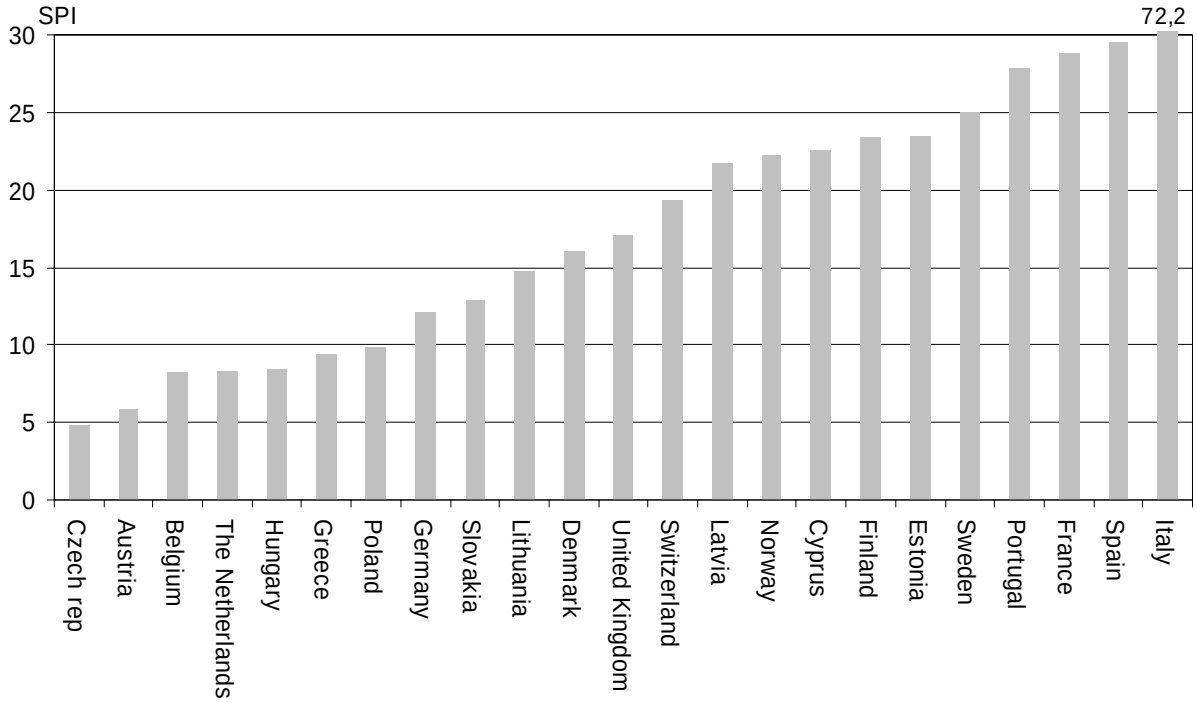


Figure 1. Alcohol safety performance indicator for SafetyNet 2005 that primarily are based on data from 2004 and 2005 (Vis and Van Cert (Eds.) 2007).

1.3 Objective, method and delimitation

The objective of this report is to asses the quality of the alcohol SPI described above for the different European counties:

- How is it calculated?
- Is the SPI valid and reliable?
- How can the SPI be explained and does it correlate with other factors?

The study comprises the following thee parts and 10 sub parts:

Part 1: Calculation and comparison

1. Calculating the SPI from 2004-2005 under different assumptions
2. Comparisons of the SPI with new data from 2006-2007
3. Comparisons of the SPI to the SPI calculated by ETSC
4. Comparisons of the SPI to the SPI calculated by WHO

Part 2: In-depth study

5. In-depth study of selected countries with extreme alcohol SPI

Part 3: Influencing factors

6. Correlations of the SPI with the legal blood alcohol concentration limits
7. Correlations of the SPI with drink-driving prevalence
8. Correlation of the SPI with alcohol consumption
9. Correlations of the SPI with motorisation
10. Correlations of the SPI with self-reported attitudes and behaviour of drivers

The objective of this study is not to explain for every country why the SPI is so low or high, but to make a quality control of the numbers and method used for the SPI calculation and to evaluate if there is a methodological explanation for low and high SPI values.

The idea of the SPIs is that they should be updated continuous. The latest update for the alcohol SPI was done in autumn 2008 based on numbers from 2006-2007. The present report was made before and parallel with this update. This means that is was not possible to base the report on the updated numbers. Thus, the report is primarily based on the first collected numbers from 2004-2005. However, this was also preferable considering the fact that most of the information about possible influencing factors used in part 3 is also only available for 2004-2005.

The results from the in-depth studies in part 2 are used in part 3 in stead of the “original” alcohol SPIs described in figure 1, because the reestimated SPIs in the in-depth studies are considered to be more right.

2 Calculation of the alcohol SPI

The alcohol SPI applied in SafetyNet is as mentioned above:

> *The percentage of fatalities resulting from accidents involving at least one driver impaired by alcohol.*

A condition for the validity and reliability of this SPI is that all drivers involved in fatal accidents are tested for alcohol. However, there may be many reasons why only some drivers are tested in practice, e.g. if nobody dies at the actual accident scene, but somebody dies later on (within 30 days after the accident is the limit in most countries) the police will not know at the time of the accident that it is a fatal accident and the involved drivers may not be tested for alcohol. In many countries the drivers involved in fatal accidents are only tested if the police have some sort of suspicion for alcohol impairment. In other countries dead drivers are not tested because they cannot be considered guilty and convicted.

The important issues regarding this SPI are consequently the *percentage* of drivers involved in fatal accidents who are actually tested for alcohol and how the SPI should be calculated if all drivers are not tested?

Table 1 shows the calculated SPI for 23 European countries. Three of these countries, Belgium, France and Spain have explicitly described the percentage of drivers involved in fatal accident who are tested for alcohol. These percentages vary between 20 % and 88 %.

Note that the United Kingdom also has provided a percentage, which is 59 %. However, the United Kingdom has made separate calculation of SPI which is used in SafetyNet (Dar 2006), so it is not necessary to “worry” about this percentage.

As indicated in table 1 the SPI for Belgium, France and Spain is calculated in two different ways in the country profiles (Vis and van Gent (Eds.) 2007a) and country comparisons reports (Vis and van Gent (Eds.) 2007). For Belgium it is calculated as alcohol positive drivers involved in fatal accidents divided by *all* drivers involved in fatal accidents. For France and Span it is calculated as alcohol positive drivers involved in fatal accident divided by only the *tested* drivers involved in fatal accidents. In the Belgian case it is assumed that no drivers among the untested persons are impaired by alcohol. In the France-Spain case it is assumed that the same percentage is impaired by alcohol among the untested persons as the tested persons. Both assumptions are probably incorrect, and the assumptions should also be the same for all countries.

- The assumption that no drivers among the untested drivers are impaired by alcohol is probably not right because it is unlikely that the police identify all drivers that are impaired without testing them.
- The assumption that the same percentage is impaired by alcohol among the untested persons as the tested persons is probably not right because it is likely that the police are able to identify a considerable part of the drivers impaired by alcohol.

Table 2 summarises the different methods for calculation of SPI when the number of tested drivers is known. It is suggested to calculate the SPI under the assumption that the percentage of alcohol impaired drivers involved in fatal accidents among untested, involved drivers is half that of the tested drivers. Overall, this assumption corresponds to the calculation by the United Kingdom.

Table 2 shows that the SPI result varies quite a lot depending on the assumptions concerning the untested drivers when the share of drivers tested is small, as is the case for Belgium and Spain. For Belgium the SPI result varies between 40.7 % and 8.2 %. When the share of drivers tested is high, as is the case for France, the results vary only slightly.

Table 1. Alcohol safety performance indicator (SPI) from SafetyNet for 23 European countries based on data from mostly 2004-2005 (Vis and Van Cert (Eds.) 2007, 2007a). The countries are listed by country code and membership of EU.

Country	Year	BAC limit (g/l)	Fatali-ties	Alcohol fatalities	SPI (%)	Tested (%)	SPI 1 (%)	SPI ½ (%)	SPI 0 (%)	SPI '05 (%)
Belgium (BE)	2002	0.5	1263	103	8.2	20.0	40.7	24.4	8.2	24.4
Czech rep (CZ)	2004	0	1382	67	4.8				4.8	4.8
Denmark (DK)	2005	0.5	331	53	16				16.0	16.0
Germany (DE)	2004	0.3	5842	704	12.1				12.1	12.1
Estonia (EE)	2005	0.2	168	35	23.5				23.5	23.5
Greece (EL)	2004	0.5	1670	157	9.4				9.4	9.4
Spain (ES)	2005	0.5	4741	398	29.5	28.5	29.5	18.9	8.4	18.9
France (FR)	2005	0.5	5318	1355	28.8	88.3	28.8	27.2	25.5	27.2
Italy (IT)	2004	0.5	5780	4172	72.2				72.2	72.2
Cyprus (CY)	2005	0.9	102	23	22.5				22.5	22.5
Latvia (LV)	2005	0.5	442	96	21.7				21.7	21.7
Lithuania (LT)	2005	0.4	760	113	14.8				14.9	14.9
Hungary (0,0)* (HU)	2005	0	1284	112	8.7				8.7	8.7
Hungary (0,5)* (HU)	2005	0.5	1284	108	8.4				8.4	8.4
The Netherlands (NL)	2005	0.5	750	62	8.3				8.3	8.3
Austria (AT)	2005	0.5	768	46	5.9				6.0	6.0
Poland (PL)	2005	0.2	5444	535	9.8				9.8	9.8
Portugal (PT)	2005	0.5	496	181	27.8				36.5	36.5
Slovakia (SK)	2005	0	560	72	12.9				12.9	12.9
Finland (FI)	2005	0.5	379	89	23.4				23.5	23.5
Sweden (SE)	2005	0.2	440	110	25				25.0	25.0
United Kingdom (UK)	2005	0.8	3337	560	17	(59)**			16.8	16.8
Norway (NO)	2002	0.2	243	55	22.2				22.6	22.6
Switzerland (CH)	2005	0.5	409	79	19.3				19.3	19.3
Average					18.8				18.2	19.4

- **SPI (%):** SPI described in deliverable D3.7a (Vis and van Gent (Eds.) 2007), i.e. the definition used previously in this report.
- **Tested (%):** Percentage of drivers involved in fatal accident that are tested for alcohol. This is only described explicitly for three countries.
- **SPI 1 (%):** SPI calculated as alcohol impaired drivers divided by the tested drivers only.
- **SPI ½ (%):** SPI calculated under the assumption that the percentage of alcohol fatalities among untested drivers is half of the percentage among tested drivers.
- **SPI 0 (%):** SPI calculated as alcohol fatalities divided by all fatalities.
- **SPI '05 (%):** The new recommended SPI for 2005 is based on SPI ½.
- **Grey:** The SPI used in deliverable D3.7a (Vis and Van Gent (Eds.) 2007).
- *: The legal blood alcohol concentration (BAC) limit for Hungary is 0.0 g/l, but data is also provided for BAC over 0.5 g/l.
- **: Percentage for United Kingdom is not used, because United Kingdom has made separate calculation of SPI which is used in SafetyNet (Dar 2006).

Table 2. Alcohol safety performance indicators (SPI) for Belgium, France and Spain, countries for which the numbers of tested drivers have been given (Vis and Van Gent (Eds.) 2007a).

Country	SPI (%)	Tested (%)	SPI, 1 (%)	SPI, 2/3 (%)	SPI, ½ (%)	SPI, 1/3 (%)	SPI, 0 (%)	SPI '05 (%)
Belgium (BE)	8.2	20.0	40.7	29.9	24.4	19.0	8.2	24.4
Spain (ES)	29.5	28.5	29.5	22.5	18.9	15.4	8.4	18.9
France (FR)	28.8	88.3	28.8	27.7	27.2	26.6	25.5	27.2

- **SPI (%):** SPI described in deliverable D3.7a (Vis and Van Cert (Eds.) 2007).
- **Tested (%):** Percentage of drivers involved in fatal accident that are tested for alcohol. This is only described explicitly for three countries.
- **SPI 1 (%):** SPI calculated as alcohol impaired drivers divided by the tested drivers only.
- **SPI 2/3 (%):** SPI calculated under the assumption that the percentage of alcohol fatalities among untested drivers is two-thirds of the percentage among tested drivers.
- **SPI ½ (%):** SPI calculated under the assumption that the percentage of alcohol fatalities among untested drivers is half of the percentage among tested drivers.
- **SPI 2/3 (%):** SPI calculated under the assumption that the percentage of alcohol fatalities among untested drivers is one-third of the percentage among tested drivers.
- **SPI 0 (%):** SPI calculated as alcohol fatalities divided by all fatalities.
- **SPI '05 (%):** The new recommended SPI for 2005 is based on SPI ½.
- **Grey:** The SPI used in deliverable D3.7a (Vis and Van Cert (Eds.) 2007).

3 Data for 2005 and 2007

The idea of the SPIs is that they should be updated regularly, preferably every year. This will give the opportunity to follow the development in each country on a yearly basis, and make annual comparisons between the countries. The procedure for the annual updating has not been decided yet. However, a questionnaire for updating has been developed and sent out to relevant persons from every European country (SafetyNet 2007).

Table 3. Alcohol SPI from SafetyNet for 18 European countries based on data from 2006-2007 (SafetyNet 2007). The countries are listed by country code and membership of EU.

Country	Year	Fatalities	Alcohol fatalities	Tested %	SPI 1 (%)	SPI ½ (%)	SPI 0 (%)	SPI '07 (%)
Belgium (BE)	2006	1069	58	33.4	16.2	10.8	5.4	10.8
Czech rep (CZ)	2006	1063	50				4.7	4.7
Germany (DE)	2006	5091	580				11.4	11.4
Greece (EL)	2006	1657	133	85.1	9.4	8.7	8.0	8.7
Spain (ES)	2006	4104	365	52.9	26.8	20.5	14.2	20.5
France (FR)	2006	4709	1400	84.1	29.7	27.3	25.0	27.3
Cyprus (CY)	2006	86	15	78.8	22.1	19.8	17.4	19.8
Latvia (LV)	2007	419	91				21.7	21.7
Lithuania (LT)	2007	739	69				9.3	9.3
Austria (AT)	2006	730	45	(3.6)			6.2	6.2
Poland (PL)	2007	5583	480				8.6	8.6
Portugal (PT)	2007	854	57	48,3	13,8	10.2	6.7	10.2
Slovenia (SI)	2006	263	158	92.8	60.0	57.9	55.7	57.9
Slovakia (SK)	2006	579	42				7.3	7.3
Finland (FI)	2006	336	88				26.2	26.2
United Kingdom (UK)	2006	3172	540				17.0	17.0
Bulgaria (BG)	2007	1006	44				4.4	4.4
Romania (RO)	2007	2791	150				5.4	5.4
Average								**16.0**

- **Tested (%):** Percentage of drivers involved in fatal accident who are tested for alcohol. This is described explicitly for eight countries including Austria. However, the number for Austria is very small, and it is therefore assumed that it probably is not right.
- **SPI 1 (%):** SPI calculate as alcohol fatalities divided by the tested drivers only.
- **SPI ½ (%):** SPI calculated under the assumption that the percentage of alcohol fatalities among untested drivers is half that of the tested drivers.
- **SPI 0 (%):** SPI calculated as alcohol fatalities divided by all fatalities.
- **SPI '07 (%):** The recommended SPI for 2007 is based on SPI ½.
- **Grey:** The SPI indicated in the updated questionnaire by the seven countries which also have stated percentage of drivers involved in fatal accident who are tested for alcohol (SafetyNet 2007).

Data from 2006 or 2007 for calculation of the alcohol SPI was received, including data from three new countries, Bulgaria, Romania and Slovenia. On the other hand eight countries which delivered data for 2004 or 2005 did not do so for 2006 or 2007. The eight countries are; Denmark, Estonia, Hungary, Italy, Norway, Sweden, Switzerland and The Netherlands. Consequently, 18 countries have delivered data for 2006-2007.

The new data and the calculated SPIs are summarised in table 3. Among these 18 countries seven countries have explicitly stated the number of the drivers involved in fatal accidents tested for alcohol. This is more than three times as many as in 2005.

The percentage of drivers involved in fatal accident tested for alcohol varies between 18.9 % for Belgium and 92.8 % for Slovenia with an unweighted average on 65.9 %. Four countries; Cyprus, France, Greece and Slovenia have tested between 79 % and 93 % of the drivers.

Belgium, France and Spain have explicitly stated the number of drivers involved in fatal accidents tested for alcohol in both 2005 and 2007. Among these three countries the percentage of tested drivers has increased only for Spain, from 28.5 % to 52.9 %. There is probably a methodological explanation for this increase or some of the increase. In 2005 the calculation was based on all killed road users and in 2006 the calculation is based on killed drivers. If the same calculation method is used for 2006 as for 2005 the percentage of tested road users will be 33.1 % instead of 52.9 %. Thus, if this method is used there will still be an increase, but it is not so large. In Belgium this percentage has decreased from 20.0 % to 18.9 %, and in France it has decreased from 88.3 % to 84.1 %.

Since only three countries have data for percentage of drivers tested for both 2005 and 2007, no general trend in testing can be concluded.

The questions in the updated questionnaire are formulated differently than the questions in the first questionnaire. In the updated questionnaire the percentage of fatalities caused by accident in which one driver involved was impaired by alcohol should be stated. However, it is not stated how this percentage is calculated, because the absolute number is not indicated. This is a problem for the seven countries which have stated the percentage of tested drivers. This means that the percentage may have been calculated in three different ways:

1. As the alcohol fatalities divided by the tested drivers only (SPI 1)
2. As the alcohol fatalities divided by all fatalities (SPI 0)
3. In a different way to take the percentage of tested drivers into consideration.

Moreover, there is also the question of *selection* of the tested drivers. If the drivers tested are selected for testing because of suspicion of alcohol use, the percentage of alcohol positive drivers is likely to be higher than if drivers are selected for testing at random. The method will probably differ from country to country. It is assumed that the countries either will use the first or the second method. For each country an individual assessment of the most likely method has been made. This assessment is indicated in table 3.

For countries with data for both periods (Belgium, France and Spain), an evident interpretation is that the percentage is calculated in the same way for both years. This has been confirmed for France and is probably also the case for Belgium. Spain is one of the few countries explicitly indicating how the percentage is calculated.

For the last four countries; Cyprus, Greece, Portugal and Slovenia an evident interpretation is that the percentage is calculated as the number of alcohol fatalities divided by all fatalities (SPI 0). The argument for that is that these two numbers are directly stated and can be used without any intermediate calculations.

Based on these assumptions the recommend alcohol SPI (SPI ½) has been calculated for the seven countries. This means that the percentage stated in the questionnaire and summarized in table 3 is not the same.

Figure 2 and table 4 compare the alcohol SPI for 2005 and 2007. 15 countries have stated numbers for both periods, eight countries have only given data for 2005 and three countries have delivered data for 2007 only.

Nine countries have had an improvement. If the data are correct, it seems that Portugal has had a very large improvement. Belgium, Slovakia and Lithuania have had a large improvement. Cyprus and Poland have had a medium improvement and Greece, Germany and Czech Republic have had a small improvement.

Five countries have had an increase in SPI. Finland and Spain have had a medium increase in the alcohol SPI from 2005 to 2007 and France, Austria and United Kingdom have had a small increase.

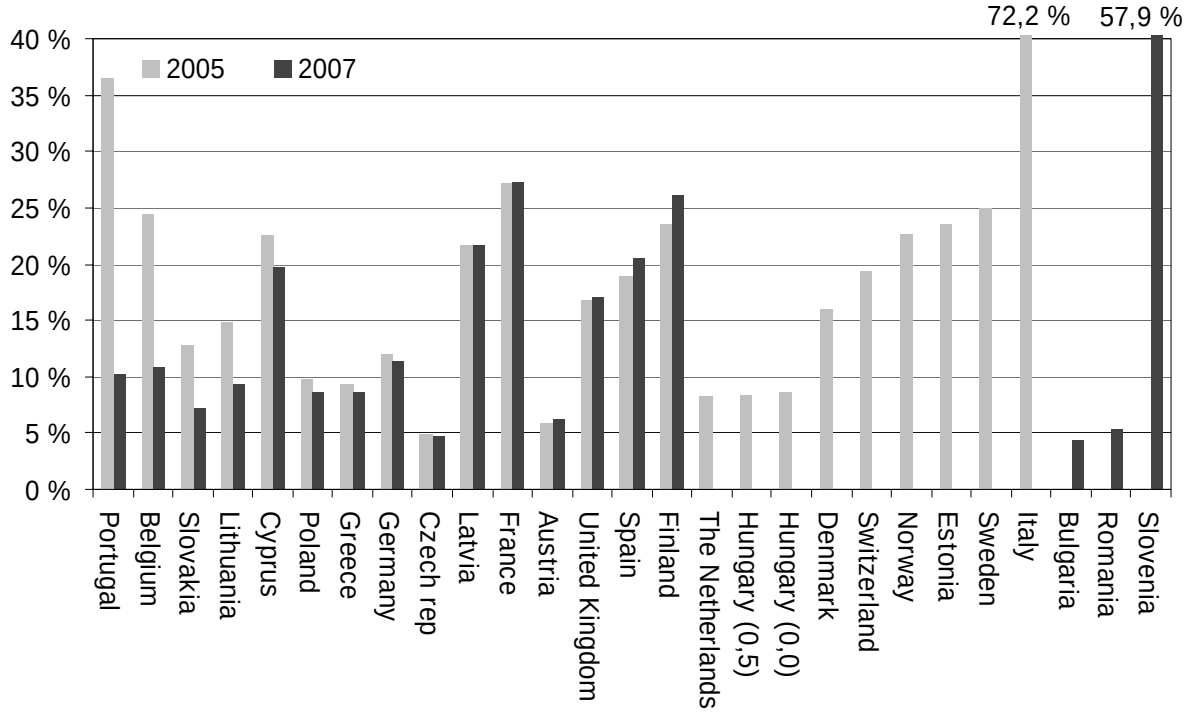


Figure 2. Comparison of alcohol safety performance indicators for 2004-2005 (SPI '05) and for 2006-2007 (SPI '07). The countries are listed from the largest decrease to the largest increase. Countries with figures for only 2005 or 2007 are listed on the right side of the diagram.

Table 4. Countries by large, medium, small and no decrease or increase in SPI from 2005 to 2007.

Changes	2007 < 2005	2007 > 2005
Very large (> 15 % point)	- Portugal	-
Large (5-15 % point)	- Belgium - Slovakia - Lithuania	-
Medium (1-5 % point)	- Cyprus - Poland	- Finland - Spain
Small (<1 % point)	- Greece - Germany - Czech rep	- France - Austria - United Kingdom
None	- Latvia	

Only 2005 data	Only 2007 data
- Denmark	- Bulgaria
- Estonia	- Romania
- Hungary	- Slovenia
- Italy	
- Norway	
- Sweden	
- Switzerland	
- The Netherlands	

4 ETSC and SafetyNet alcohol SPIs

The European Transport Safety Council (ETSC) has also developed a set of safety performance indicators for road accidents, the Road Safety Performance Index – PIN (ETSC 2007).

The SPI used for alcohol is the percentage change in the annual number of deaths in accidents related to drink-driving relative to the percentage change in all road fatalities. This indicator is a more dynamic, emphasizing the change in alcohol-related fatalities compared to change in all fatalities (Assum 2007). Based on the data from ETSC it is however also possible calculate an SPI similar to the SafetyNet SPI.

The SafetyNet SPI and the SPI based on the ETSC data are compared in figure 3 and table 5. These reveal some interesting similarities and differences.

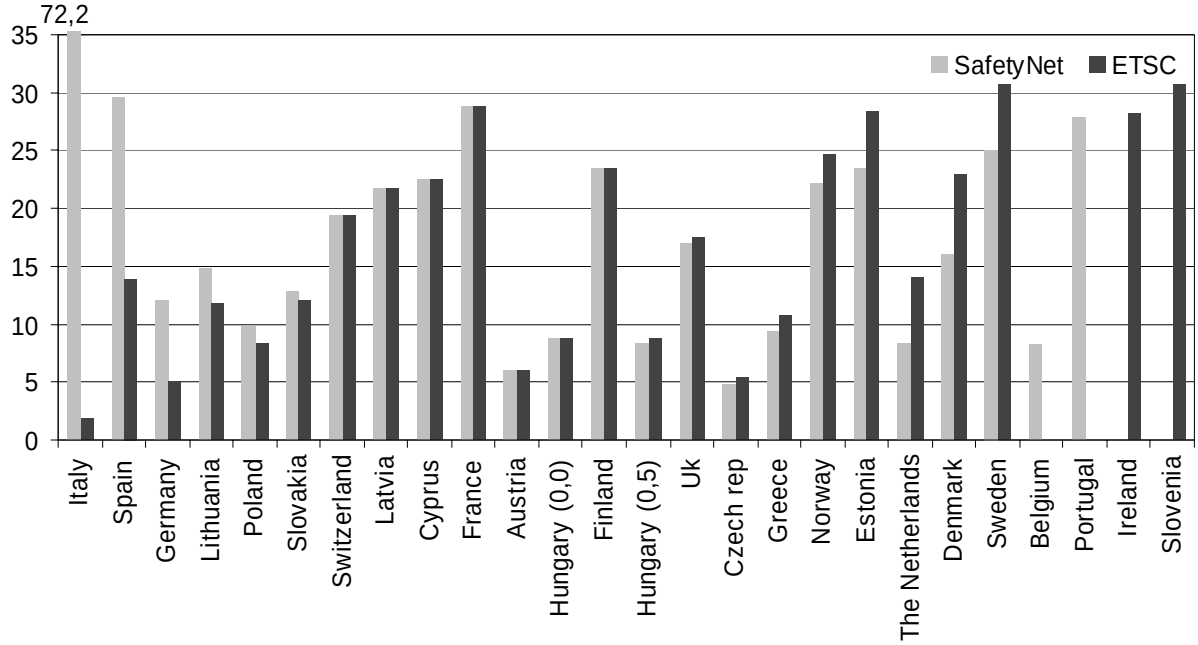


Figure 3. Alcohol safety performance indicators for SafetyNet 2005 and ETSC (European Transport Safety Council) (ETSC 2007, 2007a). The countries are ranked from the largest positive difference (SafetyNet – ETSC) to the largest negative difference. Finally countries with number for only SafetyNet or ETSC are listed.

Four countries, Cyprus, France, Latvia and Switzerland have exactly the same percentage, and three have almost the same percentage. These are Austria, Finland and Hungary. This means that the calculations are based on the same numbers or that ETSC and SafetyNet have got the numbers from each other.

Five countries, Greece, Czech Republic, United Kingdom, Poland and Slovakia have a difference between 0.1 % point and 2 % points. Thus, for 13 countries the two SPIs show very good accordance.

Italy has an extremely high SafetyNet SPI value, 72.2 % and an extremely low value 1.8 % for the ETSC SPI. In other words Italy is ranked as the worst country in SafetyNet and as the best country in ETSC. Both of the two numbers are extreme and neither of the two numbers is likely to be reliable. The quality of the Italian data needs to be checked further.

There is also a large (but not extreme) difference for Sweden, Denmark, the Netherlands, Spain and Germany. These differences are between 5 and 16 % points. For the first three countries SafetyNet SPI is smaller than ETSC SPI, and for the two last countries it is reverse.

Table 5. Countries by very large, large, medium, small, very small and no difference in SafetyNet and ETSC-based SPI results for alcohol.

Difference	SafetyNet < ETSC	SafetyNet > ETSC	Only SafetyNet	Only ETSC
Very large (> 20 % point)		- Italy	- Belgium - Portugal	- Slovenia - Ireland
Large (5-20 % point)	- Sweden - Denmark - The Netherlands	- Spain* - Germany		
Medium (2-5 % point)	- Estonia - Norway	- Lithuania		
Small (0.1-2 % point)	- Greece - Czech rep - United Kingdom	- Poland - Slovakia		
No / very small (0-0.1 % point	- France - Cyprus - Latvia	- Switzerland - Austria - Finland - Hungary		

* Calculation for Spain is based on SafetyNet SPI equal 29.5 %. It is suggested to change this to 18.9 %. This will reduce the difference from 15.6 to 5.5 % points.

According to figure 3 Spain has a large difference of 15.6 % point. However, this calculation is based on a SafetyNet SPI on 29.5 %. However, table 1 suggests that the SafetyNet SPI'05 for Spain should be 18.9 %. If that is the case, the difference is "only" 5 % points. This may indicate that the suggested method for calculation of SafetyNet SPI is better than the "old" method.

The differences between SafetyNet and ETSC indicators cannot be explained within this project, but the fact that six of 22 countries have differences of more than 5 % points between the two SPIs, indicates clearly that at least one of the two data sources are unreliable.

Four countries have supplied data to the one, but not to the other SPI system. Note that Slovenia has provided 2006 data to SafetyNet. The SafetyNet SPI is about 60 %. In comparison the ETSC SPI for Slovenia is only half about 30 %. This means that there is a very big difference that needs further investigation. At the moment the SPIs for Italy and Slovenia should be considered unreliable.

5 WHO accident data and the SPI

World Health Organization (WHO), Regional Office for Europe, has developed a European health for all database (HFA-DB) online available on http://data.euro.who.int/hfadb/. HFA-DB is a central database of independent, comparable and up-to-date basic health statistics for 53 European WHO Member States that allows different country analyses. The data comes from country experts and partner organizations and the database is updated biannually. HFA-DB contains about 600 health indicators including information about alcohol and road traffic accidents (WHO 2008, 2008a).

Table 6. Road traffic accidents involving alcohol per 100,000 persons and accident involving alcohol pr. accident with injury in 22 European countries in primarily 2004 (WHO 2008, 2008a). The countries are listed by accidents involving alcohol per 100,000 persons.

	Year	Accidents with injury per 100,000 persons	Accidents involving alcohol per 100,000 persons (WHO1)	Accidents involving alcohol / accident with injury (WHO2)
Romania	2003	30.6	1.4	4.5 %
Cyprus	2004	267.3	2.4	0.9 %
Italy	2002	416.1	5.1	1.2 %
Bulgaria	2004	97.8	5.4	5.5 %
Sweden	2004	200.5	11.7	5.9 %
The Netherlands	2003	195.0	12.8	6.5 %
Greece	2004	140.5	13.1	9.3 %
Poland	2004	133.8	15.1	11.3 %
United Kingdom	2004	346.6	18.8	5.4 %
Finland	2004	129.4	19.3	14.9 %
Denmark	2004	115.0	20.1	17.5 %
Slovakia	2004	156.8	20.9	13.3 %
Czech Rep.	2004	259.8	27.3	10.5 %
Hungary	2004	207.4	28.8	13.9 %
Lithuania	2004	185.0	28.8	15.6 %
Germany	2003	429.6	29.4	6.8 %
Luxembourg	2003	160.0	31.3	19.6 %
Latvia	2004	219.7	32.3	14.7 %
Switzerland	2002	324.6	34.4	10.6 %
Austria	2004	521.8	34.7	6.6 %
Estonia	2004	166.3	42.2	25.4 %
Slovenia	2004	637.0	88.3	13.9 %
EU25	2004	268.9	19.2	7.1 %
EU15*	2003	315.4	19.3	6.1 %
EU10**	2004	145.2	17.0	11.7 %

* EU members before May 2004.
** EU members since 2004 or 2007.

The database contains the following relevant data (WHO 2008a):

- Road traffic accidents involving alcohol per 100,000 persons
- Road traffic accidents with injury per 100,000 persons.

Road traffic accidents involving alcohol is defined as road traffic accidents involving one or more persons under the influence of alcohol. Accidents involving personal injury are included, while accidents with only material damage are not included. The parameter can be used as an alcohol safety performance indicator.

If the two parameters of the database are combined it is possible to calculate road traffic accidents involving alcohol pr. road traffic accident with injury. This can also be used as an alcohol safety performance indicator.

Table 6 summarizes the three described parameters for 22 European countries in primarily 2004. No data exist for Belgium, France, Norway, Portugal and Spain.

The numbers of accidents involving alcohol per 100,000 persons vary between 1.4 and 88.3 with an average for EU on 19.2. Romania, Cyprus, Italy and Bulgaria have very few accidents involving alcohol. The numbers for these countries are between 1.4 and 5.4. Slovenia has a very high number of 88.3.

The share of accidents involving alcohol per road traffic accident with injury varies between 0.9 % and 25.4 %. You find the lowest percentage in Cyprus, Italy and United Kingdom, while Estonia, Denmark and Lithuania have the highest percentage.

Figure 4 compares the ranks for the SafetyNet 2005 alcohol SPI and WHO SPI calculated as accidents involving alcohol pr. 100,000 persons. It is necessary to compare ranks instead of numbers because the two indicators are based on different data. The SafetyNet alcohol SPI is based on fatalities and the WHO alcohol SPI is based on accidents.

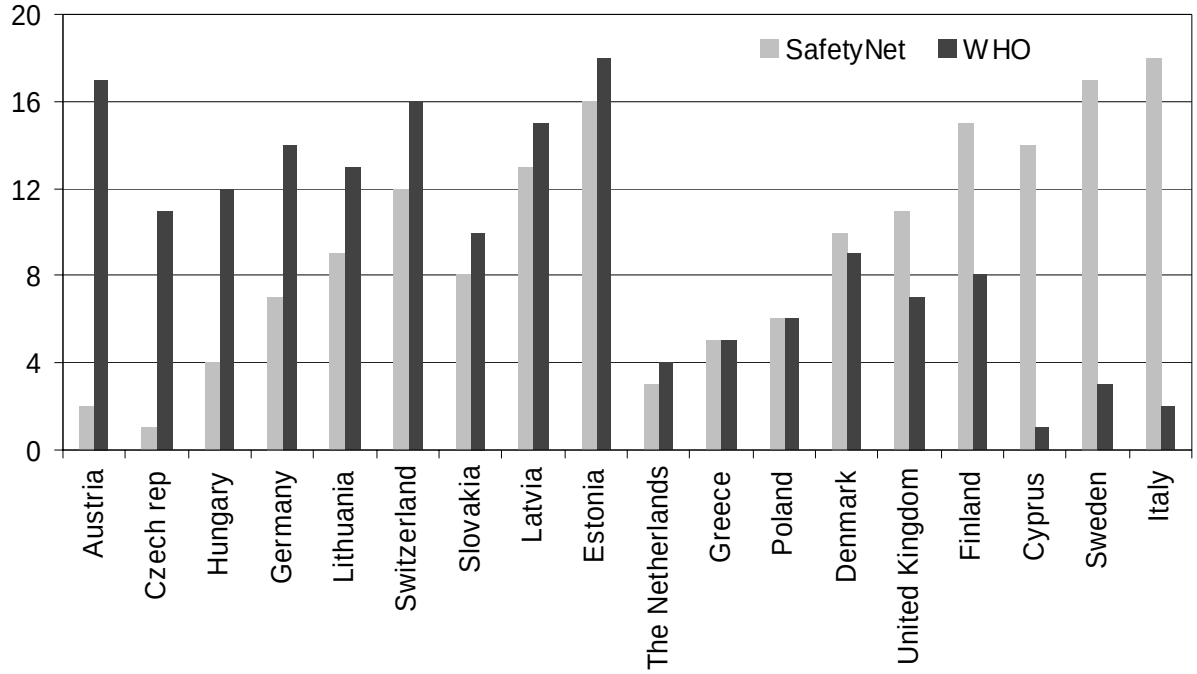


Figure 4. Ranks for the SafetyNet 2005 alcohol SPI and WHO SPI calculated as accidents involving alcohol per 100,000 persons (WHO 2008, 2008a). The countries are ranked from the largest negative difference (SafetyNet – WHO) to the largest positive difference.

Figure 4 shows surprisingly that there is no correlation between the SafetyNet SPI and the WHO SPI calculated as accidents involving alcohol per 100,000 persons and drink-driving prevalence. The correlation is calculated to -0.21.

The largest negative difference calculated as the rank for SPI minus the rank for WHO is found for Austria, Czech Republic and Hungary, i.e. differences of -15, -10 and -8 respectively. This means that these countries have a low SafetyNet SPI and a high WHO SPI.

The largest positive difference is found for Italy, Sweden and Cyprus. Italy has the largest positive difference of 16 (18 minus 2). This calculation is based on the SafetyNet SPI for Italy, which is very different compared to the ETSC SPI for Italy. If the ETSC SPI is used, the difference is only -1.

Figure 5 compares the ranks for the SafetyNet 2005 alcohol SPI and the other WHO SPI calculated as accidents involving alcohol pr. accident with injury. These ranks show neither correlation. The correlation is calculated to -0.01.

The largest negative difference calculated as the rank for SPI minus the rank for WHO is found for Hungary, Czech Republic, Lithuania and Denmark. This means that these countries have a low or medium SafetyNet SPI and a high WHO SPI.

The largest positive difference is found for Italy, Sweden and Cyprus, which also had the largest positive different in the previous comparison.

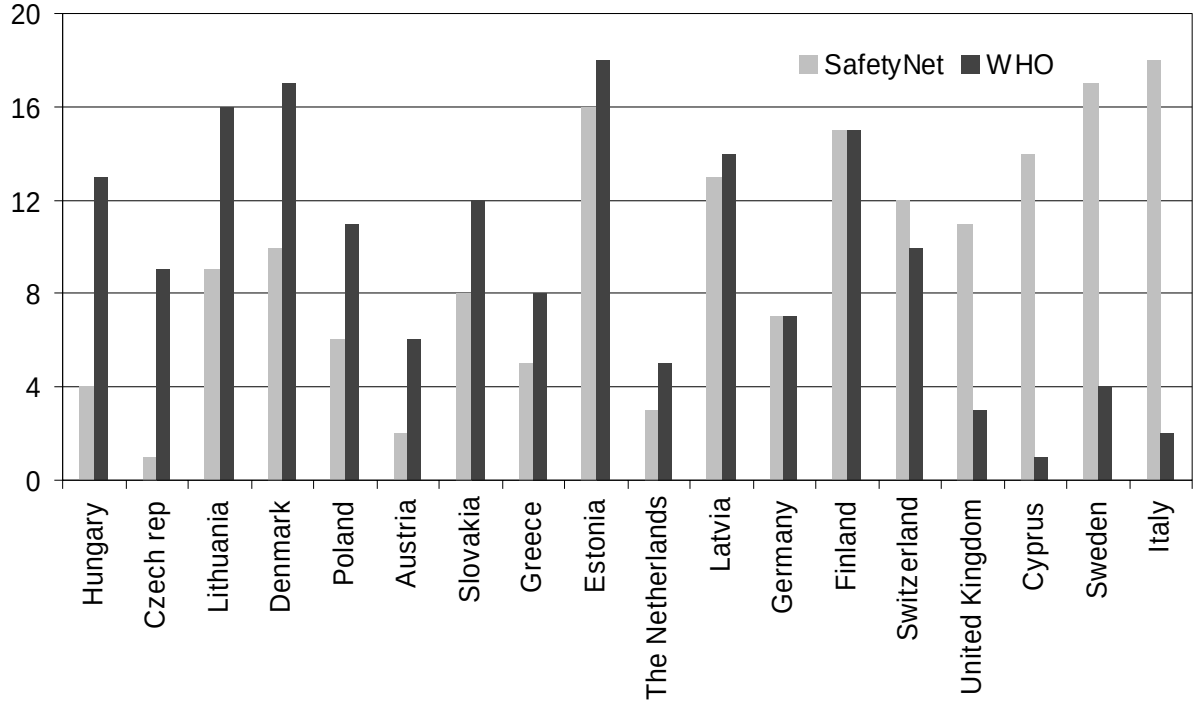


Figure 5. Ranks for the SafetyNet 2005 alcohol SPI and WHO calculated as accidents involving alcohol pr. accident with injury (WHO 2008, 2008a). The countries are ranked from the largest positive difference (SafetyNet – WHO) to the largest negative difference.

6 Data quality study of five countries

As described in the previous chapters the alcohol SPIs vary a lot from country to country. Thus, the question may be asked whether very low or very high indicator values really reflect the real situation or if there is a methodological explanation for such a value. To try to answer this question some in depth studies of the SPI for the countries with the most extreme SPI will be conducted in the following.

The objective of these studies is not to explain why the SPI is so low or high, but to make a quality control of the numbers and method used for the SPI calculation and evaluate if there is a methodological explanation for a particularly low or high SPI.

The in depth studies are conducted in different ways for the selected countries depending of what relevant materials (accident data, publications, reports and information from key persons) is was possible to find and include in the analysis.

6.1 Selection of countries

It was chosen to make an in depth study for the countries listen in table 7. This table describe also why the countries have been chosen.

Czech Republic and Austria have primarily been chosen because they have the lowest and second lowest alcohol SPI. At the same time they have high alcohol consumption. This is clarified in chapter 10. In addition Austria has also few alcohol controls. This is clarified in chapter 12.

Table 7. Countries selected for in depth study and why they have been chosen.

Country	SPI	Other criteria
Czech rep	lowest	- Highest alcohol consumption
Austria	2nd lowest	- 4th Highest alcohol consumption - 4th fewest alcohol controls
France	2nd highest	- Large country
Sweden	5th highest	- 3rd lowest alcohol consumption - Fewest people who drink and drive - 4th most alcohol controls - Safe country - Different method for calculation of SPI
Norway	9th highest	- Lowest alcohol consumption - Safe country - Different method for calculation of SPI

France has been chosen because it has the second highest alcohol SPI. In addition France is a large country, and it is important not only to have small countries in the study.

Sweden and Norway also have high alcohol SPI, but “only” the fifth and ninth highest. Thus, the main reasons to select these countries are that they have a high SPI even though they have very low alcohol consumption. Sweden also has few people who drink and drive and many alcohol controls. This is clarified in chapter 10 and chapter 12. In addition Sweden and Norway are among the countries in Europe having fewest road fatalities per million vehicles or million inhabitants (EU 2008, OECD 2008). Moreover, Sweden and Norway have used other methods for calculation of the SPI than asked for in this project.

The selection of the five countries also means that other possibly relevant countries with extreme low or high SPI have not been selected. Especially Italy stands out as the country with the highest alcohol SPI. Italy has an extremely high SPI which is over trice as high as the second highest SPI. At the same time ETSC indicate an extremely low value for SPI of 1.8 %. Obviously both numbers cannot be right at the same time and both numbers are also so extreme that none of the number probably is right. Thus, Italy is an obvious choice for an

in depth study. Further confirmation of the Italian figures was requested, but no reply was received. Consequently, Italy was considered too difficult for a follow-up study.

According to figure 1 Spain could also be relevant for an in depth study. However, in chapter 2 it is described that the SPI for Spain probably should be calculated in another way which handles the untested drivers in another way. This calculation gives that the SPI for Spain "only" is 18.9 %. This is about the average for the European countries.

The selection of countries was based on data from 2004-2005 received in the first questionnaire. In the second questionnaire data was received from three new countries; Bulgaria, Romania and Slovenia. All these three countries have extreme value for the alcohol SPI. Bulgaria and Romania have extreme low alcohol SPI on 4.4 % and 5.4 %, while Slovenia has an extreme high alcohol SPI on about 60 %. Thus, these three countries are very relevant for further investigations.

6.2 The Czech Republic

Even with a legal limit of 0.0 BAC the Czech Republic has only 4.8 % of the fatalities resulting from alcohol-related accidents, according to the data provided. This is the lowest SPI result of the 24 countries having delivered data for the alcohol SPI. If this result is valid, the Czech Republic has almost solved one of the most severe and difficult problems within road safety, drinking and driving, and the extremely high accident risk that goes with it. Consequently, the rest of the world would have a lot to learn from the Czech Republic in this field. Before declaring the Czech Republic a world leader in this field, the question has to be asked whether the SPI shows the real situation or if there is a methodological explanation to this favourable result?

6.2.1 In-depth study of data quality

An in-depth study of the quality of the Czech SPI data was carried out by the Czech Road Safety Institute CDV (Eksler, Tecl and Assum 2008) within the SafetyNet project (see Annex 1. The method was to compare police data with hospital data within the district of Kromeriz in 2003 – 2007, including 54 fatal accidents with 61 fatalities.

This study found that 38 % of the fatalities registered by the police occurred in accidents where the drivers were not tested for alcohol (Eksler, Tecl and Assum 2008).

The report concludes: "It appeared impossible to determine an exact level of under-reporting of alcohol-related crashes in the Kromeriz region… The detailed look at the crash statistics, however, allowed identifying cases which were not reported correctly at the central crash database. The analysis of crash reports uncovered several additional cases of alcohol intoxication." Some 11 % of the fatalities studied in the hospital resulted from crashes in which at least one driver was found intoxicated by alcohol (Eksler, Tecl and Assum 2008). "If we consider only fatalities which occurred in crashes in which the intoxication by active participants was either proved or refused, it would be 32 % (12 out of 38)" (Eksler, Tecl and Assum 2008).

The non-reporting of alcohol is mostly due to administrative and legal shortcomings (Eksler, Tecl and Assum 2008). Either the post-mortem examination of driver culprit is not done in order to keep costs down, or the BAC results of this examination are not claimed by the police. When an involved driver is unconscious, the police cannot carry out a breath test, or breath tests are not carried out because of lack of time or urgent medical treatment (Eksler, Tecl and Assum 2008).

"The results suggest that the extent of alcohol involvement in fatal road crashes in the Czech Republic is close to the EU average level" (Eksler, Tecl and Assum 2008).

6.2.2 Conclusion

The in-depth study of the quality of the data indicates clearly that the low SPI result is due to methodological shortcomings rather than an especially favourable situation in this field in the Czech Republic. However, it is not possible to make an exact estimate of the right SPI.

6.3 Austria

The alcohol SPI for Austria is 5.9 %, the second lowest of the countries having provided data. Does the SPI show the real situation or is there a methodological explanation?

6.3.1 Other studies and references

Machata and Wannenmacher (1998) wrote in their article "*Wie hoch liegt die Alkoholquote wirklich?*" (*How high is the alcohol rate in reality?*) that testing dead or unconscious drivers for alcohol is only allowed when there is a well substantiated suspicion. This means that unconscious or dead drivers are tested only when they are obviously intoxicated.

In their data from the province of Niederösterreich they find that 9 - 17 % of all active road users (N=789) involved in road accidents were under the influence of alcohol, whereas in the official road accident statistics only 5 % were under the influence. The authors state that "the real figures for alcohol fatalities … are at least three times as high as the official figures" (Machata and Wannenmacher 1998, p. 65).

In single accidents 29 % are under the influence of alcohol, whereas the official statistics said 21 %. The data set is from 1989 - 1991. If the situation still is as described by Machata and Wannenmacher (1998), the explanation of the low alcohol SPI for Austria is rather obvious.

In Austria "if a person is killed or heavily injured by an accident it is legally not allowed to test this person for alcohol or drugs." (Braun and Schausberger 2007, p. 30). The situation is still the same in 2008, and newer data do not exist concerning underreporting of alcohol in fatal accidents in Austria (Machata 2008).

6.3.2 Conclusion

The 1998 article shows clearly that there are methodological reasons for the low alcohol SPI in Austria, and the situation is confirmed to be the same in 2008. Consequently, the conclusion is that the low SPI for Austria is due to the lack of testing of dead or unconscious drivers. If the correct figure still is three times as high as the official figures, the SPI would be about 18 %. It is, however, difficult to estimate the SPI precisely.

6.4 France

France is among the countries having the highest SPI. The alcohol SPI for France is depending of method for calculation about 27-29 %. This is the second highest SPI. Only the SPI for Italy is perhaps higher.

6.4.1 SafetyNet 2005 and 2006

In France 88.3 % of drivers involved in fatal accident are testes for alcohol. This high rate of testing means that the SPI only varies between 27.2 % and 28.8 %, depending whether only the tested drivers or all drivers involved are taken in account. Thus, this correction does not change the fact that the SPI for France is very high.

Updated questionnaires with data for 2006 have been received for France. Obviously, the SPI can and will change from year to year, but unless something "dramatic" has happened in the country, for example new laws, new BAC limits or significantly more or less police control, the SPI should be at about the same level from year to year with a maximal change of some percentage points, hopefully to a lower SPI. Thus, the new numbers can also be used in this quality control.

Based on the new data it is calculated that the SPI for France in 2006 was 27.3 %. This is the same as for year 2005. Unless both the data for 2005 and 2006 is wrong this comparison verify that the SPI for France is very high and that it is about 27 %.

6.4.2 ETSC

In chapter 4 the SafetyNet SPI is compared with the ETSC SPI for 2005. The ETSC SPI is 28.8 %. This means that the two SPIs are exactly the same.

If the raw data for calculation of SPI in the SafetyNet and the ETSC are compared it can be concluded that these also are the same. At the same time ETSC describes that they have the data from national source. This means that the ETSC has the same raw data as SafetyNet and that the ETSC finds these data reliable.

Note that the ETSC have estimated the number of deaths in drink-driving accident in 2005 to 1,532 among the 5,318 fatalities (28.8 %), where the raw data says 1,355 among the tested 4697 (also 28.8 %). This means that ETSC assumed that the percentage is the same among untested drivers as among tested drivers. As clarified earlier this is probably not right.

6.4.3 Other studies and references

The numbers for the calculation of the SPI for 2005 is confirmed in the report “Alcool et accidents de la route” (PSR 2008), which is a yearly description of road accidents and alcohol.

The report has also been made for 2006 (PSR 2008a) and there the numbers are a little different from the numbers used for calculation of the SPI for 2006. The report describes that 29.4 % (not 29.7 %) of the fatalities were killed in accidents which at least one driver was impaired by alcohol, and that the percentage of fatalities for which the blood alcohol concentration is known is 75.4 %. If the same assumption about alcohol fatalities among untested drivers like the other situations are made the SPI for 2006 can be calculated to 25.8 %. This is only 1.5 % points less than the SafetyNet SPI for 2006.

In the report “Drinking and Driving: a Road Safety Manual for Decision-makers and Practitioners” by the Global Road Safety Partnership (GRSP 2007, p. 4) the percentage of fatal accidents with alcohol as a factor is specified for a number of countries including France. These percentages are based on data from 2002-2004. The report describes that alcohol is a factor in about 33 % of the fatal accidents for that period.

According to a press release (Web in France 2008) 4,615 people were killed on the roads in France in 2007. Alcohol-related accidents were stated as the number one cause of road fatalities. 1,241 killed were associated with alcohol-related accidents. This means that the percentage is 26.9 %.

The conclusion of the comparison with these references (PSR 2008, 2008a, GRSP 2007, Web in France 2008) is that the SafetyNet alcohol SPI has the right level.

Finally it should be noted that France is the only country with a high SPI that also has a high alcohol consumption, high motorisation, many people who answer that they drink and drive and many people who do not think that drinking and driving is an important accident cause (see chapter 10-12). Even though the SPI and these indicators do not correlate in general (see chapter 10-12) the fact that these indicators are high for France means that the high SPI for France does not seem wrong.

6.4.4 Conclusion

Based on the different assessments in the in-depth study for France it is concluded that the SPI for France probably has the right level. There are some small differences in the different references, but it seems that this can be explained by different methods of handling the share of untested drivers.

6.5 Sweden

Sweden has provided an estimate for the alcohol SPI, 25 % of all killed road users were killed in accidents where at least one driver was under the influence of alcohol. This estimate is based upon autopsies of killed drivers.

6.5.1 Other studies and information

In chapter 4 the SafetyNet SPI is compared with the ETSC SPI for 2005. The ETSC SPI for Sweden is even higher than the SafetyNet SPI, some 31 %, and second highest in Europe. We do not know from where the ETSC has received the data for Sweden, but the data must be different than the data made available for SafetyNet.

SUPREME Thematic Report Enforcement (2007, p. 40), concerning Random Breath Testing in Sweden writes: "…*RBT is also compulsory for drivers involved in injury accidents*." There must be some confusion of concepts here. Breath testing of drivers involved in injury accidents will not be random. More importantly, however, we must ask to what extent involved drivers actually are breath-tested for alcohol and what about unconscious and dead drivers – are they tested, and if so, in what way? And if they are tested in hospital, are test results available for statistical purposes?

Chief research officer Ulf Brüde, VTI, says: "Changes in the prevalence of alcohol in road traffic over the years are not known. The total number of alcohol-related fatalities has nevertheless been about the same every year" (VTI 2008).

A press release from the Swedish Road Administration (Vägverket 2007) stated that two persons die every week in alcohol-related road accidents, and further: "*Every year approximately 125 persons die in alcohol-related accidents on Swedish roads and streets."* In 2007 there were 471 road fatalities in Sweden (VTI 2008a), i.e. some 26.5 % of all fatalities result from alcohol-related accidents. This is very much in accordance with the previous estimate, but they may be based on the same data. However, the press release does not define "alcohol-related accidents". These may include impaired pedestrians and bicycle riders, but the press release discusses impaired drivers only, rather than impaired road users in general. If impaired pedestrians and bicycle riders are included, the percentage would be somewhat higher than if motor vehicle drivers only are included.

Lindholm (2004) has studied 63 fatal accidents with impaired motor vehicle drivers (11 fatal accidents involving impaired motor cycle or moped drivers are not included), which killed 75 people. Those are all 2002 fatal accidents where an alcohol impaired driver was detected. A total of 532 people were killed in road accidents in Sweden in 2002, i.e. 14.1 % of fatalities were killed in accidents involving a driver impaired by alcohol. In this study the limit for alcohol impairment is 0.1 g/l (0/00), whereas the legal limit in Sweden is 0.2 g/l (0/00). If the people killed in the accidents involving alcohol-impaired drivers of MCs and mopeds were included, the percentage would be slightly higher. The number of fatalities in these accidents is, however, not stated, and this percentage can consequently not be calculated exactly. Given that, in average, the number of fatalities per fatal accidents is the same in MC and moped accidents as in other accidents, the percentage would be 16.5 %. Whether 14 % or 16 %, this percentage is considerably smaller than the estimate provided by Sweden, 25 %.

Lindholm (2004) states explicitly that his method, i.e. statistics based on in-depth studies of fatal accidents, does not give a complete picture of alcohol-related accidents. "In the cases where the drivers survive there is a risk that the driver has been taken to hospital before the police arrive at the scene, the driver may have escaped and may be tested for alcohol much later, or the police may have forgotten to report "suspicion of impairment…." Other reasons are people who die later on, within 30 days after the accident. Then it is too late to test both the person who dies and other involved drivers".

In 52 % of these 63 fatal accidents the police had not suspected alcohol impairment of the impaired drivers, even though the average BAC of these drivers was 1.6 g/l (0/00). This is a clear indication that police suspicion is not a reliable measure of alcohol impairment.

A recent document from the Swedish Road Administration (Lindholm 2008, p. 3) shows that about 20 % of the fatal accidents in Sweden are alcohol-related, i.e. including impaired drivers, bicycle rider and pedestrians. Impaired here means above the legal limit of 0.2 g/l (0/00). Some 15 % of the fatal accidents have an alcohol-impaired driver involved. Moreover, these percentages have been constant since 1997. Of all killed drivers 2006, 33 % were alcohol-impaired. Some 125 people die every year in alcohol-related road accidents. However, it is not possible to distinguish between accidents involving alcohol-impaired drivers and accidents involving impaired bicycle riders and pedestrians. Thus, it is not possible to calculate accurately the percentage of fatalities in accidents involving impaired drivers.

6.5.2 Alternative calculation of SPI

If the number of killed people per accident involving an alcohol-related driver was the same in 2007 as for the 63 fatal accidents with impaired drivers in 2002, i.e. 75/63 = 1.19, an estimate can be made. In 2007 there were 426 fatal accidents and 471 fatalities on Swedish roads (SIKA 2008). 15 % of the fatal accidents had alcohol-impaired drivers, i.e. 426 x 0.15 = 63.9 accidents with 1.19 fatalities on average, makes 76 fatalities in accidents with alcohol impaired driver. (76/471) x 100 = ***16.1 %***, which is considerably less than the SPI of 25 % provided by the Swedish Road Administration in 2006.

6.5.3 Conclusion

An estimate of the SPI, 25 %, is made available by the Swedish Road Administration, based upon autopsies of dead drivers, but the specific calculation of the estimate is not known. An estimate made above, based on data from the Swedish Road Administration gives a lower SPI, 16.1 %. Even if these two estimates may be based on statistics from different years, they are so different that there is reason to ask whether this difference can be explained by different years only. If not, which one is more correct?

Sweden makes systematic in-depth studies of all fatal road accidents, including the blood alcohol concentration of drivers involved in these accidents. Consequently, it should be possible to produce the data needed for the SafetyNet alcohol SPI. Several similar figures, such as the percentage of fatal accidents that are alcohol-related, percentage of fatal accidents involving alcohol-impaired drivers or the number of fatalities resulting from alcohol-related accidents are available. Thus there is reason to ask why the exact data needed for the alcohol SPI cannot be made available, and more importantly, will it be possible to produce the correct alcohol SPI for Sweden in the future.

6.6 Norway

Norway has not been able to provide the data needed for the alcohol SPI, but has provided proxy data, i.e. percentage of killed drivers under the influence of alcohol, 22.2 % in 2002, much the same as Sweden, and Spain have done. Why is Norway not able to deliver the adequate data for the SPI? What can be done to provide these data for Norway? What data exist that can be used to show the situation in Norway? The proxy data provided indicate that drink-driving is an important risk factor in Norway, even if this country has a long tradition for strict enforcement of drink-driving regulations.

6.6.1 Other studies and references

In chapter 4 the SafetyNet SPI is compared with the ETSC SPI for 2005. The ETSC SPI for Norway is some 24 %, i.e. quite similar to the SafetyNet SPI.

Of 403 fatal accidents in Norway 2004 and 2005, 280 were selected for a closer study. Among guilty drivers in these accidents 32 or 11.3 % were under the influence of alcohol alone and 3.9 % were under the influence of both alcohol and other substances, i.e. a total of 15.2 % under the influence of alcohol (Humlegård 2008). These figures are preliminary, and results from all 403 fatal accidents in 2004 and 2005 will be published later (Humlegård 2008a).

The Norwegian Road Traffic Act is strict concerning drinking and driving, and drivers having alcohol in their blood will almost always be found guilty when involved in accidents. Consequently, drivers who are not found guilty are not likely to have been under the influence of alcohol. As all drivers involved in fatal accidents are not tested for alcohol, it is at least theoretically possible that some of the drivers not found guilty have also been under the influence, and all drivers involved in fatal accidents are not tested for alcohol and drugs. Moreover, only about 70 % of killed drivers are tested for alcohol. Thus, it is possible that some of the killed drivers not tested also have been under the influence.

Since 2005 all fatal road accidents in Norway are analyzed in depth to find causal factors within road user behaviour, vehicle safety and road conditions. In 25 % of the fatal accidents in 2005 intoxication is likely to have been a contributing cause of the accident. (Vegdirektoratet 2006), but the report does not distinguish between alcohol and other psychoactive substances. In 2006 intoxication is found to be a contributing factor in 18 % of the fatal accidents, including alcohol in 11 % and other substances in 8 % of these accidents. Although it is not said explicitly, it appears that only intoxicated drivers rather than also intoxicated pedestrians, bicycle riders and passengers, are included in the “contributing cause”. All drivers involved in fatal accidents are not tested for alcohol and drugs, and it is recommended that routines be introduced to ensure that all drivers involved in fatal accidents are tested. The percentage of drivers tested is not stated (Statens vegvesen Region Øst, 2007).

6.6.2 Alternative calculation of SPIs

A total of 242 people were killed in the 228 fatal accidents in 2006, i.e. 1.06 fatalities per accident (Vegdirektoratet 2008). If the average number of fatalities per accident is the same in accidents where intoxication is a contributory cause as in other accidents, and the percentages of alcohol and drugs positive are the same among the untested drivers as among the tested drivers, it is possible to make estimates of the SPIs, i.e. ***11 % of all fatalities occurred in alcohol-related accidents, and the drugs SPI would be 8 %.*** These results are well in line with the preliminary results of the study of the 2004 – 2005 fatal accidents described above.

These new SPI estimates are considerably lower than the estimates of 22.2 % for alcohol and 30.1 per for drugs provided to SafetyNet by Norway. If only the average number of fatalities in alcohol-related accidents and in drugs related accidents had been included in the accident analyses reports, more accurate SPIs for alcohol and drugs could have calculated. Supposedly this information is available for each accident studied, and consequently, Norway should quite easily be able to deliver the right SPIs for both alcohol and drugs.

6.6.3 Conclusion

Norway has the basic data needed for the calculation of the alcohol and drugs SPIs in SafetyNet in in-depth analyses of fatal road accidents. However, the results of these analyses are reported in a way that makes this calculation impossible. However, estimates are 11 % for the alcohol SPI and 8 % for the drugs SPI for 2006, on the condition that the number of fatalities per fatal accident is the same, whether the accidents are alcohol-related, drugs-related or not, and that the untested drivers involved in the fatal accidents have the same percentages of alcohol and drug positive results as the tested drivers. The alcohol and drug SPIs estimated here are considerably lower than those included in the SafetyNet Country Profiles and Country Comparisons reports.

6.7 Other countries

Originally, the plan was to include the United Kingdom in the data quality study to have two large European countries included. However, the data and information delivered by United Kingdom in the second questionnaire and later on explained in detail the data quality and the method of calculations (Vis and Van Gent, (Eds.) 2008). Consequently, the UK has not been included in this study.

During the data collection for the alcohol and drugs SPIs for SafetyNet, explanations of shortcomings in the national data have come up informally. For example, in the Netherlands killed drivers are not tested. In Switzerland very few people are declared dead at the accident scene because dead bodies cannot be transported in ambulances, and other transport of dead bodies is difficult and costly. In Malta the data concerning fatal accidents are collected locally by the police, and the data are not compiled into statistics.

These are indications that the data sets on which the calculation of the alcohol and drugs SPIs are based, may be incomplete in many countries. Thus, there may be reason to believe that countries reporting very low alcohol SPIs may have some shortcomings in their data. However, the cases of Sweden and Norway have shown that some countries may also have provided too high SPIs.

6.8 Conclusion

In this chapter the quality of the data provided for the alcohol SPI for five countries have been studied more closely. For France it is concluded that the SPI is likely to have the right level. For the United Kingdom the conclusion was made, based on the data and information provided in the second questionnaire that the data quality was good and the SPI was correct. Consequently, it was not necessary to include the United Kingdom in the data quality study.

For Austria and the Czech Republic the conclusions are that the SPIs provided are obviously too low, but it is difficult to make exact estimates of the SPI. For Sweden and Norway new estimates are made, which are considerably lower than the ones provided to SafetyNet.

Of a total of six countries studied, the data quality is considered good enough for two. For the four countries with shortcomings in the data, two have too low SPI results and two have too high SPI results. Consequently, there may be reason to believe that more countries have incomplete data as bases for the calculation of their alcohol SPIs, and the comparison of the alcohol SPI results between countries should be done with utmost care, if at all.

- The question may be asked why the data can be incomplete. This study found several answers to this question:
- The costs of autopsy of killed drivers are high when there is no reason to check for alcohol as the killed drivers cannot be punished.
- Testing people killed in road accidents may even be legally prohibited unless there is a strong suspicion.
- Privacy. Even if autopsies including alcohol analysis are carried out, the results are not reported back to the police for reasons of privacy.
- Time-consuming routines. The police may have to make formal requests to the hospitals to get the results of the autopsy.
- In some cases death occurs several days after the accident. When the person dies several days after the accident, and the accident then gets the status of a fatal accident, it is too late to check the BAC.
- Incomplete or no publication. The data needed to calculate the SPI will be collected, but no statistics are compiled or the statistics are published in a way which makes the calculation of the SPI impossible.

The possibilities of improving the data quality will of course vary from country to country, but for two of the countries studied, it should be quite easy to compile and publish the data needed. The most important thing to do to improve the quality of the alcohol and drug SPIs is undoubtedly to report the number of drivers involved in fatal accidents, tested or not tested for alcohol and drugs. Only when these figures are reported is it possible to assess the quality of the SPI.

In the following part 3 of the report the results from the in-depth studies for the Czech Republic, Austria, Norway and Sweden are used in stead of the "original" alcohol SPIs described in figure 1, because the reestimated SPIs are considered to be more right. This means that the following alcohol SPI will be used:

- The Czech Republic: 4.8 % → 18.8 %
- Austria: 5.9 % → 18.0 %
- Norway: 22.2 % → 11.1 %
- Sweden: 25.0 % → 16.0 %.

7 Factors influencing the alcohol SPI

Why do the alcohol SPI results vary between the countries? Apart from the methodological reasons there may also be real differences between the countries implying different situations. Variation in the alcohol SPI could to some extent be explained by and be expected to correlate with all or some of the following factors:

- Drink-driving prevalence
- Legal BAC limits
- Alcohol consumption
- Motorisation
- Behaviour
- Demographic factors
- Norms and culture
- Enforcement
- Information campaigns and driver training.

In the following six chapters it is tried to analyse if the alcohol SPI correlates with drink-driving prevalence, legal BAC limit, alcohol consumption, motorisation, and self-reported behaviour. These factors have been chosen because it is possible to find relevant data for these factors that can be used in a macro analysis.

In this chapter exiting and relevant studies about the subject are summarized.

7.1 Demographic factors

In terms of demographic characteristics, a consistent picture of drink-drivers emerges across a number of studies. These drivers are characterised as being (GRSP 2007, Bernhoft et al. 2007, Bernhoft and Hansen 2008):

- Male
- Aged 18–24 years old
- From a low socio-economic grouping
- Single or divorced
- In a blue collar occupation
- Of low education and limited literacy
- Of low self-esteem.

Variations in these demographic characteristics form country to country can probably contribute to explain the variation in alcohol SPI. However information about several of these characteristics is difficult to collect and compare in a macro analysis.

7.2 Norms and culture

The use of alcohol is object to formal and informal norms and culture – what kind of alcoholic drinks, how much alcohol is acceptable – the occasions when alcohol is used and the combination of alcohol and driving of motor vehicles.

Steensberg (2007, p. 385) describes the Danish preventive policy concerning drinking and driving: *"the Danish efforts to prevent alcohol conditioned road traffic accidents have been*

less effective than in the other Nordic countries caused by different population attitudes, alcohol cultures, social conditions and political cultures." Norms and culture may influence the drinking behaviour of the people directly or through public policy, legislation and enforcement. Formal and informal norms may also interact.

Australian research has found that the population can be divided into four groups regarding attitudinal characteristics of drink drivers. This division is based on three factors (Span 1995):

- Fear of being detected driving while impaired by alcohol
- Fear of crashing
- Acceptance of the BAC limit.

The four groups were characterised as (Span 1995):

1. *Believers:* High fear of being caught or crashing. They have the highest level of acceptance of a 0.05 BAC limit and associated countermeasures. They drank least on their last "drinking occasion".
2. *Pressured:* High fear of being caught or crashing, but a lower acceptance of the BAC limit and enforcement. They experienced social pressure to keep up with the group while drinking.
3. *Deterred:* Lower levels of fear of being caught or crashing, but accept the need for the 0.05 BAC limit and countermeasures.
4. *Opposers:* Low level of fear of being caught or crashing, and low levels of acceptance of the BAC limit and countermeasures. They drank most on the last "drinking occasion", and reported driving while impaired by alcohol more frequently than other groups.

The study concluded that opposers may well be the group with the highest risk of being involved in a drink-driving crash and are also likely to be those whose behaviour is most difficult to change.

The share of opposers in each country influences also the alcohol SPI. Like information about demographic characteristics this is difficult to collect. However, the SARTRE project described in chapter 12 offers the opportunity to get some information about self-reported opinions and behaviours among car drivers that indicate average attitudinal characteristics of the population in each country.

7.3 Enforcement, information campaigns and training

Public countermeasures such as enforcement, information campaigns and driver training may very well affect the alcohol SPI, but if they do, they will do it through influencing individual behaviour and prevalence of drinking and driving.

Thus, for two reasons we have chosen to study the relations between individual behaviour and prevalence of drinking and drinking on the one hand and the SPI on the other, rather than studying the relations between public countermeasures and the SPI.

Firstly, it is way beyond the scope of this project to collect data on countermeasures against drinking and driving in European countries.

Secondly, such countermeasures may also be regarded as a consequence of drinking and driving or high SPI results, since both road authorities and the road users in general may demand more countermeasures if the prevalence of drinking and driving is high or alcohol-related fatalities make up a high percentage of all road fatalities.

8 The legal limit and the SPI

The legal blood alcohol concentration (BAC) limit may correlate with the alcohol SPI. Everything else being equal the SPI should be higher, the lower the legal limit is, simply because more drivers would be above a 0.0 limit than above for example a 0.8 limit. However, low legal limits may indicate that drinking and driving is considered a serious offence and of great concern to the society. Moreover, the degree of enforcement of the legal limit may be higher in countries with lower limits than in countries with higher limits, a fact which may produce exactly the opposite results.

A meta-analysis of studies from the United Stats, Australian, Japan and Sweden from 1986 to 1996 performed by Elvik and Vaa (2004, p. 975) shows that reducing the blood alcohol concentration limits for all drivers from 0.08 to 0.05 and from 0.05 to 0.02 reduces the number of fatal accidents by 8 % and the number of injury accidents by 4 %.

Another international review of studies of lowering the legal blood alcohol concentration in the United States, Canada, Australia, Sweden, Denmark, France and Austria give a reduction in alcohol related collisions, injuries and fatalities. However, in some cases it appears that the beneficial effects may decline over time (Mann et al. 2001).

A review of 14 independent studies in the United States indicate that lowering the legal BAC limit from 0.10 to 0.08 has resulted in 5-16 % reductions in alcohol related accidents. Five other studies also indicate that lowering the legal BAC limit from 0.08 to 0.05 also have a positive effect (Fell and Voas 2006).

Table 8. Legal blood alcohol concentration (BAC) limit (g/l) for 27 European countries.

0.0	0.2	0.3	0.4	0.5	0.8	0.9
- Czech rep	- Estonia	- Germany**	- Lithuania	- Austria	- United Kingdom	- Cyprus***
- Hungary*	- Norway			- Belgium		
- Romania	- Poland			- Bulgaria		
- Slovakia	- Sweden			- Denmark		
				- Finland		
				- France		
				- Greece		
				- Italy		
				- Latvia		
				- Portugal		
				- Slovenia		
				- Spain		
				- Switzerland		
				- The Netherlands		

* The BAC limit for Hungary is 0.0 g/l, but data is also provided for BAC over 0.5 g/l.

** The BAC limit for Germany on 0.3 g/l is a limit for accident involved drivers.

*** The BAC limit for Cyprus was changed from 0.9 g/l to 0.5 g/l in 2006 (SafetyNet 2007).

Table 8 summarizes the legal blood alcohol concentration (BAC) limit for 27 European countries. The BAC limit varies between 0.0 and 0.9 g/l for the countries. The most frequent BAC limit is 0.5 g/l, which is used by 15 countries. A BAC limit of 0.0 and 0.2 g/l are both used by four countries. A BAC limit of 0.3, 0.4, 0.8 and 0.9 g/l is only used by one country. Note that the BAC limit for Cyprus was changed from 0.9 g/l to 0.5 g/l in 2006 and that the stated limit for Germany only is for accident involved drivers only.

Figure 6 compares the alcohol SPI and the BAC limit for 25 European countries. The figure shows that there is no correlation between the alcohol SPI and the BAC limit. R^2 for the trend line is 0.10. However, it should be noted that the trend line is positive meaning that higher BAC limit gives higher alcohol SPI. This finding party supports the hypothesis that low BAC limits mean higher focus and enforcement and therefore lower alcohol SPI. But again, it is a very weak support.

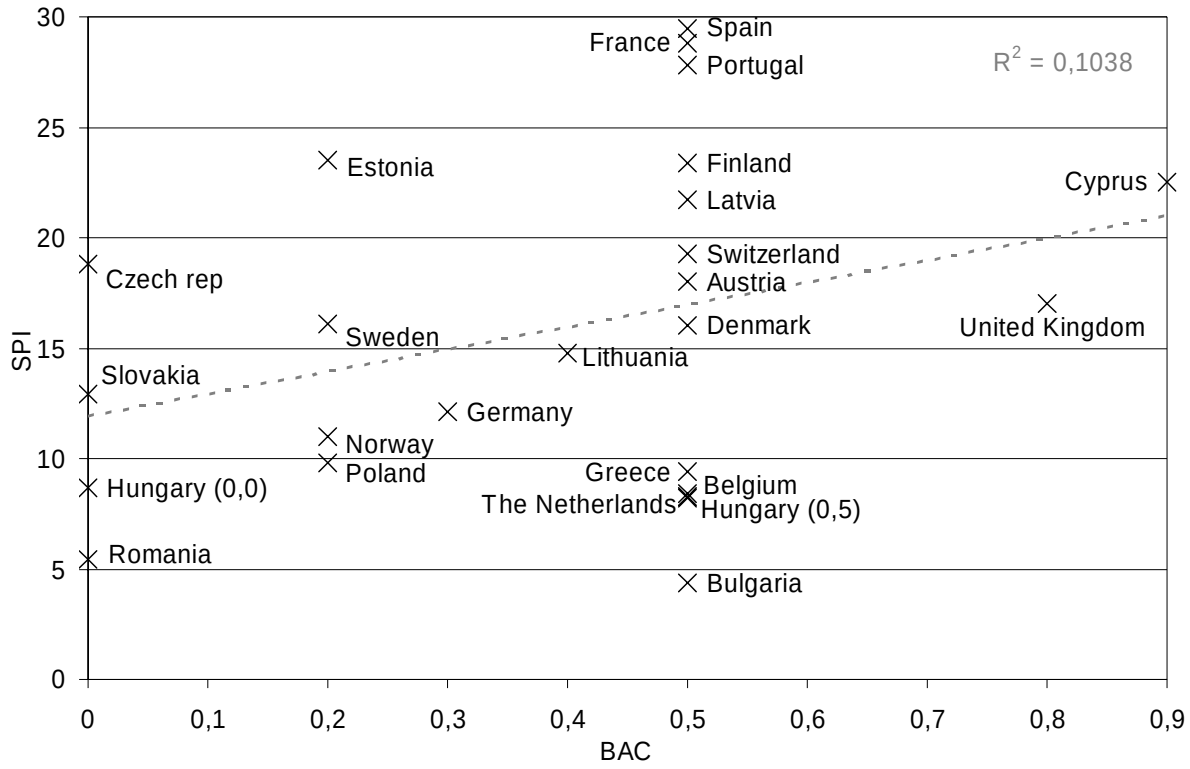


Figure 6. Comparison of the alcohol SPI for 2004-2005 and the legal blood alcohol concentration (BAC) limit. For Norway and Sweden the reestimated SPI in the in-depth study in chapter 6 is used. For Czech Republic and Austria 18.8 % and 18.0 % are used as suggested in the in-depth study. The alcohol SPI for 2007 is included for Bulgaria and Romania. Italy and Slovenia is excluded in the figure due to very high SPI.

9 Drink-driving prevalence and SPI

As described in the introduction the “ideal” safety performance indicator for alcohol and driving would be the prevalence and concentration of impairing substances among the general road user population. However, this ideal safety indicator may be difficult to achieve in practice (Assum et al. 2007, 2007a).

In this chapter the alcohol SPI will be compared to existing data for drink-driving prevalence. It is evident to assume that the drink-driving prevalence and the alcohol SPI will correlate. In fact, the drink-driving prevalence should probably be one of the main factors influencing the number of fatalities occurring in accidents where at least one driver is influenced by alcohol. Everything else being equal the SPI should be higher, the higher the drink-driving prevalence is and lower, the lower the drink-driving prevalence.

The calculation of the drink-driving prevalence is based on studies from 2006 and 2008 organised and described by the European Traffic Police Network (TISPOL). The control of drink-driving was a part of two big European drink drive safety campaigns in June 2006 and June 2008. The controls involved 19 countries in 2006 and 18 countries in 2008 (TISPOL 2008, 2008a). Table 9 describes what countries participated in the campaigns in 2006 and in 2008.

In each country the police carried out controls in the usual manner for their country. This means that vehicles were stopped in three different ways (TISPOL 2008):

1. Only drivers suspected to be under the influence of alcohol or drugs were stopped and tested
2. Drivers were stopped and tested randomly
3. All drivers on the selected roads were stopped and tested.

It is not described what method used in the different countries, and consequently the comparison of results between countries is difficult.

Table 9 summarizes the result of the controls. In 2006 nearly 600,000 drivers were tested for alcohol in the 19 countries participating. This means that about 30,000 drivers in average were tested in each country. The most controls were made in Spain, France and Poland, which made respectively about 170,000, 93,000 and 54,000 controls. Cyprus, Slovenia and Portugal made the fewest controls. They made between 2,000 and 5,000 controls (TISPOL 2008).

Among the tested drivers about 13,000 were found to have consumed excess alcohol. This corresponds to 2.2 %. The largest drink-driving prevalence was found in Slovenia, United Kingdom and Portugal. In these countries about 9 % of the controlled drivers were impaired by alcohol. The Nordic countries; Finland, Norway, Sweden and Denmark had the lowest prevalence between 0.1 and 1.1 % (TISPOL 2008).

A total of 16,604 drivers were also tested for drugs with 301 corresponding to 1.8 % proving positive (TISPOL 2008).

In June 2008 about 880,000 drivers were tested for alcohol. This means that nearly 50,000 drivers in average were tested in each country. This is 20,000 more than in 2006. Most controls were carried out in France, Spain and Sweden, about 223,000, 186,000 and 74,000 controls respectively. Moldova Republic, Belgium and Switzerland made the fewest controls (TISPOL 2008a).

Among the tested drivers 14,645 were found to have consumed excess alcohol. This corresponds to 1.7. %. This is 0.5 % points less than in 2006. The largest drink-driving prevalence was found in Moldova Republic, Switzerland and United Kingdom. In Moldova Republic almost one in five of those stopped were over the limit. Again the Nordic countries had the lowest prevalence, all less than 1 % (TISPOL 2008a).

13 countries also tested for drugs in 2008. In total 1,019 were impaired by drugs. TISPOL (2008a) has not described how many drug test made in 2008, so it is not possible to calculate the percentage of impaired.

Table 9. Drink-driving prevalence for 19 European countries in 2006 and 2008 (TISPOL 2008, 2008a). Note that the study is made for different countries in 2006 and 2008. The countries are listed by country code and EU membership.

	2006			2008		
Country	**Motorists controlled**	**Offences detected (number)**	**Offences detected (%)**	**Motorists controlled**	**Offences detected (number)**	**Offences detected (%)**
Belgium (BE)	992	44	4,4	3,567	119	3,3
Czech rep (CZ)	-	-	-	-	-	-
Denmark (DK)	18,717	206	1,1	13,585	110	0,8
Germany (DE)	167	2	1,2	49,375	591	1,2
Estonia (EE)	-	-	-	-	-	-
Greece (EL)	24,976	711	2,8	34,645	1,241	3,6
Spain (ES)	170,491	2,356	1,4	185,553	2,102	1,1
France (FR)	93,433	2,466	2,6	223,030	4,835	2,2
Ireland (IRL)	-	-	-	26,312	380	1,4
Italy (IT)	13,399	493	3,7	32,443	647	2,0
Cyprus (CY)	2,008	110	5,5	-	-	-
Latvia (LV)	-	-	-	-	-	-
Lithuania (LT)	-	-	-	23,219	491	2,1
Hungary (HU)	23,955	336	1,4	24,859	320	1,3
The Netherlands (NL)	16,693	213	1,3	30,647	470	1,5
Austria (AT)	-	-	-	-	-	-
Poland (PL)	53,596	3,095	5,8	-	-	-
Portugal (PT)	4,738	412	8,7	-	-	-
Slovenia (SI)	2,192	192	8,8	-	-	-
Slovakia (SK)	-	-	-	-	-	-
Finland (FI)	28,697	43	0,1	38,261	212	0,6
Romania (RO)	31,392	501	1,6	68,983	1,109	1,6
Sweden (SE)	50,317	372	0,7	74,506	467	0,6
United Kingdom (UK)	10,426	916	8,8	13,842	829	6,0
Norway (NO)	34,977	84	0,2	33,170	76	0,2
Switzerland (CH)	5,975	267	4,5	5,190	345	6,6
Moldova Rep.	-	-	-	1,548	301	19,4
Total	587,141	12,819	-	882,735	14,645	-
Average	30,902	675	2,2	49,041	814	1,7

Table 10 and figure 7 describe and compare the rank for the alcohol SPI and the rank for drink-driving prevalence for the 18 European countries included in the calculation of both the alcohol SPI and the drink-driving prevalence.

Contrary to expectation figure 7 shows that there is no or a very small correlation between the SPI and drink-driving prevalence. The correlation is calculated to be 0.15.

The largest negative difference calculated as the rank for SPI minus the rank for drink-driving prevalence is found for Belgium, Poland, United Kingdom, and Greece, i.e. differences of respectively -12, -11, -7 and -7. This means that these countries have a high drink-driving prevalence, but a low or medium number of fatalities occurring in accidents where at least one driver is influenced by alcohol.

The Nordic countries; Finland, Sweden and, to a lesser extent, Denmark and Norway, and the south European countries; Spain, France and Italy have the largest positive differences

calculated as the rank for SPI minus the rank for motorisation. This means that despite a low drink-driving prevalence they have a high or medium alcohol SPI.

Table 10. Drink-driving prevalence in 18 European countries in 2006 and 2008 (TISPOL 2008, 2008a). The countries are ranked by drink-driving prevalence 2006. The table also described alcohol safety performance indicator for SafetyNet 2005 and SPI rank among the 18 included countries. For Norway and Sweden the reestimated SPI in the in-depth study in chapter 6 is used.

Country	SPI (%)	SPI (Rank)	Drink-driving prevalence (%) 2006	2008	Prevalence 2006 (Rank)
Finland	23.4	14	0.1	0.6	1
Norway	11.0	6	0.2	0.2	2
Sweden	16.1	10	0.7	0.6	3
Denmark	16	9	1.1	0.8	4
Germany	12.1	7	1.2	1.2	5
The Netherlands	8.3	2	1.3	1.5	6
Hungary	8.4	3	1.4	1.3	7
Spain	29.5	17	1.4	1.1	8
Lithuania	14.8	8	-	2.1*	9
France	28.8	16	2.6	2.2	10
Greece	9.4	4	2.8	3.6	11
Italy	72.2	18	3.7	2	12
Belgium	8.2	1	4.4	3.3	13
Switzerland	19.3	12	4.5	6.6	14
Cyprus	22.5	13	5.5	-	15
Poland	9.8	5	5.8	-	16
Portugal	27.8	15	8.7	-	17
United Kingdom	17	11	8.8	6	18
Correlation	-	-	-	-	0.15

* The 2008 number for prevalence is used for Lithuania because no number for 2006 exists.

The analysis shows that there is no correlation between the alcohol SPI and the drink-driving prevalence as was expected. However, the prevalence figures are driving under the influence offences, meaning drivers above the legal limit in each country. This limit varies from 0.0 to 0.8 g/l BAC. Even if the same limits apply to the alcohol SPI, drivers involved in serious road accidents tend to have much higher BACs than the legal limit (Assum 2001, Mann et al. 2001, Bernhoft et al. 2007, Elliott et al. 2008).

However, the missing correlation may also be explained by biased or not representative numbers. As described the vehicles were stopped in three different ways in the involved countries, but it was not described which of the three methods was used in each country. Obviously the drink-driving prevalence found will be higher in countries which only test suspected drivers than in countries testing all drivers or selecting drivers at random, everything else being equal.

Even with a random selection it very difficult to find the “right” drink-driving prevalence, i.e. a representative and unbiased result. In a Norwegian study (Gjerde et al. 2008), about 12,000 drivers were stopped randomly and asked to provide an anonymous sample of oral fluid to find the prevalence of alcohol and drugs among Norwegian drivers. Alcohol above the cut-off of 0.1 g/l was found in 0.4 % of the samples. In 0.3 % of the oral fluid samples the alcohol concentration was above 0.2 g/l (the legal limit) and in 0.1 % above 0.5 g/l (Gjerde et al. 2008).

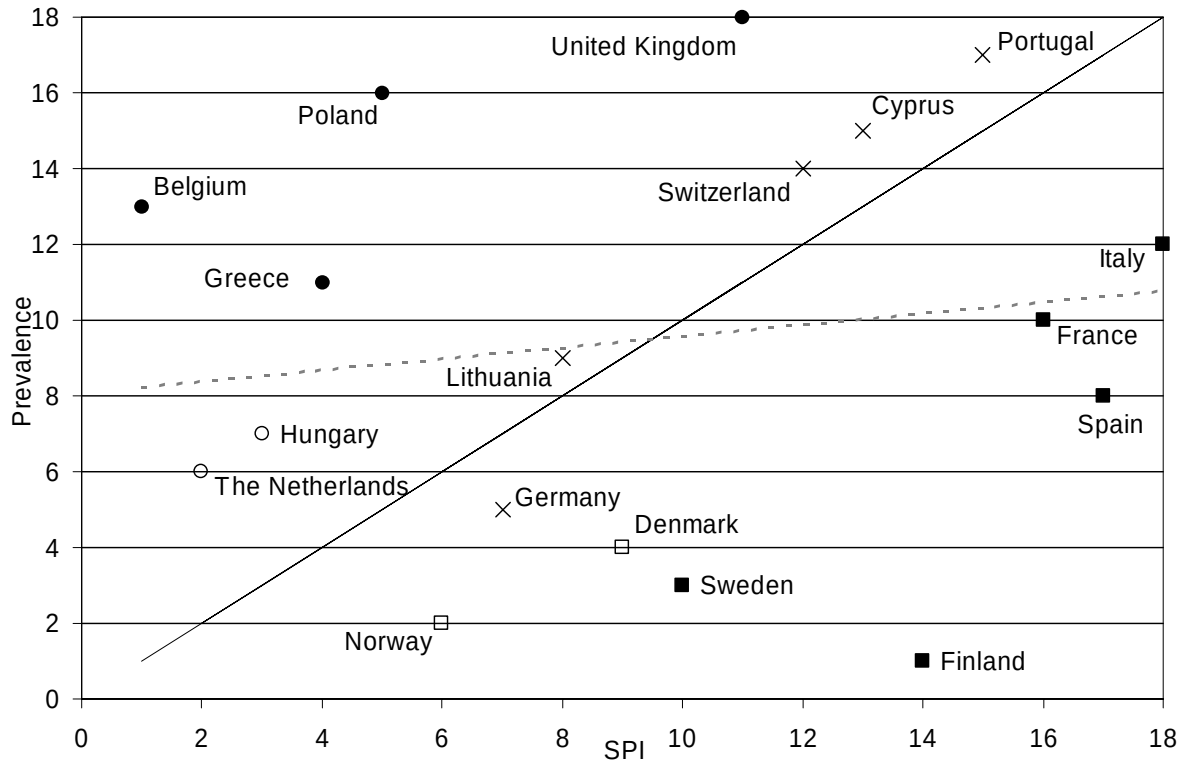


Figure 7. Comparison of the rank for SPI and drink-driving prevalence.

- The 45° line: The situation if there is 100 % correlation.
- The dotted grey line: The actually trend line.
- x: Same or almost the same rank for SPI and drink-driving prevalence.
- ●: The rank for drink-driving prevalence is considerably higher than the rank for SPI.
- ○: The rank for drink-driving prevalence is higher than the rank for SPI.
- ■: The rank for SPI is considerably higher than the rank for drink-driving prevalence.
- □: The rank for SPI is higher than the rank for drink-driving prevalence.

However these results can also be biased. (Gjerde et al. 2008):

- Each driver was asked to participate voluntarily in the study. Even though the study was anonymous, 12 % of the drivers who were stopped refused to participate. It is reasonable to assume that a higher percentage of those who refused had used alcohol or drugs prior to driving.
- The prevalence of drink drivers at control site decreases over time, probably because drivers passing the control site warn other drivers.
- For some drugs oral fluid give false negative results compared to blood. Small sample volume might also cause false negative results.

An earlier roadside study carried out in 1981-1982 in Norway (Glad 1985) found 0.27 % of the drivers to have breath alcohol levels reflecting blood concentrations above 0.5 g/l. Due to these possible biases it is not possible to conclude whether the prevalence of drunken driving has changed since 1981-1982 (Gjerde et al. 2008). These studies illustrate the difficulties in finding the “right” drink-driving prevalence.

In conclusion, we have found no correlation between the prevalence of drinking and driving and the alcohol SPI chosen in SafetyNet. This may be an indication that the data quality is poor for either the SPI or the data for drinking and driving prevalence, or both, but it may also be an indication that the actual relation between the prevalence of drinking and driving and alcohol-related road accidents is more complex than expected.

10 Alcohol consumption and SPI

Alcohol consumption is likely to be one of the factors influencing the extent of drinking and driving, which in turn, should be one of the main factors influencing the number of fatalities occurring in accidents where at least one driver is influenced by alcohol. Thus, the larger alcohol consumption the larger alcohol SPI, everything else being equal.

Skog (2001) has studied the association between per capita alcohol consumption and fatal accidents in 14 European countries and Ramstad (2008) has made a similar study for the United States. The studies are made as time series analysis where changes in alcohol consumption in a country or a region are compared with the rate of fatal accidents in the same area.

The hypothesis is that an increase in per capita consumption reflects an increase in the number of drinking occasions and thus also an increased number of circumstances involving risk of accidents. However, note that this is not an obvious outcome if the consumption increase is due to lower abstention rate or an increased number of low consumptions occasions (Ramstad 2008).

Table 11. European countries by safety performance indicator and rank for SafetyNet 2005 and by alcohol consumption rate (WHO 2004). For Norway, Sweden, the Czech Republic and Austria the suggested alcohol SPI in the in-depth study in chapter 6 is used.

Country	SPI (%)	SPI (Rank)	Alcohol consumption (l/person)	Alcohol (Rank)
Norway	11.0	7	5.8	1
Cyprus	22.5	18	6.7	2
Sweden	16.1	12	6.9	3
Poland	9.8	6	8.7	4
Italy	72.2	24	9.1	5
Greece	9.4	5	9.3	6
Latvia	21.7	17	9.3	7
The Netherlands	8.3	2	9.8	8
Estonia	23.5	20	9.9	9
Belgium	8.2	1	10	10
United Kingdom	17	13	10.4	11
Finland	23.4	19	10.4	12
Switzerland	19.3	16	11.5	13
Hungary (0.5)	8.4	3	11.9	14
Hungary (0.0)	8.7	4	11.9	15
Denmark	16	11	11.9	16
Lithuania	14.8	10	12.3	17
Spain	29.5	23	12.3	18
Slovakia	12.9	9	12.4	19
Portugal	27.8	21	12.5	20
Austria	18.0	14	12.6	21
Germany	12.1	8	12.9	22
France	28.8	22	13.5	23
Czech rep	18.8	15	16.2	24
Average	18.8	-	10.8	-
Correlation	-	-	-	0.17

The main conclusions of the time series studies of alcohol consumption and fatal traffic accidents is that accident mortality typically is significantly related to population drinking, but that there are cross-cultural differences in the magnitude of this association. In central Europe a 1 litre increase in per capita consumption gave a significant increase on 2.1 male

deaths per 100,000 inhabitants. Similar numbers for northern Europe, southern Europe, United State and Canada are 0.05, 0.8, 3.2 and 3.6, where the last three numbers are significant. The results depend of country, sex and age (Skog 2001, Ramstad 2008).

Table 11 summarizes the alcohol consumption in litre pure alcohol per person in 2004 in the 23 European countries that SPI '05 have been calculated for (WHO 2004). The countries are ranked by the consumption rate.

The average for the countries is 10.8 litres per person. Norway has the smallest consumption with 5.8 l/person. Beside Norway, Cyprus and Sweden have a low consumption, i.e. less than 7 litres per person.

The Czech Republic has the largest consumption with 16.2 l/person. This means that the consumption in Czech Republic is almost three times that of Norway. The second largest consumption per capita is found in France, 13.5 litres per person. This means that the consumption in the Czech Republic is almost 3 litres per person more than France, the second largest consumption. Germany, Austria, Portugal, Slovakia, Spain and Lithuania have a large consumption with over 12 litres per person.

It is beyond the scope of this project to assess the quality of the alcohol consumption data. These data may contain biases such as unregistered imports and exports, home making and distillery, and alcohol consumption by tourists and other foreigners.

Figure 8 compares the rank for SPI and the rank for alcohol consumption. It is necessary to compares the ranks, because it is not possible to compares the actually numbers.

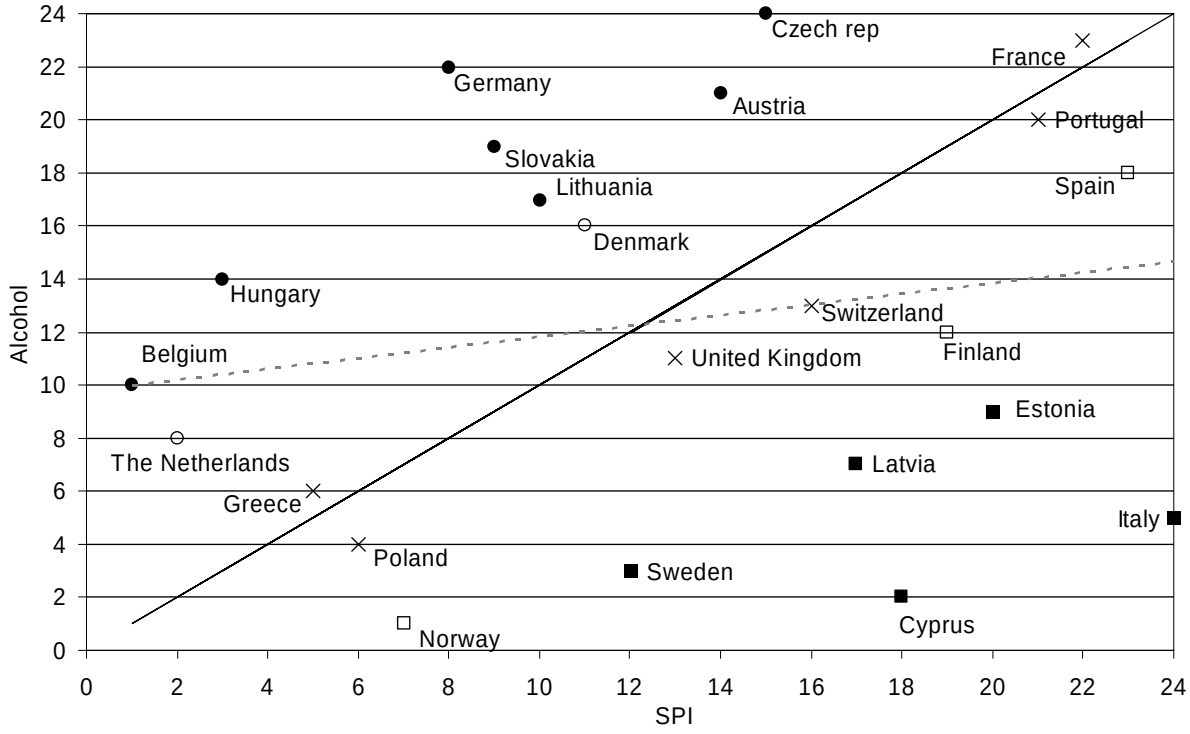


Figure 8. Comparison of the rank for SPI and alcohol consumption.

- The 45° line: The situation if there is 100 % correlation.
- The dotted grey line: The actually trend line.
- x: Same or almost the same rank for SPI and alcohol consumption.
- ●: The rank for alcohol consumption is considerably higher than the rank for SPI.
- ○: The rank for alcohol consumption is higher than the rank for SPI.
- ■: The rank for SPI is considerably higher than the rank for alcohol consumption.
- □: The rank for SPI is higher than the rank for alcohol consumption.

Figure 8 shows that there is no or a very small positive correlation between SPI and alcohol consumption. The correlation is calculated to be 0.17.

The largest negative difference calculated as the rank for SPI minus the rank for alcohol consumption appears for Germany, Hungary and Slovakia. The differences for these countries are between -14 and -10. This means that these countries have a high alcohol consumptions and a low or medium rank in the alcohol SPI.

The largest positive differences calculated as the rank for SPI minus the rank for alcohol consumption are found for Italy, Cyprus, Estonia and Latvia. Italy has the largest positive difference of 19 (24 minus 5). This calculation is based on the SafetyNet SPI, which is very different compared to the ETSC SPI. If the ETSC SPI is used, the difference is only -4.

The differences for the two rankings can be explained in different ways:

- Some or all of the numbers for the SPI and alcohol consumption are incorrect, for example the WHO figures may be methodically biased with regard to unregistered imports and exports, home production and alcohol consumed by tourists and other foreigners.
- There is no correlation as assumed. This can be explained by parameters as:
    - Where people drink (at home, at private parties, at public pubs etc.)
    - How people drink (one beer or glass of vine every day, a lot of alcohol at parties now and then etc.)
    - Who drinks (young men without education, middle-aged people with long education etc.)
    - How to drink and drive (young people who think they are invincible and drivers without seat belt and too fast, elderly people who compensate etc.)
    - Transport (public transport, numbers of cars etc.).

This is illustrated by some fictive and “extreme” examples:

- Cyprus has a small alcohol consumption and a big SPI. Possible explanation: People from Cyprus drink at parties (have to go home), they drink a lot (get drunk), they are young men without education (do not compensate, on the contrary they are speeding), and there is no public transport (have to drive their own car).
- Germany has a big alcohol consumption and a small alcohol SPI. Possible explanations: Drinking at home or close to home (no need to drive after drinking), walking or using public transport to get home after drinking, middle-aged people who drink and drive, compensating by driving slowly and carefully.

These are only some possible explanations to illustrate why it is possible that there is no or a very small correlation between the SPI and alcohol consumption. We do not know what the situation is like in the different countries. It has to be investigated to explain the missing correlation.

11 Motorisation and SPI

In the previous chapter it was suggested that SPI result can be affected by motorisation. The assumption is that a small number of cars mean that few people have motor vehicles for leisure time use. Consequently, many people will have to travel by public transport or by bicycles. Moreover, people in countries with fewer cars may in general travel shorter distances than people in countries with many cars. This kind of travel behaviour produces fewer road accidents, especially fewer alcohol-related accidents compared with countries with many cars.

Table 12 summarizes the motorisation in cars per 1000 persons in 2005 in the 23 European countries for which the SPI ’05 is calculated. The countries are ranked by motorisation.

Table 12. Motorisation for 23 European countries (EU 2008a). The countries are ranked after motorisation. The table also described alcohol safety performance indicator and rank for SafetyNet 2005. For Norway, Sweden, the Czech Republic and Austria the suggested alcohol SPI in the in-depth study in chapter 6 is used.

Country	SPI (%)	SPI (Rank)	Motorisation (Cars/1000 persons)	Motorisation (Rank)
Latvia	21.7	17	134	1
Slovakia	12.9	9	189	2
Lithuania	14.8	10	199	3
Hungary (0.5)	8.4	3	218	4
Hungary (0.0)	8.7	4	218	5
Estonia	23.5	20	269	6
Poland	9.8	6	321	7
Denmark	16	11	356	8
Czech rep	18.8	15	386	9
Greece	9.4	5	393	10
Portugal	27.8	21	396	11
Cyprus	22.5	18	427	12
Norway	11.0	7	439	13
The Netherlands	8.3	2	442	14
Belgium	8.2	1	458	15
Finland	23.4	19	459	16
Sweden	16.1	12	460	17
France	28.8	22	494	18
Spain	29.5	23	501	19
United Kingdom	17	13	503	20
Austria	18.0	14	507	21
Switzerland	19.3	16	513	22
Germany	12.1	8	559	23
Italy	72.2	24	596	24
Average	18.8	-	393	-
Correlation	-	-	-	**0.32**

The average for the countries is 393 cars per 1000 persons. Latvia has the lowest motorisation with 134 cars/1000 persons. Beside Latvia, Slovakia and Lithuania have a low motorisation with 200 cars/1000 persons. Generally, the countries in Central and Eastern Europe have low motorisation. They all have lower than average motorisation. The Czech Republic has the highest motorisation of these countries with 386 cars/1000 persons.

Italy has the highest motorisation, 596 cars per 1000 persons. This means that the motorisation in Italy is over four times greater than in Latvia. The second highest motorisation

is found in Germany, 559 cars/1000 persons. Switzerland, Austria, United Kingdom and Spain also have a motorisation of over 500 cars/1000 persons.

It is beyond the scope of this project to assess the quality of the data for motorisation, and it is assumed that the data are correct. However, some countries may have problems with registering of cars gone out of use, and may thus have an unrealistically high number of cars per 1000 people.

Figure 9 compares the rank for SPI and the rank for motorisation. Like alcohol consumption the ranks are used in the comparison.

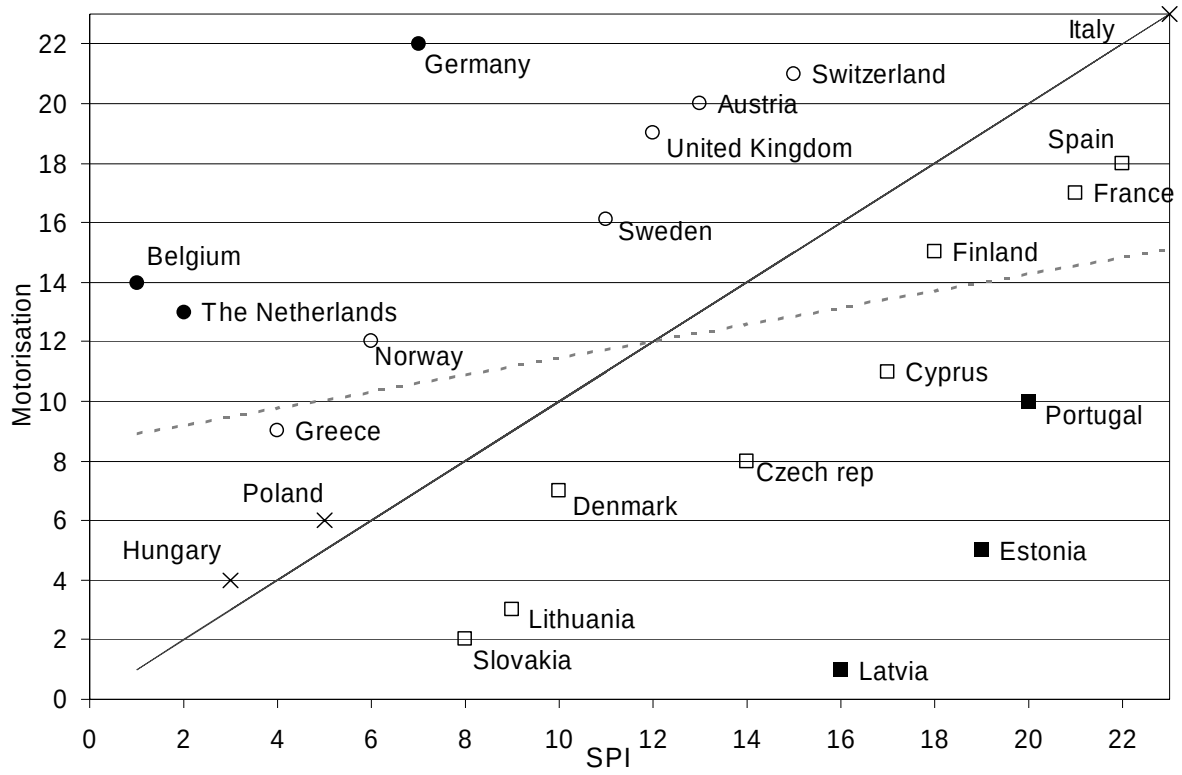


Figure 9. Comparison of the rank for SPI and motorisation.

- The 45° line: The situation if there is 100 % correlation.
- The dotted grey line: The actually trend line.
- x: Same or almost the same rank for SPI and motorisation.
- ●: The rank for motorisation is considerably higher than the rank for SPI.
- ○: The rank for motorisation is higher than the rank for SPI.
- ■: The rank for SPI is considerably higher than the rank for motorisation.
- □: The rank for SPI is higher than the rank for motorisation.

Figure 9 shows that there is a small positive correlation between SPI and motorisation. As shown in table 12 the correlation is calculated to be 0.32.

The largest negative difference calculated as the rank for SPI minus the rank for alcohol consumption is found for Germany, Belgium and the Netherlands, i.e. differences of -15, -13 and -11 respectively. As shown in the previous chapter Germany and Austria also have large negative differences regarding alcohol consumption. These means that they both drink a lot and have a lot of cars, yet have a small or medium SPI.

Latvia, Estonia and Portugal have the largest positive differences calculated as the rank for SPI minus the rank for motorisation. This means that they have relatively few cars and a relatively high SPI.

12 Self-reported behaviour and SPI

The SPI ranking is also compared with ranking from the SARTRE project. SARTRE is the acronym for "Social Attitudes to Road Traffic Risk in Europe". It is a research project, which aims at studying the opinions and reported behaviours of car drivers in 23 European countries. Among the countries included in SafetyNet, Lithuania, Latvia and Norway are not included in the SARTRE project data. In addition not all relevant data exist for Finland.

The SARTRE project is based on a representative questionnaire survey, including between 754 and 1,694 respondents in each country with and average on 1,045 respondents per country. This means that the total number of respondent is about 21,000 (Cauzard 2004).

One of the main topics of the study is drinking and driving. Among all the questions asked about this topic, we have chosen to compare the SafetyNet SPI with the answers to three of the questions. These are:

1. *Over the last week, how many days did you drive, when you may have been over the legal limit for drinking and driving?*
2. *How often do you think drinking and driving causes road accidents?*
3. *Frequency of alcohol checks over past 3 years.*

These three questions are chosen because it can be assumed that the answers will explain or correlate with the alcohol SPI. Table 13 summarizes the answers from each country on the three questions. The table also summarize the country ranking for each question.

The first result is the percentage of the drivers who have answered that they have been driving one day or more last week when they might have been over the legal limit for drinking and driving. These percentages vary between 0 and 21.8 % with an average on 4.1 %. Sweden, Poland, Denmark and United Kingdom have the best result with a percentage under 1 %. Cyprus has the worst result with a percentage of 21.8 %. Greece, Italy and Spain have also a bad result with a percentage between 7.2 % and 7.9 %.

The second result deals with the percentage of the drivers who think that drinking and driving always or very often causes road accidents. The percentage saying always or very often is used as the analysis parameter. This percentage varies between 35 % and 78 % with an average of 56 %. The Netherlands, the Czech Republic and Germany have the lowest percentages and Greece, Sweden, Italy, Estonia and United Kingdom have the highest percentages. Note that a high percentage is assumed to be good.

The last result is the percentage of the drivers having been controlled for alcohol while driving during the passed three years. The percentage controlled one or more times varies between 4 % and 64 %. Finland, Estonia and Slovakia have the most controls and Italy, United Kingdom and Denmark have the fewest controls.

Figure 10 compares the rank for SPI and the rank for the drink and drive question. There is about the same correlation as for motorisation. This means a positive and very small correlation on 0.36.

Belgium and Greece have the largest negative difference calculated as the rank for SPI minus the rank for alcohol consumption. This means that they have a low SPI rank but many people who drink and drive.

Estonia and Sweden have the largest positive difference. This means that few people drink and drive but even though the countries have a relative high SPI.

Figure 11 compares the rank for SPI and the rank for the second question about accident cause. There is no correlation between the two ranks. The correlation coefficient is calculated to be -0.26.

The Netherlands, Hungary and Germany have the largest negative difference calculated as the rank for SPI minus the rank for alcohol consumption. This means that they have a low SPI rank even though people do not think that drinking and driving is a traffic safety problem.

Italy, Estonia and Portugal have the largest positive difference. This means that many people mean that drink and drive is a traffic safety problem but the countries have a relative high alcohol SPI.

Figure 12 compares the rank for SPI and the rank for the third question about police controls. There is no correlation between the two ranks. The correlation coefficient is calculated to be -0.12. 10 of the countries have a big difference between the two ranks. Positive difference means indicate low SPI and few controls (Belgium, Hungary, Denmark, Poland, and United Kingdom) and negative difference indicate high SPI and many controls (Finland, Estonia, Spain, Portugal and France).

Table 13. Results form the SARTRE project for 20 European countries (Cauzard 2004) and alcohol SPI and rank for SafetyNet 2005. The countries are ranked by SPI. For Sweden, the Czech Republic and Austria the suggested alcohol SPI in the in-depth study in chapter 6 is used.

Country	SPI (Rank)	Drink and drive last week (%)	DD (Rank)	Drink and drive is accident cause (%)	Accident cause (Rank)	Over zero controls at 3 years (%)	Controls (Rank)	Total (Rank)
Belgium	1	5.8	16	62	7	23	13	12.0
The Netherlands	2	1.9	8	35	21	37	5	11.3
Hungary (0.5)	3	1.3	5	47	17	22	15	12.3
Hungary (0.0)	4	1.3	6	47	18	22	16	13.3
Greece	5	7.9	19	78	1	30	10	10.0
Poland	6	0.3	2	66	6	22	14	7.3
Germany	7	2.4	10	46	19	24	12	13.7
Slovakia	8	3.9	12	49	14	51	3	9.7
Denmark	9	0.3	3	49	12	13	19	11.3
Sweden	10	0	1	71	2	41	4	2.3
United Kingdom	11	0.6	4	70	3	9	20	9.0
Czech rep	12	2	9	45	20	32	9	12.7
Austria	13	2.6	11	49	13	15	18	14.0
Switzerland	14	4.2	13	54	9	20	17	13.0
Cyprus	15	21.8	20	54	10	30	11	13.7
Finland	16	-	-	51	11	64	1	6.0
Estonia	17	1.6	7	70	4	60	2	4.3
Portugal	18	4.2	14	55	8	33	6	9.3
France	19	5.1	15	49	15	33	7	12.3
Spain	20	7.2	17	48	16	32	8	13.7
Italy	21	7.3	18	70	5	4	21	14.7
Average	-	4.1	-	55.5	-	29.4	-	-
Correlation	-	-	**0.36**	**-**	**-0.26**	**-**	**-0.12**	**-0.21**

- Drink and drive last week*:* Number of asked people who have answered that they have been driving one day or more last week when they have been over the legal alcohol limits.
- Drink and drive is accident cause: Number of asked people who mean that drinking and driving always or very often cause road accidents.
- Over zero controls at 3 years: Number of asked people who have been controlled for alcohol while driving the past three years.

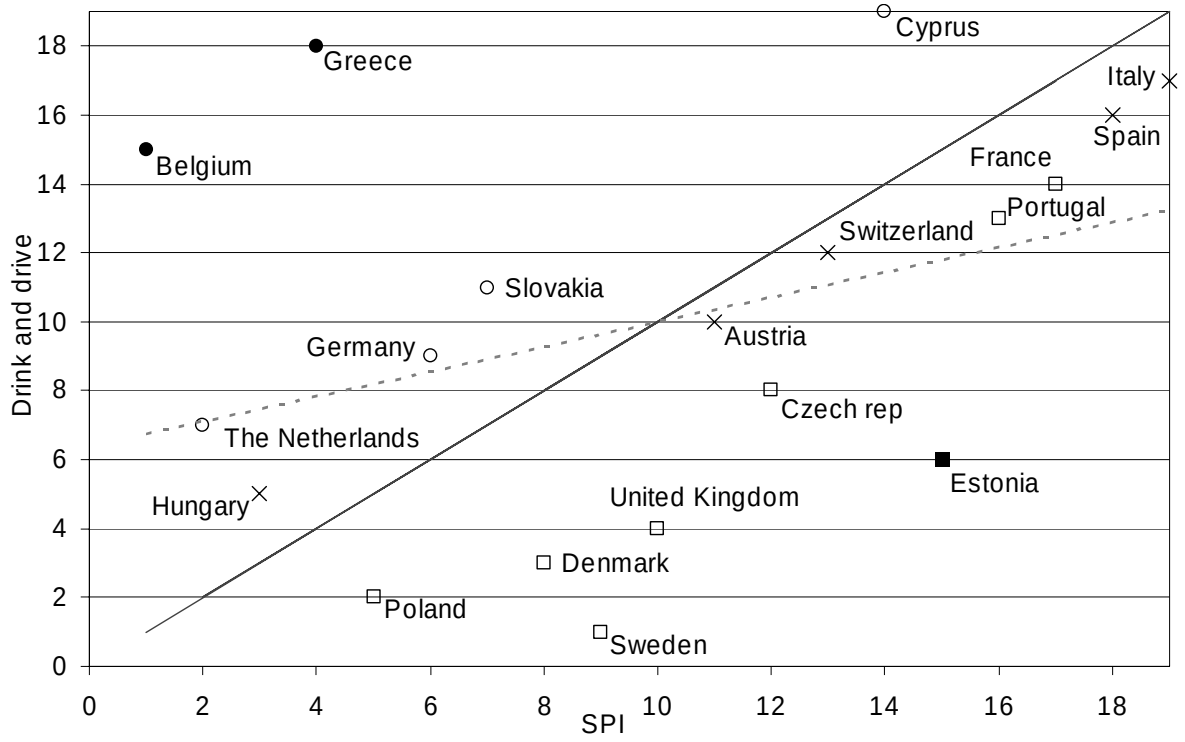


Figure 10. Comparison of the rank for SPI and people who drink and drive.

- The 45° line: The situation if there is 100 % correlation.
- The dotted grey line: The actually trend line.
- x: Same or almost the same rank for SPI and people who drink and drive.
- ●: The rank for people who drink and drive is considerably higher than the rank for SPI.
- ○: The rank for people who drink and drive is higher than the rank for SPI.
- ■: The rank for SPI is considerably higher than the rank for people who drink and drive.
- □: The rank for SPI is higher than the rank for people who drink and drive.

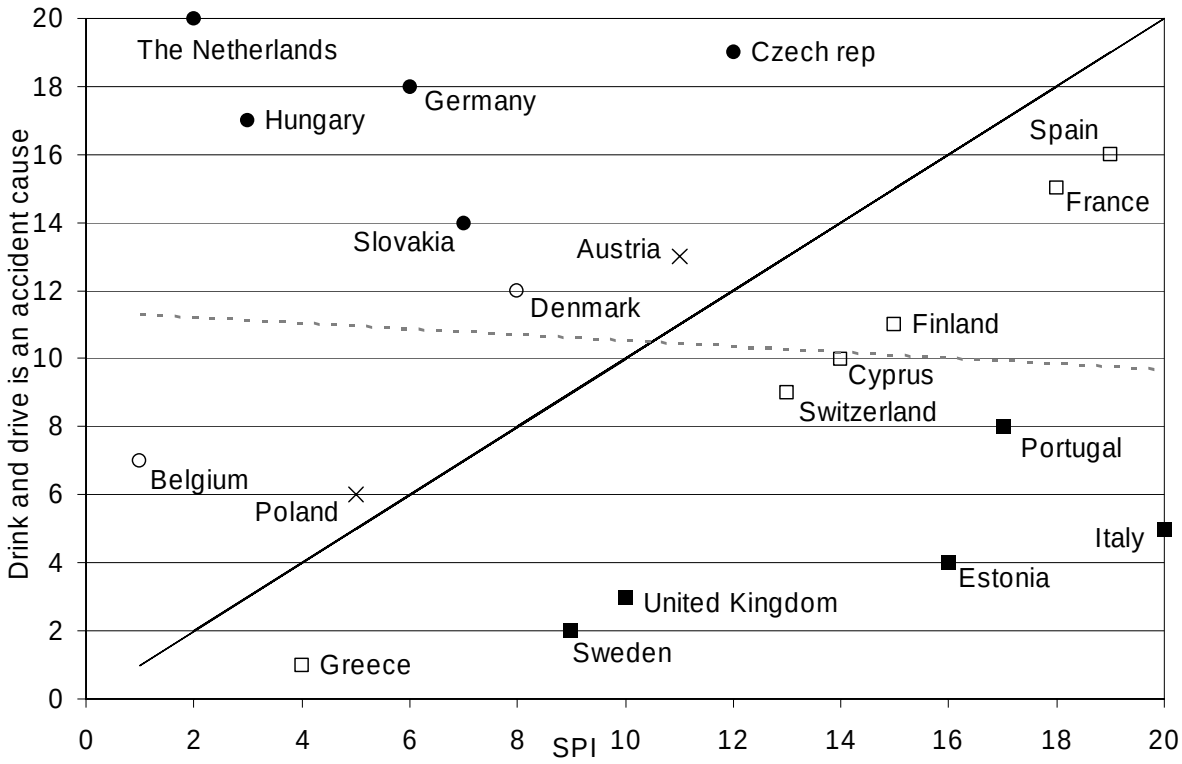


Figure 11. Comparison of the rank for SPI and drivers who think that drinking and driving very often is an accident cause.

- The 45° line: The situation if there is 100 % correlation.
- The dotted grey line: The actually trend line.
- x: Same or almost the same rank for SPI and people who mean that drinking and driving very often is an accident cause.
- ●: The rank for people who mean that drinking and driving very often is an accident cause is considerably higher than the rank for SPI.
- ○: The rank for people who mean that drinking and driving very often is an accident cause is higher than the rank for SPI.
- ■: The rank for SPI is considerably higher than the rank for people who mean that drinking and driving very often is an accident cause.
- □: The rank for SPI is higher than the rank for people who mean that drinking and driving very often is an accident cause.

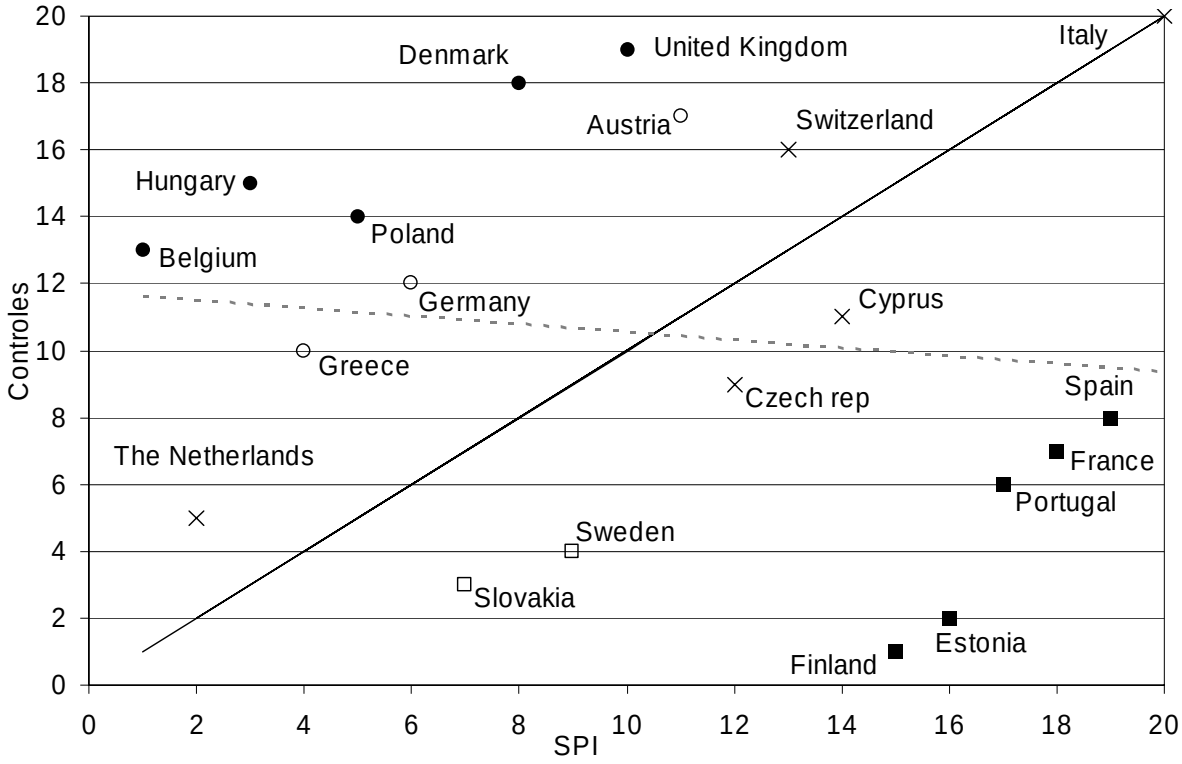


Figure 12. Comparison of the rank for SPI and people who have been controlled the last three years.

The 45° line: The situation if there is 100 % correlation.

- The dotted grey line: The actually trend line.
- x: Same or almost the same rank for SPI and people who have been controlled.
- ●: The rank for people who have been controlled is considerably higher than the rank for SPI.
- ○: The rank for people who have been controlled is higher than the rank for SPI.
- ■: The rank for SPI is considerably higher than the rank for people who have been controlled.
- □: The rank for SPI is higher than the rank for people who have been controlled.

13 Possible influencing factors and SPI

Table 14 summarizes the five described rankings for alcohol SPI; SafetyNet ’05, SafetyNet ’07, ETSC and the two WHO rankings. The table also describes an average ranking calculated as the sum of the ranks divided with the number of rankings and the difference between the largest and the smallest rank.

Table 14. Ranks for the five safety performance indicator (SPI) for 27 European countries. The countries are ranked after the total average ranking. For Norway, Sweden, the Czech Republic and Austria the suggested SafetyNet alcohol SPI in the in-depth study in chapter 6 is used.

Country	SafetyNet 05	SafetyNet 07	ETSC	WHO 1	WHO 2	Total	Difference
Bulgaria	-	1	-	-	-	1,0	-
Romania	-	2	-	-	-	2,0	-
Netherlands	1	-	11	4	5	5,3	10
Greece	3	5	7	5	8	5,6	5
Poland	4	4	5	6	11	6,0	7
Italy	23	-	1	2	2	7,0	22
Germany	6	7	2	14	7	7,2	12
Slovakia	7	3	9	10	12	8,2	9
UK	11	8	12	7	3	8,2	9
Hungary	2	-	6	12	13	8,3	11
Cyprus	17	13	15	1	1	9,4	16
Czech rep	13	12	3	11	9	9,6	10
Sweden	10	-	23	3	4	10,0	20
Austria	12	11	4	17	6	10,0	13
Lithuania	8	6	8	13	16	10,2	10
Switzerland	15	-	13	16	10	10,8	6
Spain	14	10	10	-	-	11,3	4
Norway	5	-	18	-	-	11,5	13
Denmark	9	-	16	9	17	12,8	8
Belgium	20	9	-	-	-	14,5	11
Latvia	16	14	14	15	14	14,6	2
Finland	18	15	17	8	15	14,6	10
Estonia	19	-	20	18	18	18,8	2
Ireland	-	-	19	-	-	19,0	-
France	21	16	21	-	-	19,3	5
Slovenia	-	17	22	-	-	19,5	5
Portugal	22	-	-	-	-	22,0	-

- **Light grey:** Good performance defined as about one third of the countries with the best performance. The actually number varies from ranking to ranking depending of the total number of countries ranked in the specific ranking.
- **Medium grey:** Medium performance.
- **Dark grey:** Bad performance defined as among the one third of the countries with the worst performance.
- **Total:** The total or average rank calculated as the sum of the ranks divided with the number of rankings.
- **Difference:** The difference between the largest and the smallest rank.
- **WHO 1:** Rank by accidents involving alcohol per 100,000 persons.
- **WHO 2:** Rank by accidents involving alcohol divided per accidents with injury.

Bulgaria, Romania, The Netherlands and Greece have the best average ranking for the five rankings. Note, however that alcohol SPIs for Bulgaria and Romania only have been calculated in one of the five possible rankings. Portugal, Slovenia, France and Ireland have the largest average ranking.

The difference between the largest and the smallest rank vary between 2 for Latvia and Estonia and 22 for Italy. The average difference for all the countries is about 10. These great differences between the rankings indicate that some of the rankings cannot be trusted for as minimum some of the countries. The rankings for the countries with the smallest difference are probably the most reliable.

Table 15 summarizes rankings for six possible influencing factors; drink-driving prevalence, alcohol consumption, motorisation, self-reported drinking and driving last week, accident cause and controls. The result from the analysis of the legal blood alcohol concentration is excluded, because the countries can not be ranked by BAC in a meaningful way as several of the countries have the same BAC limits.

Latvia, Sweden, Norway and Estonia have the best average ranking for the six possible influencing factors, while Austria, Germany, Switzerland and France have the largest average. However, the rankings vary a lot for each country. For example the average difference between the largest and the smallest rank is about 13 for all the countries.

Table 15. Ranks six possible influencing factors for 23 European countries. The factors are not known for Bulgaria, Romania, Ireland and Slovenia. The countries are ranked after the total average ranking.

Country	Preva-lence	Consump-tion	Motor-isation	Drink and drive last week	Accident cause	Controls	Total	Difference
Latvia	-	7	1	-	-	-	4,0	6
Sweden	3	3	16	1	2	4	4,8	15
Norway	2	1	12	-	-	-	5,0	11
Estonia	-	9	5	6	4	2	5,2	7
Lithuania	9	-	3	-	-	-	6,0	6
Poland	16	4	6	2	6	14	8,0	14
Finland	1	12	15	-	11	1	8,0	14
Greece	11	6	9	18	1	10	9,2	17
Slovakia	-	17	2	11	14	3	9,4	15
Netherlands	6	8	13	7	20	5	9,8	15
Denmark	4	15	7	3	12	18	9,8	15
Hungary	7	14	4	5	17	15	10,3	13
Cyprus	15	2	11	19	10	11	11,3	17
Belgium	13	10	14	15	7	13	12,0	8
Portugal	17	18	10	13	8	6	12,0	12
UK	18	11	19	4	3	19	12,3	16
Czech rep	-	22	8	8	19	9	13,2	14
Spain	8	16	18	16	16	8	13,7	10
Italy	12	5	23	17	5	20	13,7	18
France	10	21	17	14	15	7	14,0	14
Switzerland	14	13	21	12	9	16	14,2	12
Germany	5	20	22	9	18	12	14,3	17
Austria	-	19	20	10	13	17	15,8	10

- **Light grey:** Good performance defined as about one third of the countries with the best performance. The actually number varies from ranking to ranking depending of the total number of countries ranked in the specific ranking.
- **Medium grey:** Medium performance.
- **Dark grey:** Bad performance defined as among the one third of the countries with the worst performance.
- **Total:** The total or average rank calculated as the sum of the ranks divided with the number of indicators.
- **Difference:** The difference between the largest and the smallest rank.

Table 16 summarizes the results described in table 14 and table 15. Here it is tried to put the results from 27 European countries in 11 different categories to get a better overview of some results that “point in every directions”. The countries are divided into three overall

categories with low, medium and high SPI. These three categories are subdivided into nine categories based on the other analyzed indicators except accident cause, and supplemented with two categories for countries with no information about the other analyzed indicators.

The need to make compromises in the categorisation is emphasized. Without compromises it would not have been possible to make these categories because all the indicators or influencing factors do not have the same level for any country.

Table 16. The 27 European countries divided into 11 categories with low, medium and high SPI and low, medium and high rank for the other indicators.

Category	Country	Total	Other indicators
1.1	**Poland**	Low	Low
1.2	**Netherlands**	Low	Medium
1.2	**Greece**	Low	Medium
1.2	**Slovakia**	Low	Medium
1.3	**Italy**	Low	High
1.3	**Germany**	Low	High
1.3	**UK**	Low	High
1.4	**Bulgaria**	Low	?
1.4	**Romania**	Low	?
2.1	**Sweden**	Medium	Low
2.1	**Norway**	Medium	Low
2.1	**Lithuania**	Medium	Low
2.2	**Hungary**	Medium	Medium
2.2	**Cyprus**	Medium	Medium
2.3	**Czech rep**	Medium	High
2.3	**Austria**	Medium	High
2.3	**Switzerland**	Medium	High
2.3	**Spain**	Medium	High
3.1	**Latvia**	High	Low
3.1	**Finland**	High	Low
3.1	**Estonia**	High	Low
3.2	**Denmark**	High	Medium
3.2	**Belgium**	High	Medium
3.2	**Portugal**	High	Medium
3.3	**France**	High	High
3.4	**Ireland**	High	?
3.4	**Slovenia**	High	?

The different categories are described in the following. Low rank is good and high rank is bad.

13.1.1 Category 1.1

Category 1.1 consists only of Poland. This country both has a low SPI and low other indicators. This category may be regarded as a uniform category because countries in this category have the same grade for both SPI and possible influencing factors.

13.1.2 Category 1.2

The Netherlands, Greece and Slovakia are included in category 1.2. These countries have low SPI and a mix of other indicators which are low, medium and high, but primarily high.

13.1.3 Category 1.3

Italy, Germany and United Kingdom are included in category 1.3. Countries in this category also have low SPI results, but the other indicators are generally high. This means that these countries have succeeded to have a low SPI even though the alcohol consumption and motorisation are high; there is a relatively lot of drink-driving and few police controls.

13.1.4 Category 1.4

Category 1.4 consists of Bulgaria and Romania. These countries have low SPI results. For these two countries we have no information about the other indicators. The countries are presently not part of the SARTRE project, so it is not possible to get information from this project about opinions and reported behaviours of car drivers. Moreover, no information about drink-driving prevalence, alcohol consumption and motorisation has been found, though it may be possible to find information about these parameters by further investigation

13.1.5 Category 2

Category 2 consists of all the countries in the middle regarding SPI. All of these countries have low, medium and high other indicators.

13.1.6 Category 3.1

Category 3.1 consists of Latvia, Finland and Estonia. These countries have a high SPI even though the other indicators in general are low. This means that they have a high share of alcohol fatalities though the alcohol consumption is low and motorisation is medium; there is a relatively few people who drink and drive and there are many police controls.

13.1.7 Category 3.2

Countries in category 3.2 have high SPI and in general medium level for the other factors. Denmark, Portugal and Belgium are included in this category.

13.1.8 Category 3.3

In the other end of the scale are countries with a high SPI. France is the only country in category 3.3 with both has a high SPI and a high OI.

13.1.9 Category 3.4

Category 3.4 consists of Ireland and Slovenia. Slovenia has a high SPI, and Ireland has not provided data for the SPI. For these two countries we have no information about the other indicators. By further investigation it may be possible to find information about some of the parameters.

The initial hypothesis for this study was that the SPI should be correlated with the other factors, i.e. the ranking for both SPI and the other indicators should be the same or almost the same. However that is not the case for many countries, especially the countries in category 1.3 and 3.1. Thus, these categories are especially interesting. However, if the results of data quality studies summarised in chapter 6 had been used in stead of the officially reported SPI results, three of the six countries included in these categories would have changed places from either low (Austria) or high (Sweden and Norway) to medium. Thus, there may be reasons to study the data quality of the other countries in these two categories.

Two overall explanations are possible:

1. **Incorrect data:** Some of the data for the SPIs (SafetyNet and ETSC), drink-driving prevalence (TISPOL), alcohol consumption (WHO) and opinions and reported behaviours of car drivers (SARTRE) may be incorrect, biased or not representative. Some examples or possibilities:

- Some of the SafetyNet SPI results are incorrect. Special attention should be paid to the countries with very low or high SPI. Thus, an in depth study of Czech Republic and Austria that have a low SPI and France, Sweden and Norway that have a high SPI is described in chapter 6. The high number for Spain can be explained by the use method to handle untested drivers. Finally an attempt was made to conduct an in depth study for Italy, but it was not possible to find out what the right number for Italy is.
- The WHO statistics are methodically biased with regard to import, export, home distillery and alcohol consumed by tourist and other foreigners.
- Respondents in the SARTRE project do not comprise a representative group.

2. **No correlation:** No correlation between SPI and the other indicators as it was assumed.

Different parameters can explain the fact of no correlation.

Explanations for category 1.3 could for example be:

- Drinking at home: no need to drive
- Drinking a little many times, so the BAC limit is not exceeded
- Driving long time after drinking
- Good public transport: no need to drive
- Walk and cycle instead of drive
- Compensating when drink-driving (middle aged).

Explanations for category 3.1 could for example be:

- Drinking at parties, bars and pubs: need to go home
- Drinking so much that the BAC limit is exceeded
- Driving soon after having drank
- No public transport: need to drive their own car
- Not compensating when drink-driving, on the contrary the drivers are speeding etc. (young maybe petty criminal men)
- High general safety level: the percentage of alcohol fatalities get high
- High general safety level: “normal” people do not drink and drive, it is only young maybe petty criminal men, who have an extremely high accident risk (and Sartre questionnaire surveys addresses primarily the “normal” people).

These are of course only some ideas to illustrate why it is possible that there is no correlation between SPI and alcohol consumption. We do not know what the situation is in the different countries. It has to be investigated more to explain the missing correlation.

In chapter 7 nine factors were listed that may be expected to explain and thus correlate with the SPI results. The relations between five of these factors and the SPI have been studied in chapters 8 through 12, but surprisingly no correlation was found between these factors and the SPI. Only further research can decide whether this lack of correlation is due to poor quality of the SPI data or substantial reasons, but this lack of correlation may be an indication that there may be problems with the quality of the SPI data collected in SafetyNet.

14 Conclusion

The results of the data quality study described in chapter 6 shows that there is reason to believe that the data used as basis for the calculation of the alcohol SPI may be incomplete in many countries. In chapters 8 through 12 the factors expected to correlate with the alcohol SPI and the actual correlations with this SPI are studied. Except for legal BAC limit, we find no positive correlation between these factors and the SPI. This lack of correlation may be an indication that the alcohol SPI based on the data provided from the countries, is not valid, but there may also be other and more substantial reasons for this finding.

The results of the data quality study and the correlation study indicate clearly that there is a need to improve to quality of the data on the basis of which the alcohol SPI is calculated. Most importantly, the total number of drivers involved in fatal accidents, the number tested for alcohol and the number not tested, should be reported, in addition to the number of alcohol positive and negative drivers among those tested. When these figures are made available, adjusted SPI results can be estimated, as shown in chapter 2. Until these improvements are made for most countries, it is advisable not to compare the alcohol SPI results across countries.

15 References

Assum, T., Mathijssen, M.P.M, Houwing, S., Buttress, S., Sexton, B., Tunbridge, R.J., Oliver, J. (2005) *The Prevalence of Drug Driving and Relative Risk Estimations. A Study Conducted in the Netherlands, Norway and the United Kingdom*. IMMORTAL project, Deliverable D-R4.2. European Commission, Transport RTD Programme of the 5 Framework Programme.

Assum, T., Hollo, P., Houwing, S. and Mathijssen, R. (2007). *Alcohol and drugs* in Hakkert, A.S., Gitelman, V. and Vis, M.A. (Eds) (2007). *Road Safety Performance Indicators – Theory*. www.erso.eu.

Assum, T., Hollo, P., Mathijssen, R. and Houwing, S. (2007a) *Detailed manual for SPIs for alcohol and drugs* in Hakkert, A.S. and Gitelman, V. (2007). *Road Safety Performance Indicators – Manual*. www.erso.eu.

Assum, T. (2001). *Lavere promillegrense – mindre promillekjøring?*, report 530, Institute of Transport economics, Oslo.

Assum, T. (2007). *Safety Performance Indicators – A Tool For Better Road Safety Management: The Case Of Alcohol And Drugs*, Road Safety on four continents, November 14-16, Bangkok, Thailand.

Bernhoft, I. M., Hels, T., Rendsvig, T. L. and Orozova-Bekkevold, I. (2007). *Karakteristik af spiritusbilisten*, Report 1, Danmarks TransportForskning, http://www.dtf.dk/upload/institutter/dtu%20transport/pdf_dtf/rapporter/rapporter%202007/spiritusbilisten.pdf.

Bernhoft, I. M. and Hansen, A. S. (2008). *Trends in drink-driving accidents and convictions in Denmark*, Traffic Injury prevention, in press.

Braun, E. and Schausberger, B. (2007). *Country report Austria*. SUPREME project preliminary report. KfV, Wien, 2007.

Cauzard, Jean-Pierre (ed) (2004). *European Drivers and Road Risk. Part 1: Report on principle analyses*, INRETS, Paris, http://sartre.inrets.fr/documents-pdf/repS3V1E.pdf.

Dar, F. (2006). *Drinking and Driving*, Transport Statistics: Road safety, department for transport.

Eksler, V., Tecl, J. and Assum, T. (2008). *In-depth study on the underreporting of alcohol-related road fatalities in the Czech Republic* annex 1 in Annex 1 in The Alcohol Safety Performance Indicator – Data quality in selected countries and comparison with other alcohol indicators. Deliverable D3.10a of the EU FP6 project SafetyNet.

Elliott, S., Woolacott, H. and Braithwaite (2008). *The prevalence of drugs and alcohol found in road traffic fatalities: A comparative study of victims*, Science and justice, in press, available at www.sciencedirect.com.

Elvik, R. and Vaa, T. (2004). *The Handbook of Road Safety Measures*. Elsevier.

ERSO (2008). *European Road Safety Observatory* (ERSO), http://www.erso.eu/.

ETSC (2007). *Raising Compliance with Road Safety Law – 1st Road Safety PIN Report*, European Transport Safety Council, Brussels.

ETSC (2007a). *Reducing deaths from drink-driving. Road Safety Performance Index*, www.etsc.be/documents/copy_of_copy_of_PIN%20Flash%205.pdf.

EU (2008). *Road safety evolution in EU*, European Commission / Directorate General Energy and Transport, online available on http://ec.europa.eu/transport/roadsafety_library/care/doc/historical_evol_pop.pdf (seen September 2008).

EU (2008a). Road : *Motorization 2005*, http://ec.europa.eu/dgs/energy_transport/figures/pocketbook/doc/2007/dn_3_6_means_of_transport_2007.xls.

Fell, J. C. and Voas, R. B. (2006). *The effectiveness of reducing illegal blood alcohol concentration (BAC) limitis for driving: Evidence for lowering the limit to .05 BAC*, Journal of safety Research, 37, 233-243.

Gjerde, H., Normann, P., Pettersen, B., Assum, T., Aldrin, M., Johansen, U., Kristoffersen, L., Øiestd, E., Christophersen, A. and Mørland, J. (2008). *Prevalence of alcohol and drugs among Norwegian motor vehicle drivers: A roadside survey*. Accident Analysis and Prevention, 40, 1765-172.

Glad, A. (1985). *Research on Drinking and Driving in Norway*. Institute of Transport Economics, Oslo.

GRSP (2007): *Drinking and Driving: a Road Safety Manual for Decision-makers and Practitioners – Good Practice*, Global Road Safety Partnership (GRSP), Geneva, www.GRSProadsafety.org.

Hakkert, A.S., Gitelman, V. and Vis, M.A. (Eds.) (2007) *Road Safety Performance Indicators – Theory*. Deliverable D3.6 of the EU FP6 project SafetyNet www.erso.eu.

Hakkert, A.S. and Gitelman, V. (Eds.) (2007) *Road Safety Performance Indicators – Manual*. Deliverable D13.8 of the EU FP6 project SafetyNet, www.erso.eu.

Humlegård, O.R. (2008) *Rusførerne, hvem er de og hva kjennetegner dem? (Drivers under the influence, who are they?)* Presentation at the conference “Trafikk og rus” *(Road traffic and psychoactive substances), Oslo, April 22-23, 2008.*

Humlegård, O.R. (2008a) *E-mail of June 6, 2008 to T. Assum*. Oslo

Lindholm, Magnus (2004) *Alkoholpåverkade personbilförare inblandade i dödsolyckor, 2002. (Alcohol-impaired drivers involved in fatal accidents, 2002*). Vägverket, publication 2004:161, Borlänge (Sweden).

Lindholm, Magnus (2008) *Alkoholrelaterad olycksstatistik – en beskrivning av vedertagen data. (Alcohol-related accident statistics – a description of accepted data), Vägverket, Borlänge (Sweden)*.

Machata, K. (2008). *E-mail of February 7, 2008 to T. Assum*, Oslo.

Machata, K. and Wannenmacher, E. (1998). *Wie hoch liegt die Alkoholquote wirklich*, in Bartl, Gl. and Kaba, A. Alkohol im Strassenverkehr. Kuratorium für Verkehrssicherheit (KfV), Wien.

Mann, R. E., Macdonald, S., Stoduto, G., Bondy, S., Jonah, B. and Shaikh, A. (2001). *The effects of introducting or lowering legal per se blood alcohol limits for driving: an international review*, Accident Analysis and Prevention, 33, 569-583.

OECD (2008). *Selected Risk Values*, IRTAD database (International Traffic Safety Data and Analysis Group), online available on http://cemt.org/irtad/IRTADPublic/we2.html (seen September 2008).

PSR (2008). *Alcool et accidents de la route*, http://www.lepermis.com/Pages/Secu_Rou/Bilan2005/AA_ACALC.pdf.

PSR (2008a). *Alcool et accidents de la route*, http://www.lepermis.com/Pages/Secu_Rou/Bilan2006/AA_ACALC.pdf.

Ramstad, M. (2008). *Alcohol and fatal accidents in the United States – A time series analysis for 1950-2002*, Accident Analysis and Prevention, 40, 1273-1281.

SafetyNet (2006). *The New European Road Safety Observatory – SafetyNet*, http://www.erso.eu/safetynet/fixed/SafetyNet%20paper%20for%20PRI%20conference%202006.pdf.

SafetyNet (2007). (Interne) *Updated Questionnaire about alcohol from 18 European countries*, SafetyNet.

SIKA (200) *Vägtrafikskador 2007. (Road casualties 2007)* http://www.sika-institute.se/Templates/FileInfo.aspx?filepath=/Doclib/2008/Statistik/Strada%20officiell%202007%20II.xls (Sweden).

Skog, O. J. (2001). *Alcohol consumption and mortality rates from traffic accidents, accidental falls, and other accidents in 14 European countries*, Addiction 96, S49-S58.

Span D. (1995). *Research and knowledge, attitudes and reported behavior on drink-driving in New South Wales*. International Conference on Alcohol, Drugs and Traffic Safety, Adelaide, SA.

Statens vegvesen Region Øst (2007).*Årsrapport 2006 UAG – Region øst*. *(Annual Report Accident Analysis Group Region East).* Lillehammer, Norway.

Steensberg, J. (2007). *Trafik og alkohol: dansk forebyggelsespolitik gennem det 20. århundrede set i nordisk perspektiv*, Nyt Nordisk Forlag Arnold Busck, København.

SUPREME (2007). *Thematic Report Enforcement*, http://ec.europa.eu/transport/roadsafety_library/publications/supreme_f6_thematic_report_enforcement.pdf.

TISPOL (2008). *Police catch 13,000 world cup drink drivers*. European Traffic Police Network (TISPOL), https://www.tispol.org/node/614.

TISPOL (2008a). *Vigilance call as campaign catches 2000 drink drivers a day*. European Traffic Police Network (TISPOL), http://tispol.org/node/3679.

Vegdirektoratet (2006) *Dybdeanalyser av dødsulykker i vegtrafikken. Nasjonal årsrapport for ulykkesanalysegruppenes arbeid i 2005. (Depth Analyses of Fatal Road Accidentsy - National Annual Report on the Accident Analysis Groups in 2005).* Oslo, Norway.

Vegdirektoratet (2008). *Dybdeanalyser av dødsulykker i vegtrafikken. Najsonal årsrapport for ulykkesgruppenes arbeid i 2006. (Depth Analyses of Fatal Road Accidentsy - National Annual Report on the Accident Analysis Groups in 2006).* Draft. Oslo, Norway.

Vis, M.A (Ed.) (2005) *State of the art Report on Road Safety Performance Indicators*. Deliverable D3.1 of the EU FP6 project SafetyNet. www.erso.eu.

Vis, M.A. and Van Gent, A.L. (Eds.) (2007). *Road Safety Performance Indicators: Country Comparisons*. Deliverable D3.7a of the EU FP6 project SafetyNet. www.erso.eu.

Vis, M.A. and Van Gent, A.L. (Eds.) (2007a). *Road Safety Performance Indicators: Country profiles*. Deliverable D3.7b of the EU FP6 project SafetyNet. www.erso.eu.

Vis, M.A. and Van Gent A.L.(Eds. 2008) *Road Safety Performance Indicators: Country profiles.* Draft. Revised version of the deliverable D3.7b of the EU FP6 project SafetyNet.

VTI (2008). *VTI:s trafiksäkerhetsbarometer December 2007 (VTI Road Safety Barometer December 2007),* Swedish National Road and Transport Research Institute, Press release, January 16, 2008.

VTI (2008a). VTI:s trafiksäkerhetsbarometer, www.vti.se/templates/Page____9598.aspx (seen September 2008).

Vägverket (2007). Polisen ökar kontrollen av nykterheten i trafiken - två personer i veckan dör i alkoholrelaterade olyckor, Press release. December 6, 2007, http://www.vv.se/templates/Pressrelease____23149.aspx.

Web in France (2008). *Drunk drivers in France lose their cars in new French road safety laws*, Web in France Magazine, http://www.webinfrance.com/drunk-drivers-in-france-lose-their-cars-in-new-french-road-safety-laws-214.html.

WHO (2004). *Global Status Report on Alcohol 2004*, World Health Organization, Department of Mental Health and Substance Abuse, Geneva, http://www.who.int/substance_abuse/publications/global_status_report_2004_overview.pdf.

WHO (2008). *Alcohol and drugs*, World Health Organization, Regional Office for Europe, http://www.euro.who.int/alcoholdrugs (seen September 2008).

WHO (2008a). *European health for all database (HFA-DB)*, World Health Organization, Regional Office for Europe, Copenhagen, Updated: July 2008, http://data.euro.who.int/hfadb/ (seen September 2008).

Annex 1. In-depth study on the underreporting of alcohol-related road fatalities in the Czech Republic

Vojtech Eksler (CDV), Jan Tecl (CDV), Terje Assum (TØI)

Content

Executive Summary

The objective of this study was to determine the extent of the underreporting of alcohol-related road fatalities in the Czech Republic. The study area covered the district of Kromeriz (one of 76 districts in the Czech Republic), and the period 2003-2007, which meant a detailed look at 54 fatal crashes with 61 road fatalities. The national police data were first compared with the local police database and crash protocols. The hospital records were then studied in order to uncover non-reported alcohol cases by Police. According to the central police database, only 10% of road fatalities occurred in crashes with intoxicated culprit (6 out of 61) in the district of Kromeriz. In some other crashes involving at least one fatality, either pedestrian, or pedal cyclist was found intoxicated (considered as not guilty), so at least 20% of fatalities occurred in crashes in which at least one active participant was found intoxicated by alcohol (12 out of 61). But if we consider only fatalities which occurred in crashes in which the intoxication by active participants was either proved or refused, it would be 32% (12 out of 38) in the same district.

The non-reporting of alcohol intoxication is mostly due to administrative and legal shortcomings, notably the BAC determined through post-mortem of the culprit is not claimed by the Police (not necessary for juridical purposes) and even when carried out, its results are not communicated back to the Police, so they must be sought for in hospital (or in specialised judicial medicine institute), where they are not always available. In some other cases, the tests are not performed due to unconsciousness of a person involved, or just because of lack of time due to urgent medical treatment.

The results suggest that the extent of alcohol involvement in fatal road crashes in the Czech Republic could be rather higher than the officially reported figures, but there is quite difficult to say more accurate number for countrywide level in this stage of research. A relatively higher estimated proportion of fatalities resulting from alcohol related crashes does not undermine the choice of the zero BAC limit is inefficient, rather it points to some insufficiencies in police enforcement.

Background

Up to one fourth of road fatalities in Europe are alcohol related, whereas about only 1% of all kilometres are driven by drivers with 0.5 g/l alcohol in their blood or more. Compared to a sober driver the crash rate of a driver with a BAC of 0.8 g/l is 2.7 times that of sober drivers. When a driver has a BAC of 1.5 g/l, his crash rate is 22 times that of a sober driver. Not only the crash rate grows rapidly with increasing BAC, but the crashes also become more severe.

SafetyNet project has developed an indirect road safety performance indicator to measure the extent of alcohol problem in road traffic. The percentage of road fatalities resulting from crashes involving at least one driver impaired by alcohol was eventually picked up as the most convenient and appropriate indicator for international comparison.

Table 1. Percentage of fatalities resulting from crashes involving at least one driver impaired by alcohol, and legal limit of blood alcohol concentration in four countries (in 2006)

Country	Percentage of fatalities resulting from crashes involving at least one driver impaired by alcohol	Legal limit - blood alcohol concentration in g/l
Austria	5.9	0.5
Czech Republic	4.5	0.0
Norway	22.2*	0.2
Sweden	25.0	0.2

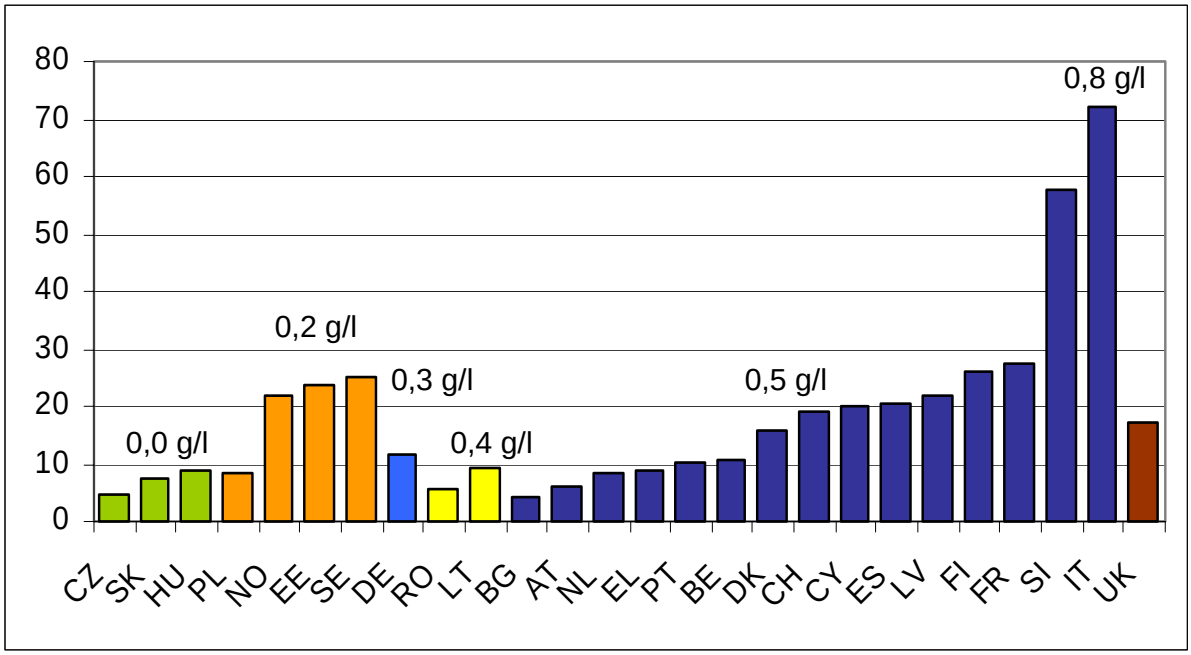
Source: Vis and van Gent, Eds. (2007) * Killed drivers impaired by alcohol in per cent of all killed drivers

Results from the SafetyNet WP3 Safety Performance Indicators (SPI) Task 1 Alcohol and drugs, have shown that the Czech Republic and Austria have the lowest alcohol SPI, i.e. the lowest percentage of drivers involved in fatal road crashes under the influence of alcohol, as shown in Table 1, whereas Norway and Sweden are among the countries having the highest SPI. For practical reasons “impaired by alcohol” was here understood as blood alcohol concentration (BAC) above the legal limit in each country. There are 4 EU countries applying nowadays the zero BAC limit: the Czech Republic, Hungary, Slovakia and Romania. In contrast, these countries have unexpectedly relatively low percentage of drinking and driving fatalities compared to other countries. More particularly, the Czech Republic has registered only 4.8% of the fatalities resulting from alcohol-related crashes, which is one of the lowest figure among all EU countries (Figure 1).

In Austria, the percentage of alcohol related road fatalities is also very low, but a study carried out by the KfV has shown that the official Police figures are largely underestimating the problem extent, because testing dead or unconscious drivers for alcohol is only allowed when there is a well substantiated suspicion. This means that unconscious or dead drivers are tested only when they are obviously intoxicated. In the province of Lower Austria (Niederösterreich) 17% of all active road users (N=789) involved in road crashes were under the influence of alcohol, whereas in the official road crash statistics only 5 per cent were under the influence [Machata & Wannenmacher 1998]. This situation is also confirmed by Braun & Schausberger (2007, p. 30): “if a person is killed or heavily injured by a crash it is legally not allowed to test this person for alcohol or drugs.” The situation is still the same in 2008, and newer data do not exist concerning underreporting of alcohol in fatal crashes in Austria (Machata, 2008). Consequently, it is rather obvious that the low alcohol SPI for Austria is mainly due to the lack of testing of dead and injured drivers.

Figure 1 shows the percentage of fatalities resulting from accidents involving at least one driver impaired by alcohol in 2007. Colours indicate the same BAC legal limits. Please note that for several countries 2007 figures were not available and older were used instead (CZ, SK, GR, ES, FR, CY, AT, SI, FI, DE, UK: 2006; HU, SE, DK, CH: 2005, IT: 2004)

Figure 1: Percentage of alcohol-related road fatalities in EU countries in 2007 (Eksler and Vis, Eds., 2007)



Police statistics

Czech Police Presidium produces statistics on the percentage of alcohol related crashes in the country. Alcohol related crash is a crash in which at least one active road user was found under the influence of alcohol (by the international definition). These statistics are produced on regular basis and provide the first overview of the situation of alcohol presence in road crashes. The Police uses the concept of culprit, i.e. a person appears to be responsible for a crash at the spot and the police refers to their alcohol intoxication in the crash report.

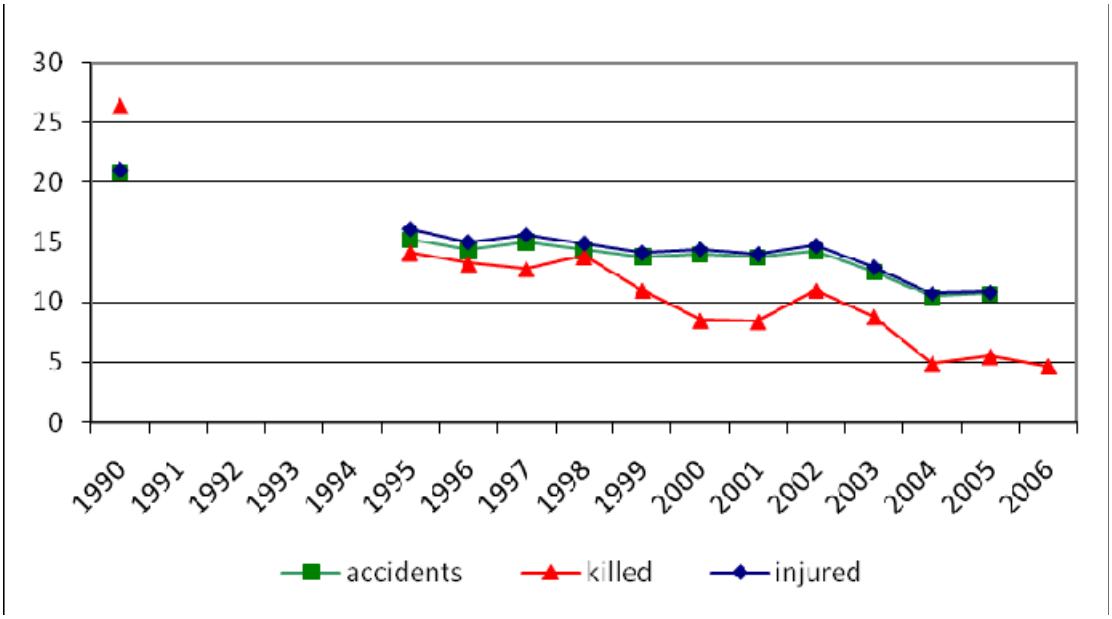
In 2007, altogether 1,222 people died in road crashes which occurred on the roads of the Czech Republic and which involved 1,692 drivers and 1,956 active participants (drivers and pedestrians) in total. In these crashes, 41 crash victims were related to crashes in which culprit of the crash was under the influence of alcohol, 38 victims when any driver and 47 victims if any active participant was found intoxicated by alcohol. It appears that considering the intoxication by alcohol for all active crash participants increases the number of cases only marginally. This means that in most cases the intoxicated driver is also the victim of the crash, by a factor of 1.04 (781 killed in crashes with any active participant intoxicated against 751 killed in crashes with intoxicated culprit in the period 2000 to 2007).

In any case, the regular statistics do not provide information on the percentage of alcohol-related fatalities, i.e. fatalities resulting from crashes where one or more drivers were under the influence of alcohol, whether culprit or not.

Table 2. All road fatalities in the Czech Republic, and road fatalities resulting from alcohol related crashes in the period 2000-2007

All fatalities	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Total killed (30 days)	1,486	1,334	1,431	1,447	1,382	1,286	1,063	1,222
Participating drivers	1,948	1,738	1,919	1,949	1,876	1,726	1,464	1,692
Active participants (drivers+pedestrians)	2,243	2,084	2,256	1,165	2,171	2,066	1,675	1,956
Alcohol related fatalities								
Killed culprit intoxicated DWI	126	112	158	127	68	71	48	41
Relative share (%)	*8.5*	*8.4*	*11.0*	*8.8*	*4.9*	*5.5*	*4.5*	*3.4*
Killed any participating driver intoxicated	120	104	149	122	67	68	47	38
Relative share (%)	*8.1*	*7.8*	*10.4*	*8.4*	*4.8*	*5.3*	*4.4*	*3.1*
Killed any active participant intoxicated	126	115	161	134	73	73	52	47
Relative share (%)	*8.5*	*8.6*	*11.3*	*9.3*	*5.3*	*5.7*	*4.9*	*3.8*
Drivers in fatal crashes tested	164	124	176	142	80	78	55	54
Active participants in fatal crashes tested on alcohol	NA	NA	NA	NA	NA	NA	NA	NA

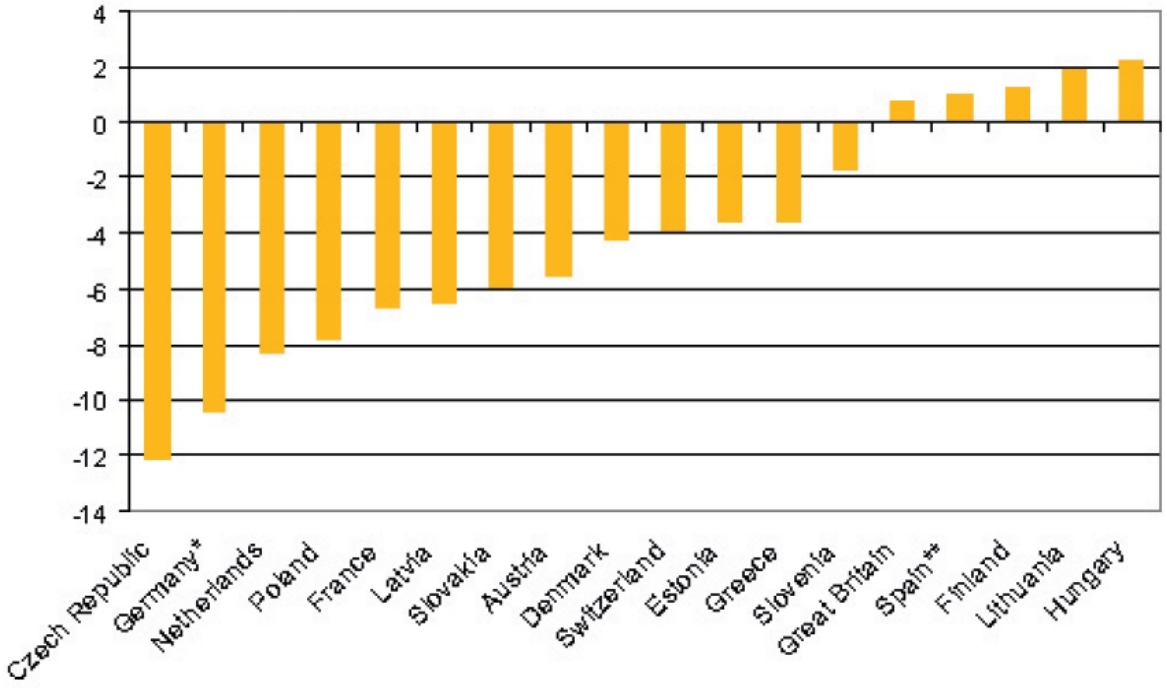
Figure 2. The percentage of crashes/injuries/fatalities resulting from alcohol related crashes



In a longer term, the numbers of crashes, crashes with at least one injury and crashes with at least one fatal injury in which the driver was intoxicated by alcohol crash, injuries and fatalities have been decreasing steadily since 1990. If the decrease in injuries was similar to the one registered for crashes, the decrease recorded for road fatalities was more significant. More particularly, in the period 1998-2001, the percentage of alcohol related fatalities was decreasing while the percentage of injuries and crashes was more or less constant (Figure 2). This could point to the methodological changes in data collection during and after the crash investigation.

The 2006 percentage is less than a third of the 1998 percentage and less than a fifth of the 1990 percentage. The time series shown in Figure 2 does not support the hypothesis that the low SPI for the Czech Republic is due to a long tradition of strict rules and enforcement concerning drinking and driving. On the contrary, the low value of SPI is a fairly recent thing, for which the explanation should be sought.

Figure 3. Annual average change in alcohol related road deaths over the period 1996 to 2006 (source: ETSC, PIN Flash 6).



In the ranking produced by the European Transport Safety Council (ETSC) in their PIN Flash 6 study, the Czech Republic ranked first among 18 EU countries for which relevant data were available. The gap between the Czech Republic and other top ranking countries is surprising and suspicious at the same time.

Alcohol consumption

Numerous authors claim that there is a relationship between the general alcohol consumption and alcohol related crashes (e.g. Elvik & Vaa 2004; p. 975). The Czech Republic has the second highest per capita alcohol consumption in Europe, whereas Norway and Sweden have considerably lower figures for alcohol consumption. Nevertheless, the Czech Republic as well as Norway and Sweden have a tradition for strict enforcement of drinking and driving.

The World Health Organization (WHO) produce regularly reports on the alcohol situation in different countries. Their data on the recorded adult per capita pure alcohol consumption (age 15+) in time suggest that the consumption had been increasing until late 1970's in most European countries and then started to stagnate or decline. The WHO statistics on alcohol consumption in European countries also contains figures on crashes involving alcohol per 100,000 inhabitants (WHO 2007). These statistics give a totally different impression of alcohol related road crashes in the four countries (Table 3).

In some cases, the data on BAC in the road crash is not available in the Police road crashes database: therefore the number of fatal crashes with culprit intoxicated by alcohol and crashes with the culprit with zero BAC are compared.

Given various facts presented above, it is possible that the number of alcohol related fatalities in the Czech Republic is underestimated. Consequently, a study is proposed to determine the real extent of alcohol involvement in fatal crashes and the reasons for the underreporting.

Table 3. Alcohol consumption and alcohol related road crashes in four countries in 2003 (WHO)

Country	Pure alcohol consumed, litres per capita, age 15 +	Road crashes involving alcohol per 100,000 inhabitants
Austria	12.6	34.5
Czech Republic	13.7	27.3
Norway	4.8	-
Sweden	5.6	11.7

Data sources

The police database

The police database of Czech Republic is in an international context a reliable source of high quality road crash data source, which has been developed and maintained over more than 30 years. It is organised in three administrative levels: district, regional and central. Data collected at district level are verified and transmitted to the regional level, again verified and transmitted to the central level, again verified and then stored to the central database on the State Police Directory. The data collecting process is carried out by means of a road crash form. At present, this process is highly computerized. The crash data form contains 74 variables related to the 4 main groups (crash, vehicle, driver and passenger, pedestrian). By the law there is a legal obligation of reporting to the police most of crashes on public roads, not only crashes with a person injured, but also crashes with only material damage over some financial limit (this limit for reporting is at present 50,000 CZK (2,000 EUR), until 2006 – 20,000 CZK (800 EUR) and until 2000 – 1,000 CZK (40 EUR).

The hospital medical database

There is no central hospital injury database in Czech Republic, unlike in many other countries. Nevertheless, statistics on hospitalized and killed persons from all hospitals on the territory of Czech Republic are collected by the Institute of Health Information and Statistics that is the administrator of the National Health Information System.

The statistics available from hospitals are not uniform and their degree of completeness and reliability vary considerably. In this study, the records from one hospital of central Moravia were analyzed, as an example of a hospital with relatively reliable and available data. The hospital of Kromeriz (a town of some 30,000 inhabitants with near surrounding) is located about 70 km from Brno.

There are three possible problems in data handling. First, the operation zone of the police and the emergency service of the hospital do not always cover the same area. Second, the hospital statistics are predominantly oriented to the medical elements of the case (diagnosis of the injury), while the elements related to the crash circumstances are not focussed on by the medical personnel, even in those hospitals whose statistical data is better. Third, there may be gaps in the communication between involved medical institute, such as hospital (or medical rescue service) and the specialised judicial medicine institute.

BAC recording procedure

All surviving drivers involved in a road crash with an injury or a fatality are supposed to be tested for the presence of alcohol by means of a standard breath test. This test is carried out by Police officers on the spot. In case of damage only crashes, the breath test is performed occasionally, depending on the judgement of the police officer on the potential of a judicial procedure. If the condition of person does not allow a breath test, a body liquid is taken by a physician usually in the hospital with a certain delay. The evidential test is compulsory by law and in case of objections; another and more precise blood test is performed in the nearest medical centre with a minimum delay. If the delay between the crash and the test is too long, the doctor computes the actual value of blood-alcohol at the moment of crash based on the basic characteristics of the driver.

It is a common practice to carry out a post-mortem examination for all killed road crash active participants. Despite no legal provision exist. The aim is to identify a potential physical indisposition of a driver during the crash. However, in case of single crashes involving only one person who is also the victim, no post-mortem investigation is carried out as there is no concern about juridical liability. The fact that drink drivers tend to be overrepresented in single vehicle crashes may seriously influence statistics here. As killed drivers in single vehicle crashes are not tested for alcohol in the Czech Republic this may be one reason for the low SPI result. The BAC level determined during an autopsy is kept as a medical secret in the hospital, and the police must present an official request for these data, rising from the judicial procedure needs. Moreover, the Police have to pay an administrative fee for obtaining this information. Therefore no results of post-mortem are usually available in police records. At the same time, the number of post-mortems of crash victims is not available at country level. Nevertheless, even the hospital often does not have any information on the intoxication by alcohol because the autopsy may be executed in an other specialised institute (judicial medicine institute).

Two indicators of alcohol related road crashes can be produced in the Czech Republic.

- Crashes with a culprit intoxicated by alcohol – the culprit found with the BAC over the legal limit of zero g/l
- Crashes with the presence of alcohol – any active participant found with the BAC over the legal limit of zero g/l

National statistics produced by the Police and supplied to international organizations regular statistics of the Police Presidium typically refer to the first indicator, but the second one is also available from their database.

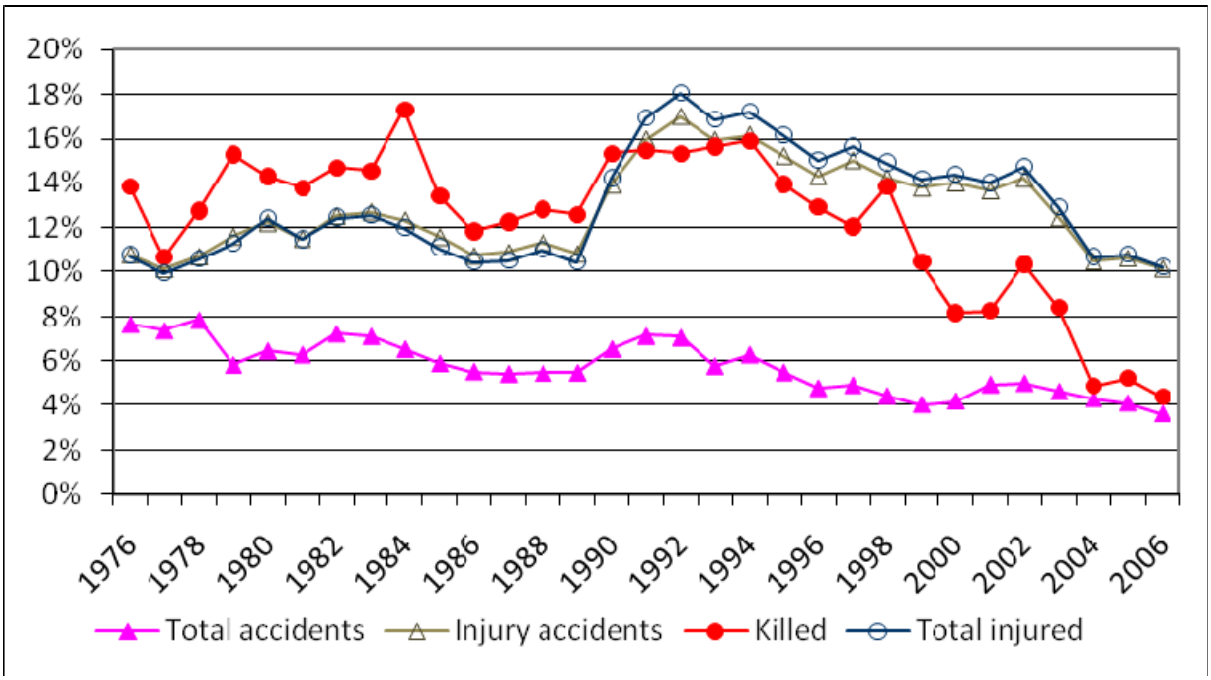
The data needed for an international comparison are fatalities occurring in crashes where at least one driver is under the influence of alcohol – whether culprit or not. For the time being, there is only a little interest in the BAC level of other active road users involved, thought it can come in a long run.

Analysis of official Police data

By analyzing the crash records available in the central crash database, one can get a first picture on the magnitude of the problem of DWI and on its development over the time. The national definition of road fatality (a death occurring within 24 hours after the crash) is applied in this data file. While the reliability of the indicators is subject of investigation in this study, the evolution of indices employed can still provide a useful insight into the problem.

First, we will look at the evolution of the proportion of crashes (crash injuries) in which the culprit was found under the influence of alcohol. We will consider two different jurisdictions: the Czech Republic and Slovak Republic. The period from 1976 to 1988 was predominated by stagnation in all the indices analysed. In the period from 1989 to 1990, there was a sharp increase (e.g. proportion of injuries from crashes with culprit DWI increased from 10% in 1989 to 18% in 1992). The increase was common for two of the indicators, but not for fatalities, where the trend was rather stagnating at the same period. It is straightforward to assume that the development registered in this period was most likely related to the societal and institutional changes the country was undergoing. Since then, a declining trend has been observed, but among these indices, the decline in the fatality trend was the most pronounced. This may be an indication that there is a methodological problem for identifying the alcohol related fatalities, e.g. that the police have to present an official request and pay for the data, whereas the police does the breath testing themselves for injured drivers.

Figure 4. Proportion of crashes/injuries in which the culprit was found intoxicated by alcohol in Czech Republic



While it is more difficult to identify clear trends in the development of indices under consideration compared to the Czech Republic, one can conclude that the situation in Slovakia was rather similar, except the period after 1988 in which the rise registered was rather tiny and took place over a rather short period (two years only compared to 5 years). Also in Slovakia, the proportion of fatalities resulting from crashes with culprit was found intoxicated has been decreasing substantially and continuously since 1988.

The same comparison figure is now presented for the Slovak Republic (Figure 5), showing the proportion of crashes and injuries in which the culprit was found intoxicated by alcohol. In general, the trend of all indices considered was practically identical until 1988, while after this

year the trend show different pace, with a fatality indicator having clearly a different development compared to other indices. The most recent data are summarized in Table 4, presenting various sets of alcohol crash information. We shall take a closer look at the reduction realized in the last 15 years, which unveils these disparities in the development of particular indices.

The data related to 24 hours definition of road crash victim are summarized in Table 4, showing the absolute numbers of crashes and their victims whether alcohol related or not.

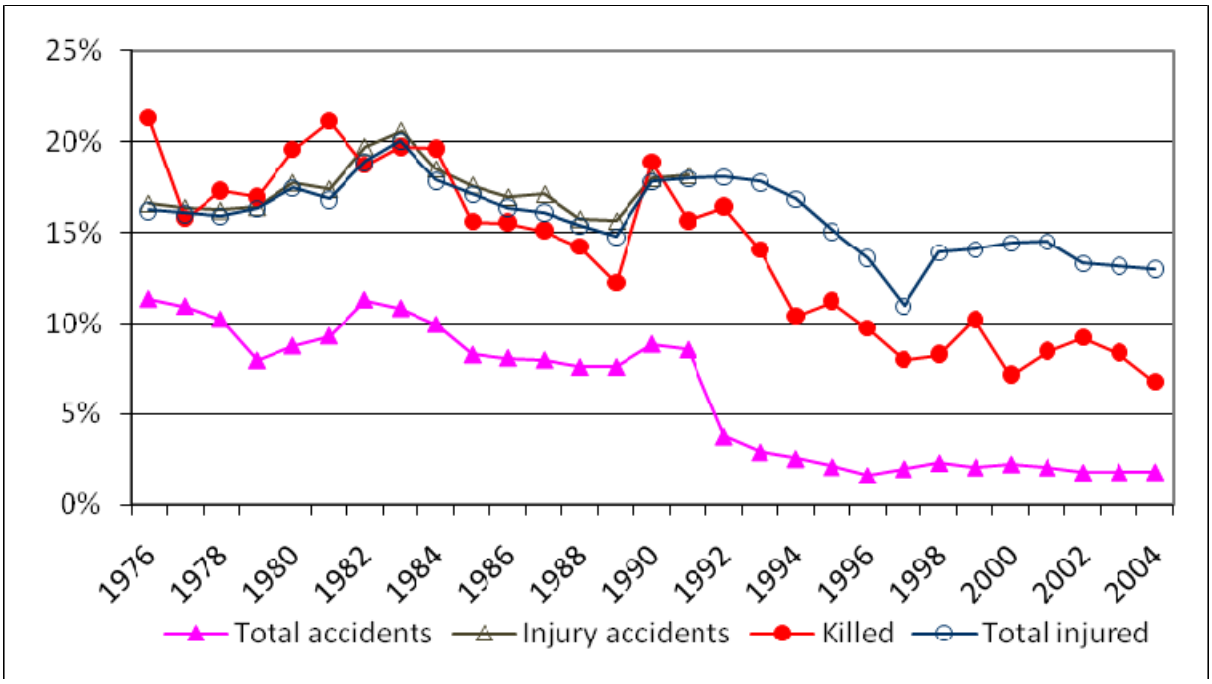
Table 4. Number of crashes and victims in all and alcohol-related crashes with culprit found intoxicated and their relative shares (Czech Republic 2000-2006)

Czech Republic 24 hrs	2000	2001	2002	2003	2004	2005	2006
Total crashes	211,516	185,664	190,718	195,851	196,484	199,262	187,965
Injury crashes	25,445	26,026	26,585	27,320	26,516	25,239	22,115
Killed	1,336	1,219	1,314	1,319	1,215	1,127	956
Seriously injured	5,525	5,493	5,492	5,253	4,878	4,396	3,990
Slightly injured	27,063	28,297	29,013	30,312	29,543	27,974	24,231
Total injured	32,588	33,790	34,505	35,565	34,421	32,370	28,221
Culprit with alcohol							
Total crashes	8,888	9,191	9,552	9,076	8,445	8,192	6,807
Injury crashes	3,566	3,557	3,779	3,404	2,787	2,688	2,252
Killed	109	101	136	111	59	59	42
Seriously injured	824	801	834	726	432	388	314
Slightly injured	3,870	3,933	4,250	3,860	3,242	3,105	2,567
Total injured	4,694	4,734	5,084	4,586	3,674	3,493	2,881
Share							
Total crashes	0.04	0.05	0.05	0.05	0.04	0.04	0.04
Injury crashes	0.14	0.14	0.14	0.12	0.11	0.11	0.10
Killed	0.08	0.08	0.10	0.08	0.05	0.05	0.04
Seriously injured	0.15	0.15	0.15	0.14	0.09	0.09	0.08
Slightly injured	0.14	0.14	0.15	0.13	0.11	0.11	0.11
Total injured	0.14	0.14	0.15	0.13	0.11	0.11	0.10

Table 5 shows the average annual percentage reduction in the indicators specified earlier over the period 1992-2008. It is based on a simple linear regression estimation model. The estimates show the average annual percentage reduction as being estimated over the period of 15 years. More serious the type of injury, higher the reduction in the proportion of fatalities related to alcohol (culprit intoxicated by alcohol) in time. The difference between slight injury (3.2%) and fatal injury (6.8%) is huge and can hardly be attributed to the randomness in data.

If general deterrence – enforcement, penalties and campaigns – caused less drinking and driving among the general driver population, the trend should have been more or less the same for all indicators – crashes, injuries and fatalities. One can therefore assume that there were some other external factors behind recorded trends, such as change in reporting practices etc.

Figure 5. Proportion of crashes/injuries in which the culprit was found DWI – Slovakia



It is possible that the political changes brought along a large number of legal and administrative changes, which might have had an impact on the reporting practices. Most particularly, the concept of the protection of personal and sensitive information has been gaining on importance over the years and the transfer of certain data between different administrative entities has become more complex.

Table 5. Average annual percentage reduction of alcohol-related crashes/injuries with culprit intoxicated over the period 1992-2008

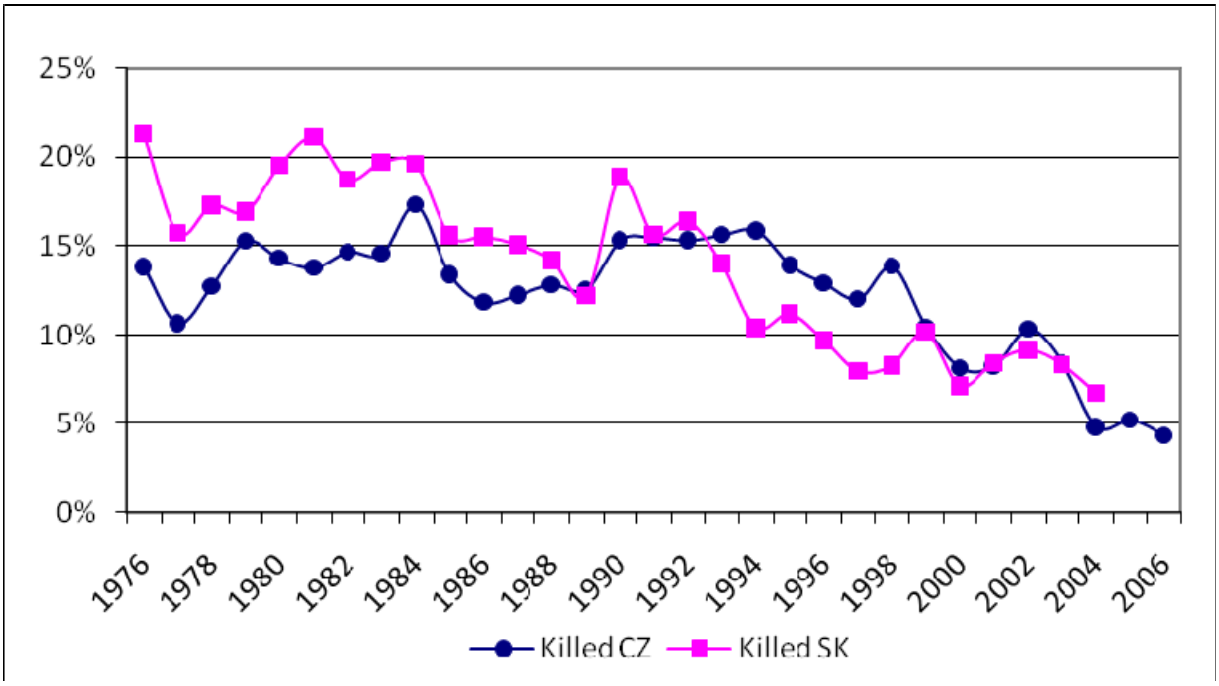
Average annual percentage reduction (1992-2008)	Czech Republic	Slovakia	Czechoslovakia
Total crashes	4.7	7.3	5.0
Injury crashes	3.1	NA	NA
Killed	6.8	7.6	6.5
Seriously injured	4.7	NA	NA
Slightly injured	3.2	NA	NA
Total injured	3.4	3.4	3.2

Moreover, we may have a closer look at the differences in the development of the proportion of culprit alcohol intoxicated fatalities between the Czech Republic and Slovakia. This comparison suggests that the period of reduction started some 5 years earlier in Slovakia where it has also be more pronounced compared to the Czech Republic. The decrease recorded in Slovakia between the year 1990 (19%) and 1994 (10%) is truly spectacular and can hardly be attributed to any concrete road safety oriented measures.

Given the findings presented, one may suggest that the low proportion of fatalities resulting from crashes with culprit DWI is most likely the result of changes in reporting practices and that the "true" value lays somewhere at the level of the index for injuries (approximately double the value of present estimate). Similarly, since the medical records on the BAC determined during an autopsy are not transferred directly to Police, the statistics can suffer from certain inaccuracy. Moreover, the conditions of injured person do not always allow

performing the BAC test in a reasonable timeframe after the crash and this can further undermine the quality of data.

Figure 6. Development of the proportion of DWI fatalities in the Czech Republic and in the Slovak Republic



Methodology

The underreporting of alcohol related road fatalities can be due to a large number of reasons/factors, occurring in different stages of crash investigation and data processing.

Following three steps have been employed within the study:

1. A set of at least 50 fatal crashes, which have occurred in most recent years in the district of Kromeriz was identified by filtering the central (national) crash database (Police Presidium).
2. The police crash investigation reports of these crashes were studied in detail. The relevant information shall then be checked against the centrally registered information from the state crash database (db line description for all single road fatality). (Step 1 and 2)
3. The medical files of in-patients including fatally injured were then studied in detail and the information relevant to the presence of alcohol were matched with the relevant crash information.

Study area description

Kroměříž district (*okres Kroměříž* in Czech) is one of four districts (okres) within Zlín Region (*Zlínský kraj*) of the Czech Republic. District capital is city of Kroměříž (30,000 inhabitants). The area is 795,67 km^2, the number of inhabitants 107,564 (population density 135 per 1 km²). There are 79 municipalities, from which 7 cities and 1 market-town.

Kromeriz district represents altogether one percent of the population of the Czech Republic. Five years were considered in order to get a sample of at least 50 fatalities to be studied in detail within this study.

In spite of its central location, it is little influenced by transit traffic. More particularly, until 2007, no motorway was passing through the district. It can be considered as well representative for the country as a whole.

Table 6. Study area description in relationship to the country

Area	Fatalities (2003-2007)	Population
Kromeriz	63	107,800
Czech Republic	6,400	10,240,000
Proportion	0.98%	1.05%

Linking procedure

The linking procedure was similar to the one proposed and applied in SN WP1 project, where the underreporting of injury crashes was studied for the same geographical area of the Czech Republic. The best linking variable would be surely the ID-number of injured person. This possibility is, however, excluded by the law for personal data protection. Consequently, the alternate variables were used.

Although most variables of police and hospital databases are different, some corresponding variables could be found. The following variables have been chosen for the linking process:

- day of crash and hour
- year of birth,
- sex,
- type of road user.

Skateboard and roller skate users are registered in the hospital database as a specific type of road user, but they are considered as pedestrians for the linking procedure. Anyway, in this study we are only interested in the BAC drivers of motor vehicles involved in fatal crashes. However all fatal crashes should be included no matter what kind of road user has been killed.

Some tolerance in variables for the linking process are allowed:

- day of crash: +1 day in the hospital database,
- year of birth: +/- 1 year
- type of road user: some difference in the hospital database is possible.

The estimation of SPI

The question is then how to calculate the SPI. Should the fatalities resulting from crashes where one or more drivers are not tested, be included in the total, i.e. in the denominator? There is no easy answer to this question. On the one hand it seems reasonable to calculate the SPI only on the basis of crashes where the alcohol relation is fully known. On the other hand, if the drivers were not tested because there is a reason to believe that they had not been drinking before the crash, it seems reasonable enough to leave these crashes out.

This study should give us some an indication whether the alcohol SPI for Czech Republic is realistic or not. Moreover, the problem of how to calculate the SPI - on the basis of all fatal crashes or only those for which the BAC of all drivers is known, pertains to all countries. This in-depth study will produce results which will also give better knowledge of possible problems in producing the data needed for the SPI both for the Czech Republic and other countries. This knowledge can be used in the dissemination and training for the collection and compilation of the data needed for the alcohol and drug SPIs.

In-depth investigation

In depth investigation into the fatal crashes related to the presence of alcohol as described earlier consist of three steps: Analysis of central crash database data (1), Analysis of Police crash reports (2) and the analysis of medical data (3).

Analysis of data from the central crash database

Police district of Kromeriz corresponds to Kromeriz administrative district, what is true for most of Czech districts. This fact should somewhat facilitate the analysis of relevant data.

In the first step of the analysis, the data on road cashes resulting in at least one fatal injury (30 days) which occurred in Kromeriz district in the period of 1.1.2003 to 31.12.2007 was obtained from the Police database maintained centrally by the Police Presidium. According to these data altogether 54 crashes resulting in 61 fatalities occurred in the district and period under consideration.

As for the presence of alcohol, only the information on culprit is available. Culprit was tested in 80% cases, while they were found positive in 10% of cases (20% in total).

Table 7. Alcohol related fatalities data summary retrieved from the Central Police database

Kromeriz district (1.1.2003 - 31.12.2007)		**30 days**	**24 hours**
Crashes		54	44 (fatal)
Fatalities	Total	61	51
	Vehicle drivers	35	28
	Vehicle passengers	13	13
	Pedestrians	13	10
Culprit tested	Total	48 (80%)	
	Positive	5 (9%)	
Other active participants tested	Total	45 (98%)	
	Positive	2 (4%)	

Six culprit drivers involved in crashes resulting in a fatal injury were not tested for the presence of alcohol (54 crashes and 48 culprit tested). This study shall shed some light on why many active participants were not tested. In two crashes in which the culprit was tested negative on the presence of alcohol in blood a pedestrian was involved.

Considering culprit of a crash, 10% (6/61) of fatalities occurred in crashes with an intoxicated culprit and in 9% (5/54) of crashes resulting in a fatal injury, the culprit was found intoxicated.

Considering all active participants, including pedestrians13% (8/61) of fatalities occurred in crashes with an intoxicated active participant.

Analysis of data from crash reports

In the second step of the study, the crash reports were investigated at the local police directorate of Kromeriz. Original crash reports in their paper form were analysed in order to identify possible shortcomings in data processing from the local to central state database.

The detailed look on crash reports allowed identifying additional 4 fatalities occurring in crashes with intoxicated active crash participants, of whom one culprit found intoxicated and 3 other participants (12 out of 61 fatalities) found intoxicated. All this besides 8 fatalities from road accident database statistics (6 if drivers considered and 2 more if pedestrians considered.

Table 8. Alcohol related fatalities data summary retrieved from crash reports

Kromeriz district (1.1.2003 - 31.12.2007)		**30 days**
Crashes		54
Fatalities	Total	61
	Vehicle drivers	35
	Vehicle passengers	13
	Pedestrians	13
Culprit tested	Total	39 (72%)
	Positive	6 (11%)
Other active participants tested	Total	45 (98%)
	Positive	5 (9%)

According to crash reports, altogether 23 (10+6+6+1) fatalities occurred in crashes where not all drivers were tested for the presence of alcohol (Table 9). This represents a very large proportion of all fatalities (38%). The reasons vary from unconsciousness of driver to no juridical reason for examination.

Let us remind here that there were altogether 54 culprits and 46 additional active crash participants, which makes 100 active participants in total, were involved in 54 fatal crashes.

Table 9. Alcohol related fatalities

Crashes	Fatalities	of whom vehicle occupants	of whom pedestrians	Type
				Known possible intoxication
5	6	6		Culprit intoxicated (police database)
2	2		2	Other participant intoxicated (police database)
4	4	2	2	Other active participant intoxicated (crash reports)
24	26	18	8	No alcohol found for any of participant
				Unknown possible intoxication
6	*10*	10		Crash with a train (no examination done)
6	*6*	6		Only culprit died (no examination done, or unknown)
6	*6*	5	1	Indisposition, myocardial infarction, suicide (no examination, or unknown)
1	1	1		Special case, unknown circumstances
54	**61**	**48**	**13**	**SUM**

It is unknown in how many cases the post-mortem examination was actually undergone. In one single case which is known, the result was positive, and the case appeared as culprit intoxicated in police database. For other cases, the result of the post-mortem is unknown.

If not necessary, the post-mortem examination of driver, culprit is not done in order to keep costs down. In the end, only for 38 fatalities it was possible to find out information on the intoxication of active participants, i.e. for 62% cases. For the remaining 23 fatalities the possible involvement of some intoxicated active participant is unknown.

Only two thirds of (8 out of 12) fatalities resulting from crashes involving at least one active participants intoxicated by alcohol actually appear in the police database, which serve to produce all relevant national and international statistics.

Table 10. Alcohol related fatalities and their share among fatalities

61			Total fatalities
38			Known possible intoxication by active crash participants
6	6/61	10%	Culprit intoxicated (police database)
8	8/61	13%	Other participant intoxicated (police database)
12	12/61	20%	Other active participant intoxicated (crash reports)
6	6/38	16%	Culprit intoxicated (police database)
8	8/38	21%	Other participant intoxicated (police database)
12	12/38	32%	Active participant intoxicated (crash reports)

Analysis of medical data

In the third and last step, the records from the in-patient database of Kromeriz hospital were matched with the records from crash reports. The date of birth and sex was used as the matching key to the records. Only in 40 out of 54 fatal crashes were the injured participants transported to Kromeriz hospital. In at least 3 fatal crashes the injured victim was transported by a helicopter to Brno, or Olomouc. For the remaining cases, dispatch centres of Zlin and Prerov were most likely involved.

A blood sample is taken at surgery ambulance only on the request of police. The analysis is than done centrally in the judicial medicine institute. The Police transports the samples taken in ambulance and does not report to the hospital the result of the test. According to the staff, the blood sample is taken only occasionally. However, in the analysed sample, no such cases could be identified.

One difficulty is a possible gap in data, or a confusion resulting from the fact that the jurisdiction of each emergency service may overlap so that the ambulance can be sent from the closest dispatch centre located in other district.

Several injuries resulted from a crash involving a police officer and they were treated in the emergency unit of Kromeriz hospital, but this crash could not be matched with any police record as there was no fatal injury involved. The culprit of the crash was according to the medical record showing sights of alcohol intoxication and smelt alcohol (faetor alcoholicus), but no breath or blood test was done.

The analysis of medical data did not bring too many new information for several reasons:

- Police perform a breath-test on crash spot and only in case of a positive result asks for a blood sample testing.
- Since the intoxication by alcohol is not relevant for the treatment, the hospitals do not carry out a blood sample test on a routine basis.
- Medical staff is reluctant in making any suspicious notes on the alcohol intoxication, since the medical record is occasionally used in legal process if engaged, bringing inconveniences to medical staff.
- The patient has an access to their medical record, therefore any information on alcohol intoxication, which is not based on official test results can become a source of blame towards medical staff.

Analyses summary

We can summarize the findings as follows: Some 10% of fatalities resulted from crashes in which at least one driver was found intoxicated by alcohol. In several other crashes resulting in fatal injury, either pedestrian, or pedal cyclist was found intoxicated, so at least 20% of fatalities occurred in crashes in which at least one active participant was found intoxicated by alcohol.

Table 10. Summary of results

Alcohol-related fatalities	Out of 61	Out of 38
Driver intoxicated (8)	13%	18%
Active participant intoxicated (12)	20%	32%

Discussion and conclusions

It appeared impossible to determine an exact level of underreporting of alcohol-related crashes in the Kromeriz region (as the sample standing for the Czech Republic). It is to be stressed here, that this regions represents only a marginal proportion of the total population and road traffic (some 1%).

The analysis of crash reports enabled to uncover several additional cases of alcohol intoxication in comparison with data retrieved from central police crash database. Furthermore, the look at hospital database shed additional light on the reasons for shortcomings in reporting alcohol intoxication by crash participants. Last, but not least, an interview with police officers and medical staff enabled to better understand the reasons for the gaps in reporting of alcohol-related fatalities.

The fact that drink drivers tend to be overrepresented in single vehicle crashes may seriously influence national statistics on alcohol related road fatalities. As killed drivers in single vehicle crashes are usually not tested for alcohol in the Czech Republic, this may be one reason for the low proportion of alcohol-related fatalities. Furthermore, if police have to make an official request to the hospital to obtain the information concerning the blood alcohol concentration level of killed drivers and even a payment may be necessary could cause serious gaps in accident statistics. Apparently, the local hospital may also have problems in getting this information, when the autopsy is done elsewhere.

These shortcomings are common to many other European countries (e.g.) Austria and this fact only illustrate obvious difficulties in compiling and comparing national statistics on alcohol in road crashes.

The results of this study suggest that the proportion of alcohol-related fatalities may be actually higher than reported and may be only slightly lower than EU average (19%). But as mentioned earlier, it became impossible to determine the exact value of the indicator and an additional study may be necessary to bring more exact figures valid for the country as a whole.

As regards the determined level of alcohol intoxication, this was not sought separately in this study, but it usually varies between 0.2 and 1 g/l. Higher blood alcohol contents are often found for pedestrians, especially those sustaining fatal injury in a crash.

References

Eksler V., Hollo P., Bensa B. et al. (2005). SUNflower+6: A comparative study on the development of road safety in the Czech Republic, Hungary and Slovenia, CDV

Elvik, R. & Vaa, T. The Handbook of Road Safety Measures. Elsevier 2004.

ETSC (2007). Raising Compliance with Road Safety Law, First Road Safety PIN report, Brussels

Machata, K. & Wannenmacher, E. Wie hoch liegt de Alkoholquote wirklich? Detailanalyse von Verkehrsunfällen mit Todesfolge im Land Niederösterreich. In Bartl, G. & Kaba, A. Alkohol im Strassenverkehr. Kuratorium für Verkehrssicherheit. Wien 1998.

Vis, M.A. and Eksler, V. (Eds.) (2008) Road Safety Performance Indicators: Country Comparisons 2008. Deliverable D3.11a of the EU FP6 project SafetyNet.

Vis, M.A. and van Gent (Eds.) A. Road Safety Performance Indicators: Country Comparisons. Deliverable D3.7a of the EU FP6 project SafetyNet. 2007

WHO (2007). Alcohol and drugs. Country information.
http://www.euro.who.int/alcoholdrugs/ctryinfo/ctryinfo

Rocakova-Filemon, P., Eksler V. (2008) Evaluation of the 0.0 BAC limit for drivers of road vehicles in Czech Republic, Slovakia, Hungary and Croatia, Deliverable 4.2, Pepper project

Data

The following annex contains detailed information on alcohol-related crashes and resulting victims as analyzed from crash reports and hospital registry. Each line refers to one single road user involved in fatal crash. Lines with bold text refer to crash victims. The column statistics refers to the record found in the central Police database, while the next column headed crash report refers to the information from locally stored crash reports. The column hospital presents supplementary information found thanks to the analysis of hospital data.

Nr.	Date	Time	Type	Statistics	Crash report	Sex	Year of birth	Injury	Hospital
1	19/12/2003	0610	car	No		male	1957	Slight	**No**
1	19/12/2003	0610	good vehicle	No		female	1969	None	No record
2	**18/10/2003**	**0900**	**car**	**No**		**male**	**1981**	**Fatal**	No record
3	**07/06/2003**	**1700**	**car**	**No**		**male**	**1960**	**Fatal**	**With train, PM requested**
4	02/05/2003	2150	car	No		male	1951	None	No record
4	**02/05/2003**	**2150**	**cyclist**	**No**		**male**	**1959**	**Fatal**	
4	02/05/2003	2150	car	No		male	1955	None	No record
5	**09/02/2003**	**0110**	**car**	**Yes**	**Yes**	**male**	**1969**	**Fatal**	**Unknown**
6	31/10/2003	1700	good vehicle	No		male	1971	None	No record
6	**31/10/2003**	**1700**	**pedestrian**	**No**		**female**	**1941**	**Fatal**	**PM**
7	18/07/2003	0815	car	No		male	1931	None	No record
7	**18/07/2003**	**0815**	**pedestrian**	**No**		**female**	**1935**	**Fatal (2 days)**	**Unknwn**
8	14/01/2003	0530	autobus	No		male	1942	None	No record
8	**14/01/2003**	**0530**	**pedestrian**	**No**	**Yes**	**male**	**1953**	**Fatal (8 days)**	**Unknown**
9	07/12/2004	1758	car	No		male	1958	None	No record
9	**07/12/2004**	**1758**	**cyclist**	**No**	**Yes**	**male**	**1947**	**Fatal**	
10	**24/06/2004**	**1450**	**car**	**No**		**male**	**1972**	**Fatal**	
10	24/06/2004	1450	good vehicle	No		male	1976	Slight	Unknown
11	**07/09/2004**	**1555**	**PTW**	**No**		**male**	**1959**	**Fatal**	**PM**
11	07/09/2004	1555	good vehicle	No		male	1983	None	No record
11	07/09/2004	1555	good vehicle	No		male	1977	None	No record
12	**01/11/2004**	**1130**	**car**	**No**		**male**	**1930**	**Fatal (25 days)**	**Transport by air / NA**
12	01/11/2004	1130	good vehicle	No		male	1976	Slight	No record
12	01/11/2004	1130	good vehicle	No		male	1977	None	No record
13	31/08/2004	1730	car	No		female	1960	Serious	Unknown
13	31/08/2004	1730	good vehicle	No		male	1969	Slight	NA
14	**08/07/2004**	**1620**	**car**	**No**		**male**	**1925**	**Fatal (16 days)**	**NO**
14	08/07/2004	1620	car	No		male	1951	Slight	No record
14	08/07/2004	1620	car	No		male	1977	Slight	No record
15	**26/06/2004**	**0300**	**car**	**Yes**	**Yes**	**male**	**1978**	**leh. zran.**	**YES**
16	23/04/2004	1700	car	No		male	1965	leh. zran.	NA
17	**10/04/2004**	**1545**	**car**	**No**		**male**	**1985**	**Fatal**	**Transport by air / NA**
18	**20/02/2004**	**1400**	**cyclist**	**Yes**	**Yes**	**male**	**1943**	**Fatal (4 days)**	**Transport by air / NA**
18	20/02/2004	1400	car	No		male	1973	Slight	No record
19	**11/01/2004**	**1348**	**car**	**No**		**female**	**1985**	**Fatal**	
20	**28/11/2005**	**1357**	**cyclist**	**No**		**female**	**1967**	**Fatal**	**With train / NA**
21	**12/11/2005**	**0225**	**car**	**Yes**	**Yes**	**male**	**1983**	**leh. zran.**	**NA**
22	**30/10/2005**	**1359**	**PTW.**	**No**		**male**	**1988**	**Fatal**	**FN Bohunice**
23	23/08/2005	1140	good vehicle	No		male	1979	Slight	
23	**23/08/2005**	**1140**	**car**	**No**		**female**	**1970**	**Fatal**	**No record**
24	06/08/2005	1215	car	No		male	1974	Slight	No record
24	**06/08/2005**	**1215**	**PTW**	**No**		**male**	**1983**	**Fatal**	**No record**

Nr.	Date	Time	Type	Statistics	Crash report	Sex	Year of birth	Injury	Hospital
25	29/07/2005	1123	good vehicle	No		male	1971	Slight	No record
25	**29/07/2005**	**1123**	**car**	**No**		**male**	**1965**	**Fatal**	**NA**
26	**11/05/2005**	**1315**	**cyclist**	**No**		**female**	**1928**	**Fatal (4 days)**	**Transport by air / NA**
26	11/05/2005	1315	good vehicle	No		male	1957	Slight	No record
27	**06/04/2005**	**0635**	**car**	**No (infarctus)**		**male**	**1926**	**Fatal**	**Infarctus**
28	29/04/2005	1030	good vehicle	No		male	1957	Slight	No record
28	**29/04/2005**	**1030**	**cyclist**	**No**		**female**	**1934**	**Fatal (3 days)**	**NA**
29	**24/01/2005**	**0030**	**car**	**No (infarctus)**	**Yes**	**male**	**1978**	**Fatal**	**No record**
30	16/12/2005	1640	car	No		male	1985	Slight	No record
30	**16/12/2005**	**1640**	**pedestrian**	**No**		**female**	**1923**	**Fatal**	**No record**
31	14/10/2005	1920	car	No		male	1973	Slight	No record
31	**14/10/2005**	**1920**	**pedestrian**	**No**	**Yes**	**female**	**1916**	**Fatal**	**NA**
32	20/01/2005	1825	car	No		male	1978	Slight	No record
32	**20/01/2005**	**1825**	**pedestrian**	**No**		**male**	**1937**	**Fatal**	**No record**
33	22/12/2006	0945	car	No		male	1980	Slight	No record
33	**22/12/2006**	**0945**	**car**	**No**		**male**	**1960**	**Fatal**	**NA**
34	**05/11/2006**	**1730**	**car**	**No (infarctus)**		**male**	**1940**	**Fatal**	**PM, infarctus**
35	**03/07/2006**	**2560**	**cyclist**	**No**		**male**	**1960**	**Fatal (5 days)**	**No record**
36	**21/03/2006**	**0912**	**car**	**No**		**male**	**1971**	**Fatal**	**With train / NA**
37	**18/03/2006**	**1800**	**car**	**No (infarctus)**		**male**	**1928**	**Fatal**	**PM**
38	**18/01/2006**	**1515**	**car**	**No**		**male**	**1972**	**Slight**	**NA**
38	**18/01/2006**	**1515**	**car**	**No**		**male**	**1930**	**Fatal**	
39	02/11/2006	1915	car	No		male	1980	Slight	No record
39	**02/11/2006**	**1915**	**pedestrian**	**No**		**female**	**1952**	**Fatal**	**NA**
40	**06/06/2006**	**2560**	**pedestrian**	**No (indispo)**		**male**	**1957**	**Fatal (2 days)**	**No record**
41	**28/09/2007**	**0255**	**car**	**No**		**male**	**1967**	**Fatal**	**NA**
42	**09/09/2007**	**2140**	**good vehicle**	**No (suicide)**		**male**	**1978**	**Fatal**	**suicide**
42	09/09/2007	2140	good vehicle	No		male	1954	Serious	NA
42	09/09/2007	2140	car	No		male	1980	Slight	No record
42	09/09/2007	2140	car	No		male	1978	Slight	No record
42	09/09/2007	2140	car	No		male	1984	Slight	No record
43	**21/07/2007**	**1440**	**car**	**No**		**male**	**1988**	**Fatal**	**No record**
43	21/07/2007	1440	autobus	No		male	1948	Slight	NA
44	**12/06/2007**	**0745**	**good vehicle**	**No (fatigue)**		**male**	**1959**	**Fatal**	
44	12/06/2007	0745	autobus	No		male	1955	Slight	No record
44	12/06/2007	0745	good vehicle	No		male	1960	Slight	No record
45	**10/06/2007**	**0345**	**PTW.**	**No**		**male**	**1981**	**Fatal**	
46	**23/12/2007**	**1850**	**car**	**No**		**male**	**1972**	**Fatal**	
47	**21/04/2007**	**0145**	**car**	**Yes**	**Yes**	**male**	**1988**	**Slight**	
48	10/04/2007	0645	good vehicle	No		male	1968	Slight	No record
48	**10/04/2007**	**0645**	**PTW.**	**No**		**male**	**1981**	**Fatal**	
49	**01/01/2007**	**0800**	**car**	**No (indispo)**		**male**	**1931**	**Fatal (2 days)**	**No record**
50	21/09/2007	0055	good vehicle	No		male	1977	Slight	No record
50	**21/09/2007**	**0055**	**pedestrian**	**No (indispo)**		**male**	**1955**	**Fatal**	**No record**
51	27/12/2007	1725	car	No		male	1949	Slight	No record
51	**27/12/2007**	**1725**	**pedestrian**	**No**		**female**	**1942**	**Fatal**	
52	16/10/2007	2010	car	No		male	1988	Slight	No record
52	**16/10/2007**	**2010**	**pedestrian**	**Yes**	**Yes**	**male**	**1968**	**Fatal**	**No record**
53	10/04/2007	2215	good vehicle	No		male	1960	Slight	No
53	**10/04/2007**	**2215**	**pedestrian**	**Yes**	**Yes**	**male**	**1975**	**Fatal**	
54	20/03/2007	0630	bus	No		male	1975	Slight	No record
54	**20/03/2007**	**0630**	**pedestrian**	**No**		**female**	**1951**	**Fatal**	